Best Practices for Performing Less Frequent Tests Required by NFPA 25-2014

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Less Frequent Tests

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For the purpose of this presentation "Less Frequent Tests" refers to those inspection and tests required at intervals greater than one year, i.e. 3yr., 5 yr., 10yr., etc.
Less Frequent Tests

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When sprinklers fail to operate, the reason most often given (64% of failures) was shutoff of the system before fire began, ..., lack of maintenance (6%), ...
(U.S. EXPERIENCE WITH SPRINKLERS - JOHN R. HALL, JR. - June 2013)

General Requirements

4.1.1.2 Inspection, testing, and maintenance shall be performed by qualified personnel.

3.3.34 Qualified. A competent and capable person or company that has met the requirements and training for a given field acceptable to the AHJ.

A.4.1.1 Any portion or all of the inspection, testing, and maintenance can be permitted to be contracted with an inspection, testing, and maintenance service.

The building owner has the ultimate responsibility for ITM
• Any capable person or company properly trained and acceptable to the AHJ can perform ITM
• Any or all of the required ITM activities can be contracted out

It's stated very clearly throughout NFPA 25 that the building owner has the ultimate responsibility to properly maintain any water based fire protection system in their building.
Sprinklers

5.3 Testing.
5.3.1* Sprinklers.

5.3.1.1 Where required by this section, sample sprinklers shall be submitted to a recognized testing laboratory acceptable to the authority having jurisdiction for field service testing.

5.3.1.2 A representative sample of sprinklers for testing per 5.3.1.1 shall consist of a minimum of not less than four sprinklers or 1 percent of the number of sprinklers per individual sprinkler sample, whichever is greater.

5.3.1.3 Where one sprinkler within a representative sample fails to meet the test requirement, all sprinklers within the area represented by that sample shall be replaced.

In service sprinklers must be tested at frequencies based on age and type of sprinkler,
- A representative sample is a minimum of 4 or at least 1%
- The sample can represent a building, or a floor, or a system, or anything you want
- A single failure in the sample requires that all sprinklers represented must be replaced

Talk to the owner and determine what the sample should represent

Standard Sprinklers

5.3 Testing.
5.3.1* Sprinklers.

5.3.1.1.1 Where sprinklers have been in service for 50 years, they shall be replaced or representative samples from one or more sample areas shall be tested.
5.3.1.1.1.1 Test procedures shall be repeated at 10-year intervals.
5.3.1.1.1.2 Sprinklers manufactured prior to 1920 shall be replaced.

5.3.1.1.5 Where sprinklers have been in service for 75 years, they shall be submitted to a recognized testing laboratory acceptable to the authority having jurisdiction for field service testing and repeated at 5-year intervals.
The in-service date or the age of the installed sprinklers must be known.

Some sprinklers are too old to be tested:

- Sprinklers in service for 50 years must be replaced or tested
  - Retest every 10 years
- Sprinklers manufactured before 1920 must be replaced
- Sprinklers in service for 75 years must be replaced or tested
  - Retest every 5 years

5.3 Testing.
5.3.1 Sprinklers.

5.3.1.1.1.3 Sprinklers manufactured using fast-response elements that have been in service for 20 years shall be replaced or representative samples shall be tested and then retested at 10-year intervals.

5.3.1.1.1.6 Dry sprinklers that have been in service for 10 years shall be replaced or representative samples shall be tested and then retested at 10-year intervals.

Special Sprinklers

- Fast response sprinklers in service for 20 years must be replaced or tested
  - Retest every 10 years
- Dry type sprinklers in service for 10 years must be replaced or tested
  - Retest every 10 years

Dry type sprinklers can normally be identified by the vent hole in the cap.
5.3 Testing.
5.3.1* Sprinklers.

5.3.1.1.4* Representative samples of solder-type sprinklers with a temperature classification of extra high [325°F (163°C)] or greater that are exposed to semicontinuous to continuous maximum allowable ambient temperature conditions shall be tested at 5-year intervals.

5.3.1.1.2* Where sprinklers are subjected to harsh environments, including corrosive atmospheres and corrosive water supplies, on a 5-year basis, either sprinklers shall be replaced or representative sprinkler samples shall be tested.

Special Environments

- Extra high temp solder-type sprinklers exposed to high ambient temps must be (replaced or) tested every 5 years
- Sprinklers subjected to harsh environments must be replaced or tested every 5 years

Harsh environments include those with corrosive atmospheres and water supplies. A long list of examples is in the annex including “… all portions of cold storage areas, …”

Testing Sprinklers

Replacement Tools Needed
- Standard hand tools
  - Pipe wrench, ratchet, sockets, etc.
- Vacuum pump?
- Ladders and lifts
- Sprinkler wrench
- Replacement sprinklers

Test Equipment Needed
- Provided at the testing laboratory

Before removing any sprinklers for testing, replacement sprinklers must be on hand.
Testing Sprinklers

Pass / Fail Criteria

- Sprinklers can have some surface corrosion and can be “lightly” loaded
- Sprinklers must operate within the required time frame
- Sprinklers must release their operating parts with a 7 psi inlet pressure

Sample Sprinklers Not Tested by UL

- Showing signs of mechanical damage
- Showing signs of being painted
- Showing signs of leakage
- Manufactured prior to 1920

Observations for Corrosion or Loading

- The level of corrosion or loading observed by UL staff conducting the testing will be noted in UL’s test report

Some sprinkler samples submitted to UL are not subjected to the operation test.

Results of UL Field Sample Testing of Sprinkler

- Approximately 97% of the samples tested (not including O-ring sealed or dry type sprinklers) have operated normally
- Approximately 50% of dry type sprinklers tested have operated abnormally (fail the operation test).
- Approximately 80% of the dry type sprinklers tested incorporate an O-ring water seal.
Testing Sprinklers

UL Contact Information

Field Sprinkler Testing
UL LLC
333 Pfingsten Rd.
Northbrook, IL 60062
Tel: 847.664.2488
Fax: 847.509.6391
E-mail: Field.SprinklerNBK@ul.com
Web: www.ul.com

Sprinkler sample identification tags are available from UL free of charge.

Testing Sprinklers

Remember -
- Inspectors must determine when sprinklers were installed or their age.
- Replacement sprinklers are needed for those being removed for testing.
- Dry sprinklers installed that were manufactured prior to 2003 have over a 50% failure rate when tested.

... sprinkler testing is critical to determine the operating condition of a sprinkler system.

Gauges

5.3.2* Gauges.

A.5.3.2 The normal life expectancy of a gauge is between 10 and 15 years. A gauge can be permitted to have a reading with an error of ±5 percent of the maximum (full scale) gauge reading. For example, a gauge having 200 psi (13.8 bar) maximum radius installed on a system with a 60 psi (4.1 bar) normal pressure can be permitted if the gauge reads from 54 psi to 66 psi (3.7 bar to 4.5 bar).

5.3.2.1 Gauges shall be replaced every 5 years or tested every 5 years by comparison with a calibrated gauge.

5.3.2.2 Gauges not accurate within 3 percent of the full scale shall be recalibrated or replaced.

5.3.2.3 Where multiple system risers are supplied by a common water supply source and are located at the same elevation, and the gauges for all systems are within 3 percent of the other(s), only one gauge shall be required to be tested to determine if replacement is required.
Gauges

- Must be tested or replaced every five years
- Replacement is normally less expensive because the list price for a gauge is typically under $30
- When replacing or after testing, mark the gauge with the installation date or the successful test date.

Replacement Tools Needed
- Standard hand tools
  - Pipe wrench, ratchet, sockets, etc.

Test Equipment Needed
- Calibrated gauge
- Test manifold
- Hydrostatic Test pump

Pass / Fail Criteria
- Applies only when testing by comparison to a calibrated gauge
- Must be accurate to within 3 percent of full scale
- For multiple risers with all gauges at the same elevation reading within 3 percent of each other, only one gauge must be tested
Standpipe Systems - Flow

6.3.1 Flow Tests.
6.3.1.1* A flow test shall be conducted every 5 years on all Class I and Class III standpipe systems to verify that the required flow and pressure are available at the hydraulically most remote hose valve outlet(s) while flowing the standpipe system demand.

6.3.1.1.1 Where a flow test of the hydraulically most remote outlet(s) is not practical, the authority having jurisdiction shall be consulted for the appropriate location for the test.

6.3.1.3 The standpipe system demand shall be based on the design criteria in effect at the time of installation.

6.3.1.3.1 Where the standpipe system demand cannot be determined, the authority having jurisdiction shall determine the standpipe system demand.

• All class I & III standpipes must be flow tested every five years at design flow and pressure.
• The hydraulically most remote hose connections are generally at a roof manifold, or at the top of a stair leading to the roof.
• A water supply source must be provided to test a manual wet or dry standpipe.

In some cases a fire department pumper or portable fire pump will be needed.

6.3.1.2* The standpipe system demand shall include 500 gpm (1892 L/min) for the first standpipe and 250 gpm (946 L/min) for each additional standpipe until the total system demand is simultaneously flowing.

6.3.1.2.1* The 250 gpm (946 L/min) required from each additional standpipe shall be allowed to be flowed from the most convenient hose valve on that standpipe.

6.3.1.2.2* Where the 250 gpm (946 L/min) cannot be flowed from each additional standpipe, the authority having jurisdiction shall determine where the additional flow can be taken.
Standpipe Systems Flow

- Flow 500 gpm from the top two hose valves of the most remote standpipe
- Flow 250 gpm for each additional standpipe until system demand flow is met
- Flows from additional standpipes can be from the bottom valves since pressures are not required to be balanced
- Alternative outlets can be flowed with AHJ permission

New text requires that 5 year flow test simulate the original design criteria

Standpipe Systems - Flow

Test Equipment Needed
- Standard hand tools
  - Spanner wrench, ratchet, sockets, etc.
- Hoses
- Water diffuser
- Pitot tube or built-in pitot

Standpipe Systems - Flow

Pass / Fail Criteria
- Flows and pressures must meet the original design criteria
  - Design criteria has changed over the years, including total flow requirements and pressure at the hose valve
  - When most remote and other standpipe outlets aren’t practical for use in the test, the AHJ can determine where to perform the flows
  - When the original design criteria or the version of NFPA 14 used for the installation isn’t available, the AHJ should provide design criteria

What has changed over the years is the pressure requirement at the standpipe hose valve.
6.3.2 Hydrostatic Tests.
6.3.2.1 Hydrostatic tests of not less than 200 psi (13.8 bar) pressure for 2 hours, or at 50 psi (3.4 bar) in excess of the maximum pressure, where maximum pressure is in excess of 150 psi (10.3 bar), shall be conducted every 5 years on manual standpipe systems and semi-automatic dry standpipe systems, including piping in the fire department connection.
6.3.2.1.1 Manual wet standpipes that are part of a combined sprinkler/standpipe system shall not be required to be tested in accordance with 6.3.2.
6.3.2.3 The hydrostatic test pressure shall be measured at the low elevation point in the individual system or zone being tested.
6.3.2.3.1 Inside standpipe piping shall show no leakage.

• Certain standpipes must be hydrostatically tested every five years.
  • Manual type – exception for combined sprinkler/standpipe
  • Semiautomatic dry type
  • Fire department connection piping must be tested as well

The requirement to test FDC piping was expanded to all FDCs in the 2014 edition.

Test Equipment Needed
• Water source
• Hydrostatic test Pump

Pass / Fail Criteria
• Test pressures are to be measured at the lowest point in the standpipe.
• There must be no signs of leakage

Firefighters depend on the integrity of the standpipe systems
Standpipe Systems - Hose

6.1.7 Where approved by the authority having jurisdiction, existing hose shall be permitted to be removed and shall not be recorded as a deficiency.

- NFPA 25 now allows the approved removal of owner’s hose without being noted as a deficiency
- If hoses remain in place, they must be tested every 3 or 5 yrs depending on the type

Test Equipment Needed
- Per NFPA 1962

Pass / Fail Criteria
- Per NFPA 1962

This allowance first appears in the 2011 edition of NFPA 25.

Private Fire Service Mains

7.3 Testing.

7.3.1* Underground and Exposed Piping Flow Tests. Underground and exposed piping serving hydrants shall be flow tested at minimum 5-year intervals.

7.3.1.1 Any flow test results that indicate deterioration of available water flow and pressure shall be investigated to the complete satisfaction of the authority having jurisdiction to ensure that the required flow and pressure are available for fire protection.

7.3.1.2 Where underground piping supplies individual fire sprinkler, standpipe, water spray, or foam-water sprinkler systems and there are no means to conduct full flow tests, tests generating the maximum available flows shall be conducted.

Private Fire Service Mains

- Mains with hydrants must be flow tested at least every five years
- Deterioration of the required water supply shall be investigated
- Mains without hydrants must still be flowed at the highest possible volume through drains, FDCs, hose valves, etc.

In most applications, inspection testing and maintenance of underground supplies starts at the building property line.
Private Fire Service Mains

Test Equipment Needed
• PIV or roadway box wrench
• Hydrant wrench
• Pitot tube with gauge or built-in pitot

Pass / Fail Criteria
• Flows and pressures measured through hydrants are compared to the original water supply data.
• Results that indicate a deterioration of the water supply must be investigated and remedied.
• Every effort should be made to measure the flows and pressures when flowing through systems without hydrants.

The NFPA 25 technical committee has debated if it’s practical to measure the flow through drains and FDGs to determine the adequacy of the water supply.

Water Storage Tanks

• 9.2.6 Interior Inspection.
  • 9.2.6.1 Frequency.
  • 9.2.6.1.1 The interior of steel tanks without corrosion protection shall be inspected every 3 years.
  • 9.2.6.1.2 The interior of all other types of tanks shall be inspected every 5 years.
  • 9.2.6.2 Where interior inspection is made by means of underwater evaluation, silt shall first be removed from the tank floor.
  • 9.2.6.3 The tank interior shall be inspected for signs of pitting, corrosion, spalling, rot, other forms of deterioration, waste materials and debris, aquatic growth, peeling or general failure of interior coating.
Water Storage Tanks

- Without corrosion protection must be performed every 3 years and with corrosion protection every 5 years
- Tanks can be drained for this inspection or with special equipment can be performed while full of water
- If inspected when full of water, silt must first be removed

Many times the tanks can be inspected while still full of water using special equipment.

Test Equipment Needed

- Special robotic equipment

Pass / Fail Criteria

- Tank interior must not show any signs of pitting, corrosion, spalling, rot, other forms of deterioration, waste materials and debris, aquatic growth, and local or general failure of interior coating.

Tank Level Indicators

- 9.3 Testing.
- 9.3.1* Level indicators shall be tested every 5 years for accuracy and freedom of movement.
Tank Level Indicators

- If the tank needs to be drained for the internal inspection, the indicator is tested while draining and refilling the tank.
- If the internal inspection is done with the water in the tank, the water level will drop while silt is being removed and the indicator can be tested.

Normal maintenance including lubrication of the cables and pulleys will ensure their freedom of movement.

Test Equipment Needed
- No special equipment needed

Pass / Fail Criteria
- Must be accurate
- Must have freedom of movement

Deluge System Strainer

- 10.2 Inspection and Maintenance Procedures.
- 10.2.1.7 Mainline strainers shall be removed and inspected every 5 years for damaged and corroded parts.
Most of these systems require a mainline strainer, because most of the nozzles installed on them have waterways smaller than 3/8 of an inch.

**Deluge System Strainer**

- Mainline strainers on water spray fixed systems be removed every 5 years
- After removal they are inspected for damaged and corroded parts
- Replacement gaskets should be on hand.
- In some cases it may be necessary to replace the strainer basket

NFPA 15 requires that these strainers be installed so they're accessible for flushing and cleaning.

**Deluge System Strainer**

**Test Equipment Needed**

- Standard hand tools
  - Pipe wrench, ratchet, sockets, etc.
  - Pipe jacks or portable lift

**Pass / Fail Criteria**

- All parts must be undamaged
- All parts must show little or no corrosion

**Internal Valve Inspections**

13.4 System Valves.

13.4.1.2* Alarm valves and their associated strainers, filters, and restriction orifices shall be inspected internally every 5 years unless tests indicate a greater frequency is necessary.

13.4.2 Check Valves.

13.4.2.1 Inspection. Valves shall be inspected internally every 5 years to verify that all components operate correctly, move freely, and are in good condition.

13.4.3 Preaction Valves and Deluge Valves.

13.4.3.1.7.1 Internal inspection of valves that can be reset without removal of a faceplate shall be permitted to be conducted every 5 years.
Internal Valve Inspections

• Alarm valves, check valves, and exterior resetting preaction/deluge valves must be internally inspected every 5 years
• Sludge and sediment can accumulate making it improbable that it will fully open in a fire scenario.
• The FDC check valve is never exercised unless the fire department charges the connection.

Clappers in the FDC check valves will sometimes become frozen to the seat.

Equipment and Parts Needed

• Standard hand tools
  • Pipe wrench, ratchet, sockets, etc.
  • Spare gaskets (face plate and clapper)
  • 5 Gallon bucket
  • Garden hose with water source

Pass / Fail Criteria

• All components operate correctly, move freely, and are in good condition

Strainers, Filters, Orifices

13.4 System Valves.

13.4.1.2* Alarm valves and their associated strainers, filters, and restricted orifices shall be inspected internally every 5 years unless tests indicate a greater frequency is necessary.

13.4.3 Preaction Valves and Deluge Valves.

13.4.3.1.8 Strainers, filters, restricted orifices and diaphragm chambers shall be inspected internally every 5 years unless tests indicate a greater frequency is necessary.

13.4.4 Dry Pipe Valves, Quick-Opening Devices.

13.4.4.1.6 Strainers, filters, and restricted orifices shall be inspected internally every 5 years unless tests indicate a greater frequency is necessary.
**Strainers, Filters, Orifices**

- Strainers, filters, restricted orifices, and diaphragm chambers on all of the following valves and devices shall be inspected every 5 years unless tests indicate a greater frequency is necessary:
  - alarm valves,
  - preaction/deluge valves,
  - dry pipe valves, and
  - quick opening devices

Many older valves are still in operation today because of good ITM.

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**Equipment and Parts Needed**

- Standard hand tools
  - Pipe wrench, ratchet, sockets, etc.
- Spare parts
- 5 Gallon bucket
- Garden hose with water source

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**Pass / Fail Criteria**

- All components operate correctly, are not clogged, are not damaged, and are in good condition

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**Air Leakage Test**

13.4.3 Preaction Valves and Deluge Valves.

13.4.3.2.6 Preaction systems shall be tested once every 3 years for air leakage, using one of the following test methods:

1) A pressure test at 40 psi (3.2 bar) for 2 hours. The system shall be permitted to lose up to 3 psi (0.2 bar) during the duration of the test. Air leaks shall be addressed if the system loses more than 3 psi (0.2 bar) during this test.

2) With the system at normal system pressure, shut off the air source (compressor or shop air) for 4 hours. If the low-air pressure alarm goes off within this period, air leaks shall be addressed.
Air Leakage Test

13.4.4 Dry Pipe Valves/Quick-Opening Devices.

13.4.4.2.9 Dry pipe systems shall be tested once every 3 years for gas leakage, using one of the following test methods:

1. A gas (air or nitrogen) pressure test at 40 psi (2.8 bar) shall be performed for 2 hours.
   (a) The system shall be permitted to lose up to 3 psi (0.2 bar) during the duration of the test.
   (b) Gas leaks shall be addressed if the system loses more than 3 psi (0.2 bar) during the test.

2. With the system at normal system pressure, the gas source (nitrogen supply, compressor, or shop air) shall be shut off for 4 hours. If the low pressure alarm goes off within this period, the leaks shall be addressed.

Preaction and dry pipe systems must have an air leakage test once every 3 years.

Two methods of performing the test are allowed:
- Pressurize system to 40 psi for 2 hrs
- Turn off air supply for 4 hrs

The frequency coincides with the 3 year full flow trip test for dry systems.

Test Equipment Needed

- Portable air compressor?

Pass / Fail Criteria

- During the test at 40 psi for 2 hrs, the system must lose less than 3 psi
- During the test at system pressure with air supply turned off, the low air alarm must not activate

Leaks causing a test to fail must be "addressed"
13.4.4 Dry Pipe Valves/Quick-Opening Devices.

13.4.4.2 Testing.

13.4.4.2.2* Every 3 years and whenever the system is altered, the dry pipe valve shall be trip tested with the control valve fully open and the quick-opening device, if provided, in service.

13.4.4.2.5 A tag or card that shows the date on which the dry pipe valve was last tripped, and the name of the person and organization conducting the test, shall be attached to the valve.

13.4.4.2.5.1 Separate records of initial air and water pressure, tripping air pressure, and dry pipe valve operating conditions shall be maintained on the premises for comparison with previous test results.

13.4.4.2.5.2 Records of tripping time shall be maintained for full flow trip tests.

**DPV – Full Flow Trip Test**

- Full flow trip testing normally requires 2 people, one at the dry pipe valve and one at the inspectors test valve.
- There is an exception for dry pipe systems protecting freezers so moisture isn’t introduced into the piping in the freezer.

The dry valve full flow trip test is typically performed with regularity.

**Equipment and Parts Needed**
- Standard hand tools
  - Pipe wrench, ratchet, sockets, etc.
- Stop watch
- Cell phones (or other communication devices)
- Spare parts
- 5 Gallon bucket
- Garden hose with water source
**Pass / Fail Criteria**
- Annex section A.13.4.2.2.2 has a detailed process for performing this test.
- There are several recordings to make including air and water pressure (before test), air pressure at trip, elapsed time at trip, and water delivery time.
- Compare valve trip time and water delivery time to original test results or computer calculation results.

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**13.5 Pressure Reducing Valves and Relief Valves.**

- **13.5.1.2** A full flow test shall be conducted on each valve at 5-year intervals and shall be compared to previous test results.
- **A.13.5.1.2** The sectional drain valve should be opened to compare the results with the original installation or acceptance test results.
- **13.5.1.2.1** Adjustments shall be made in accordance with the manufacturer’s instructions.

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**Pressure Reducing and Relief Valves for sprinkler systems are typically installed with gauges on the inlet and outlet so pressure readings can be observed.**

- The sectional drain should be fully opened and the pressures compared to previous results.

**It isn't required or necessary to measure the flow.**
Test Equipment Needed

- Test gauges may be required if not already installed

Pass / Fail Criteria

- Test pressures are compared to the original installation flow test pressures
- Differences must be corrected by adjusting valve per manufacturer’s instructions

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**Hose PRV – Flow Test**

13.5 Pressure Reducing Valves and Relief Valves.

13.5.2 Hose Connection Pressure Reducing Valves.

13.5.2.2* A full flow test shall be conducted on each device at 5-year intervals and shall be compared to previous test results. Adjustments shall be made in accordance with the manufacturer’s instructions.

13.5.3 Hose Rack Assembly Pressure Reducing Valves.

13.5.3.2 A full flow test shall be conducted on each valve at 5-year intervals and shall be compared to previous test results. Adjustments shall be made in accordance with the manufacturer’s instructions.

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**Hose PRV – Flow Test**

- PRV devices can be bench tested per manufacturer’s instructions or tested in place.
- To test in place, a gauge is connected to both sides of the device, and flow readings are taken.
- It is advantageous to perform these tests as part of the standpipe system full flow test

Annex section A.13.5.2.2 describes methods for conducting these tests.
**Hose PRV – Flow Test**

**Test Equipment Needed**
- Standard hand tools
  - Spanner wrench, ratchet, sockets, etc.
- Test gauges
- Hoses
- Water diffuser
- Pitot tube or built-in pitot

**Pass / Fail Criteria**
- Flows and pressures must meet the original design criteria and previous test results
- Design criteria has changed over the years, including total flow requirements and pressure at the hose valve
- Field-adjustable valves are to be reset as needed
- Nonadjustable valves should be replaced.
- When the original design criteria or the version of NFPA 14 used for the installation isn’t available, the AHJ should provide design criteria

*What has changed over the years is the pressure requirement at the standpipe hose valve.*

**FDC Piping – Hydro**

**13.7.4** The piping from the fire department connection to the fire department check valve shall be hydrostatically tested at 150 psi (10 bar) for 2 hours at least once every 5 years.
All dry piping between the FDC and the check valve must be hydrostatically tested every five years.

Perform the internal check valve inspection first.

The requirement to test FDC piping was expanded to all FDCs in the 2014 edition.

Test Equipment Needed
- Water source
- Hydrostatic test Pump

Pass / Fail Criteria
- Test pressures are to be measured at the lowest point in the standpipe.
- There must be no signs of leakage

Firefighters depend on the integrity of the FDC piping.

Internal Pipe Assessment
14.2 Assessment of Internal Condition of Piping

14.2.1 An assessment of the internal condition of piping shall be conducted on a frequency determined by 14.2.1.1 or 14.2.1.2 for the purpose of inspecting for the presence of foreign organic and inorganic material.

14.2.1.1 An assessment of the internal condition of piping shall be conducted at a minimum of every 5 years or in accordance with 14.2.1.2 for the purpose of inspecting for the presence of foreign organic and inorganic material.

14.2.1.2 Where an assessment frequency has been established by an approved risk analysis, the assessment shall be performed at a frequency determined by the approved risk analysis.

14.2.1.3 Tubercules or slime, if found, shall be tested for indications of microbiologically influenced corrosion (MIC).

14.2.1.4 If the presence of sufficient foreign organic or inorganic material is found to obstruct pipe or sprinklers, an obstruction investigation shall be conducted as described in Section 14.3.

14.2.2 In buildings having multiple wet pipe systems, every other system shall have an assessment of the internal condition of piping as described in 14.2.1.

14.2.2.1 During the next inspection frequency required by 14.2.1.1 or 14.2.1.2, the alternate system not assessed during the previous assessment shall be assessed. Systems not assessed in 14.2.2.1 shall be assessed.

14.2.2.2 If foreign organic and/or inorganic material is found in any system in a building, all systems shall be assessed.
Internal Pipe Assessment

- Signs of MIC must be tested
- If obstructing material is found an obstruction investigation per 14.3 must be performed
- Exceptions:
  - Nonmetallic pipe is exempted from the internal pipe assessment
  - Multiple systems in a building can be alternately tested every five years as long as no signs of MIC or obstructing material is found

These exceptions were first included in the 2011 edition.

Internal Pipe Assessment

A.14.2.1 It is the intent of this requirement to provide a reasonable assurance that corrosion and obstruction issues within fire protection systems are identified. It is not the intent to require verification that every piece of the system is free from corrosion and obstructions. An assessment of the internal condition of piping can be accomplished by several methods that meet the intent of this section. These methods include the following:

1. Opening a flushing connection at the end of one main and removing the end fitting or piece of branch line or a sprinkler for the purpose of inspecting for the presence of foreign organic and inorganic material.
   - (a) In dry pipe systems and preaction systems, the branch line inspected should be the most remote one from the source of water that is not equipped with the inspector's test valve.
   - (b) When performing normal maintenance that involves draining down a system, such as for tenant fit out or building renovations, or when troubleshooting or replacing piping, this inspection can be performed as described and properly recorded at that time. The time interval would then start for the next assessment of that system at the frequency determined by 14.2.1.1 or 14.2.1.2.

The annex describes various methods for performing the assessment of the internal condition of piping.

The first method is the internal pipe inspection from the previous editions.

Some old and new guidance is included:

- In dry systems don’t inspect the branch line with the test valve.
- Can be performed when system is drain down for other reasons.
- Remove branch line piece instead of a sprinkler. If a sprinkler is removed, replace it.
**Internal Pipe Assessment**

**Tools and Equipment Needed**
- Standard hand tools
  - Pipe wrench, ratchet, sockets, etc.
- Vacuum pump?
- Ladders and lifts
- Flashlight, digital camera
- Replacement sprinklers?

**Test Equipment Needed**
- MIC test kit provided by the testing laboratory

It's best to record the results of the inspection, whether good or bad, by using a digital camera.

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**Pass / Fail Criteria**
- Piping must be clear of tubercules and slime that could indicate MIC activity
- Piping must be clear of the presence of sufficient foreign organic or inorganic material that could obstruct piping or sprinklers

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**Internal Pipe Assessment**

A.14.2.1 ... An assessment of the internal condition of piping can be accomplished by several methods that meet the intent of this section. These methods include the following:

1. Utilizing alternative examination methods such as the following:
   a. Using video inspection equipment that is inserted into the system at strategic points to observe the internal condition of the piping. This equipment provides a visual exam of the pipes using a camera and lighting system on the end of a push cable. Video inspection equipment can be inserted in alarm, dry, and preaction valves for a look into risers, feed mains, some cross mains, and some branch lines depending on the system configuration. The push cable can also be inserted in a check valve when performing the five year internal inspection required by 13.4.2.1 to view additional areas of a system. The fire department connection to perform the interior inspection required by 13.7.2.
Three alternative examination methods are included in the annex.

The first alternative method is a video inspection of the interior of the piping.

Equipment features include a camera with video recording capability and lighting at the end of a push cable that can vary in length from 3’ up to 325’.

Can be inserted into the system at convenient points including through alarm valves, check valves or flushing connections.

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Tools Needed

- Standard hand tools
  - Pipe wrench, ratchet, sockets, etc.
  - Vacuum pump?

Equipment Needed

- Video equipment

There are several manufacturers of this equipment that offer many useful features.

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Pass / Fail Criteria

- Piping must be clear of tubercules and slime that could indicate MIC activity.
- Piping must be clear of the presence of sufficient foreign organic or inorganic material that could obstruct piping or sprinklers.
A.14.2.1... An assessment of the internal condition of piping can be accomplished by several methods that meet the intent of this section. These methods include the following:

(2) Utilizing alternative examination methods such as the following:

(a) Ultrasonic or similar technology that can test the pipe wall to be tested to determine the extent of any deterioration due to microbiologically influenced corrosion (MIC) or other forms of corrosion. This method would not typically be used as an internal inspection of piping required by this section because it may not detect the presence of solid material in the piping, such as wood, plastic, or other foreign obstructions, that are not a by-product of corrosion, because only small representative sections of pipe

The second and third alternative methods are useful to determine the extent of corrosion MIC activity, but will not normally detect obstructing material in the piping.

• Ultrasonic or similar technology is useful to determine pipe wall deterioration and buildup of sediment

• Laboratory analysis of water samples will determine the potential for MIC and standard forms of corrosion

An advantage that both options have is that systems don't have to be drained to perform the tests.
Tools Needed
• None

Test Equipment Needed
• Ultrasonic equipment provided by the subcontractor
• Water sample test kits provided by the testing lab

Pass / Fail Criteria
• Low to moderate MIC activity and/or corrosion can be acceptable as long as the system is monitored closely.
• High levels should be addressed with corrosion inhibitors either on the pipe wall or in the water.
• Corrosion in dry systems can be mitigated with nitrogen.

Questions?
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