



Valves

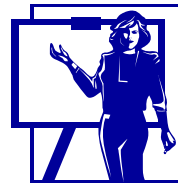
Controls Valves, Wet Pipe Valves, Dry-pipe Valves, and FDC's



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Housekeeping

- Ask questions
- Polling
- Post-webinar assessment



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Objectives

- Identify the NFPA standard used for inspection, testing, and maintenance of water-based fire protection systems.
- Summarize and locate the requirements for inspection, testing, and maintenance of wet and dry sprinkler systems using the appropriate NFPA standard.
- Identify common hardware used in wet and dry sprinkler systems.

Introduction

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Table 13.1.1.2

Table 13.1.1.2 Summary of Valves, Valve Components, and Trim Inspection, Testing, and Maintenance

Item	Frequency	Reference
Inspection		
<i>Alarm Valves</i>		
Exterior	Quarterly	13.4.1.1
Interior	5 years	13.4.1.2
Strainers, filters, orifices	5 years	13.4.1.2
<i>Backflow Prevention Assemblies</i>		
Reduced pressure	Weekly	13.7.1
Reduced-pressure detectors	Weekly	13.7.1
Interior	5 years	13.7.1.3
<i>Check Valves</i>		
Interior	5 years	13.4.2.1
<i>Control Valves</i>		
All valves except locked or supervised	Weekly	13.3.2.1
Locked or supervised	Monthly	13.3.2.1.1
Electrically supervised	Quarterly	13.3.2.1.2
<i>Dry Pipe Valves/Quick-Opening Devices</i>		
Enclosure (during cold weather)		Chapter 4
Exterior	Monthly	13.4.5.1.2
Interior	Annually	13.4.5.1.3
Strainers, filters, orifices	5 years	13.4.5.1.4
Low temperature alarm	Annually	Chapter 4

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Inspection

<i>Deluge Valves</i>		
Enclosure (during cold weather)	Daily/weekly	Chapter 4
Exterior	Monthly	13.4.4.1.1
Interior	Annually/5 years	13.4.4.1.2
Strainers, filters, orifices	5 years	13.4.4.1.3
<i>Fire Department Connections</i>	Quarterly	13.8.1
<i>Gauges</i>	Monthly/quarterly	13.2.5
<i>Hose Valves</i>	Quarterly	13.6.1
<i>Precision Valves</i>		
Enclosure (during cold weather)		Chapter 4
Exterior	Monthly	13.4.3.1.1
Interior	Annually/5 years	13.4.3.1.2
Strainers, filters, orifices	5 years	13.4.3.1.3
<i>Pressure-Regulating and Relief Valves</i>		
Master pressure-regulating	Weekly	13.5.4.1
Sprinkler system pressure-reducing	Quarterly	13.5.1.1
Hose connection pressure-regulating	Annually	13.5.2.1
Hose rack pressure-regulating	Annually	13.5.3.1
Fire pump circulation relief	With no flow test	13.5.6.1
Fire pump main pressure-relief	With fire pump test	13.5.6.2.1
<i>Valve Supervisory Signal Initiating Device</i>	Quarterly	13.3.2.1.3
<i>Supervisory Signal Devices (except valve supervisory switches)</i>	Quarterly	13.2.6.1

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Testing

Table 13.1.1.2 Continued

Item	Frequency	Reference
<i>Dry Pipe Valves/</i>		
<i>Quick-Opening Devices</i>		
Air leakage	3 years	13.4.5.2.9
Priming water	Quarterly	13.4.5.2.1
Low air pressure alarm	Annually	13.4.5.2.6
Quick-opening devices	Quarterly	13.4.5.2.4
Trip test	Annually	13.4.5.2.2
Full-flow trip test	3 years	13.4.5.2.2.2
<i>Gauges</i>	5 years	13.2.5.2
<i>Main Drains</i>	Annually/quarterly	13.2.3
<i>Precision Valves</i>		
Priming water	Quarterly	13.4.3.2.1
Low air pressure alarms	Quarterly	13.4.3.2.11
Trip test	Annually/3 years	13.4.3.2.2 and 13.4.3.2.3
Air leakage	3 years	13.4.3.2.6
Low temperature alarm	Annually	13.4.3.2.12
<i>Pressure-Regulating and Relief Valves</i>		
Master pressure-regulating	Quarterly/annually	13.5.4.2 and 13.5.4.3
Sprinkler systems pressure-reducing	Annually/5 years	13.5.1.3 and 13.5.1.2
Hose connection pressure-regulating	Annually/5 years	13.5.2.3 and 13.5.2.2
Hose rack pressure-regulating	Annually/5 years	13.5.3.3 and 13.5.3.2
Fire pump circulation relief	With churn test	13.5.6.1.2
Fire pump pressure relief valves	With fire pump test	13.5.6.2.2
<i>Hose Valves</i>	Annually/3 years	13.6.2
<i>Waterflow Alarms</i>	Quarterly/semiannually	13.2.4
<i>Supervisory Signal Devices (except valve supervisory switches)</i>	Annually	13.2.6.2

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Maintenance

Maintenance		
<i>Alarm Valves</i>	Per manufacturer	13.4.1.3
<i>Backflow Prevention Assemblies</i>	Per manufacturer	13.7.3
<i>Check Valves</i>	Per manufacturer	13.4.2.2
<i>Control Valves (outside screw and yoke)</i>	Annually	13.3.4
<i>Deluge Valves</i>	Annually/5 years	13.4.4.3
<i>Dry Pipe Valves/</i>	Annually	13.4.5.3
<i>Quick-Opening Devices</i>		
<i>Hose Valves</i>	As needed	13.6.3
<i>Precision Valves</i>	Annually/5 years	13.4.3.3

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General Provisions

- The property owner or designated representative shall have manufacturers' literature available to provide specific instructions for inspecting, testing, and maintaining the valves and associated equipment.
- All system valves shall be protected from physical damage and shall be accessible.



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General Provisions

- Before opening a test or drain valve, it shall be verified that adequate provisions have been made for drainage.



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General Provisions

- A valve status test (main drain test) shall be conducted annually at each water-based fire protection system riser to determine whether there has been a change in the condition of the water supply piping and control valves.



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General Provisions

- In systems where the sole water supply is through a backflow preventer and/or pressure reducing valves, the valve status test (main drain test) of at least one system downstream of the device shall be conducted on a quarterly basis.



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General Provisions

- When there is a 10 percent reduction in full flow pressure when compared to the original acceptance test or previously performed tests, the cause of the reduction shall be identified and corrected if necessary.
- Where other sections of this standard have different frequency requirements for specific gauges, those requirements shall be used.



Static Pressure



Expected Residual Pressure



Actual Residual Pressure

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Poll Question

- Poll question #1

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Valves

Controls Valves



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Control Valves

- A control valve is a valve controlling flow to water-based fire protection systems.
- Each control valve shall be identified and have a sign indicating the system or portion of the system it controls.
- Systems that have more than one control valve that must be closed to work on a system shall have a sign on each affected valve referring to the existence and location of other valves.



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Control Valves

- When the valve is returned to service, a drain test (either main or sectional drain, as appropriate) shall be conducted to determine that the valve is open.
- Each normally open valve shall be secured by means of a seal or a lock or shall be electrically supervised in accordance with the applicable NFPA standards.

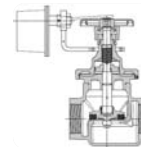


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Control Valves

- Normally closed valves shall be secured by means of a seal or shall be electrically supervised in accordance with the applicable NFPA standard.
- Sealing or electrical supervision shall not be required for hose valves.



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Control Valves

- All valves that are locked or supervised in accordance with applicable NFPA standards shall be permitted to be inspected monthly.
- Valves that are electrically supervised shall be permitted to be inspected quarterly.



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Control Valves

- After any alterations or repairs, an inspection shall be made by the property owner or designated representative to ensure that the system is:
 - In service
 - All valves are in the normal position
 - Properly sealed, locked, or supervised



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Control Valves

- The valve inspection shall verify that the valves are in the following condition:

- (1) In the normal open or closed position
- (2)*Sealed, locked, or supervised
- (3) Accessible
- (4) Provided with correct wrenches
- (5) Free from external leaks
- (6) Provided with applicable identification



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Control Valves

- Each control valve shall be operated annually through its full range and returned to its normal position.
- Post indicator valves shall be opened until spring or torsion is felt in the rod, indicating that the rod has not become detached from the valve.
- This test shall be conducted every time the valve is closed.



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Control Valves

- Post indicator and outside screw and yoke valves shall be backed a one-quarter turn from the fully open position to prevent jamming.
- A main drain test shall be conducted any time the control valve is closed and reopened at system riser.



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Control Valves

- Valve supervisory switches shall be tested semiannually.
- A distinctive signal shall indicate movement from the valve's normal position during either:
 - First two revolutions of a hand wheel
 - When stem of the valve has moved one-fifth of the distance from its normal position.



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Control Valves

- The operating stems of outside screw and yoke valves shall be lubricated annually.
- The valve then shall be completely closed and reopened to test its operation and distribute the lubricant.



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Poll Question

- Poll question #2

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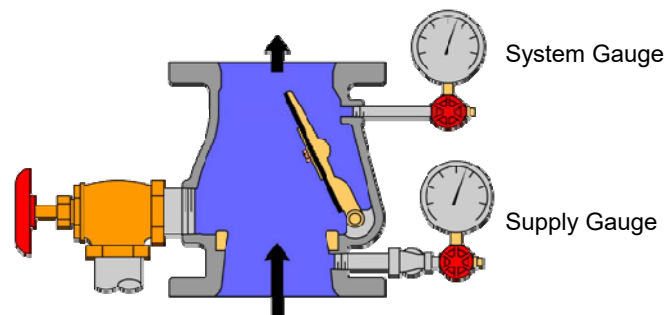
Valves

Wet Pipe Valves



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Wet Pipe Valves



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Wet Pipe Valves

- Wet pipe sprinkler systems shall be protected from freezing by maintaining a minimum building temperature of 40°F (4°C).

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Wet Pipe Alarm Testing

- Mechanical waterflow alarm devices including, but not limited to, water motor gongs, shall be tested quarterly.
- Vane-type and pressure switch-type waterflow alarm devices shall be tested semiannually.



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Wet Pipe Valves

- Alarm valves and system riser check valves shall be externally inspected monthly and shall verify the following:
 - (1) The gauges indicate normal supply water pressure is being maintained.
 - (2) The valve is free of physical damage.
 - (3) All valves are in the appropriate open or closed position.
 - (4) The retarding chamber or alarm drains are not leaking.



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Wet Pipe Valves

- 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.
- Internal components shall be cleaned/repaired as necessary in accordance with the manufacturer's instructions.



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Poll Question

■ Poll question #3

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Valves

Dry Pipe Valves & Quick Opening Devices

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Dry Pipe Valves

- Valve enclosures shall be inspected during cold weather for its ability to maintain a minimum temperature of at least 40°F (4°C).
- Daily
 - Weekly, when valve enclosures are equipped with low temperature alarms
- Low temperature alarms, if installed in valve enclosures, shall be inspected annually at the beginning of the heating season.

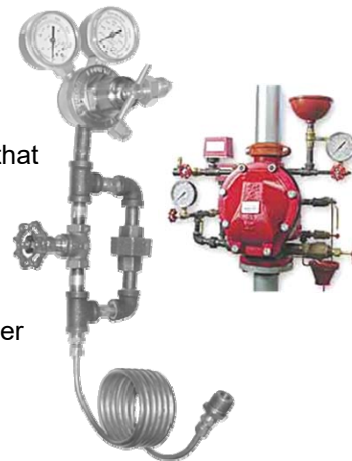


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Dry Pipe Valves

- Gauges shall be inspected monthly to verify the gauges are operable and not physically damaged.
- Gauges monitoring air or nitrogen pressure alarms shall be inspected monthly to verify that normal air or nitrogen pressure is being maintained.
- Gauges monitoring water pressure shall be inspected quarterly to verify that normal water supply pressure is being maintained.



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Traditional Dry Pipe Valves

■ Operates on a pressure differential concept

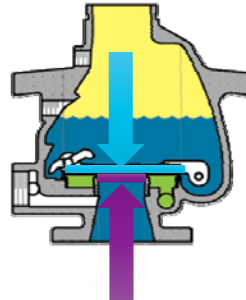
- 1 pound of air pressure holds back approximately 6 pounds of water pressure
- Most require disassembly to reset valve
- Often required prime water

■ Few moving parts

- Used for over 100 years
- Dependable
- Easy to operate and maintain

■ Large valve body

- Takes up valuable floor space
- Heavy
- Can be difficult to install for larger pipe sizes



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Air Pressure Requirements

■ To determine proper air pressure settings:

- Water Supply / Valve Differential = Valve Trip Point
- Valve Trip Point + Safety Pressure = System Set Pressure

■ For an example:

- City Water Pressure 72 psi
- Valve Differential 6:1
- Safety Pressure 20 psi or in Accordance with Valve Listing
- $72 / 6 = 12$
- $12 + 20$ (NFPA 13 Requirements) = 32 psi
- $12 + 10$ (Listed Safety Pressure) = 22 psi

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Dry Pipe Valves

- Systems with auxiliary drains shall require a sign at the dry pipe valve indicating the number of auxiliary drains and location of each individual drain.

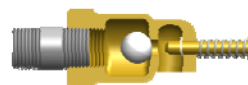


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Dry Pipe Valves

- The dry pipe valve shall be externally inspected monthly to verify the following:
 - (1) The valve is free of physical damage.
 - (2) All trim valves are in the appropriate open or closed position.
 - (3) The intermediate chamber is not leaking.



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Dry Pipe Valves

- The interior of the dry pipe valve shall be inspected annually when the trip test is conducted.
- Strainers, filters, and restricted orifices shall be inspected internally every 5 years unless tests indicate a greater frequency is necessary.

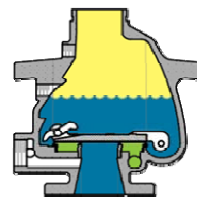


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Dry Pipe Valves

- The priming water level shall be tested quarterly.
- Each dry pipe valve shall be trip tested annually during warm weather.



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Dry Pipe Valves

- Dry pipe valves protecting freezers shall be trip tested in a manner that does not introduce moisture into the piping in the freezers.



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Dry Pipe Valves

- 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.
- During those years when full flow testing in is not required, each dry pipe valve shall be trip tested with the control valve partially open.



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Dry Pipe Valves

- Grease or other sealing materials shall not be applied to the seating surfaces of dry pipe valves.



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Poll Question

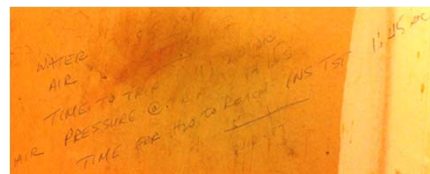
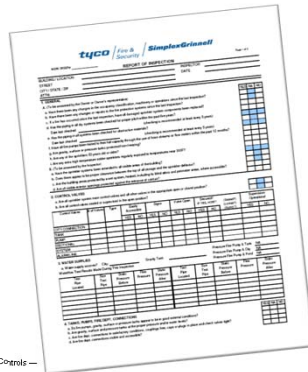
- Poll question #4

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Dry Pipe Valves

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

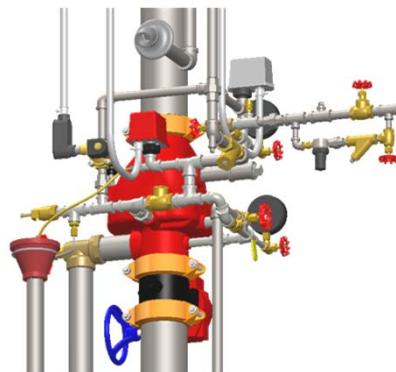


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Dry Pipe Valves

- Low air pressure alarms, if provided, shall be tested annually in accordance with the manufacturer's instructions.



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Dry Pipe Valves

- Low temperature alarms, if installed in valve enclosures, shall be tested annually at the beginning of the heating season.
- Automatic air pressure maintenance devices, if provided, shall be tested annually during the dry pipe valve trip test in accordance with the manufacturer's instructions.



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Dry Pipe Valves

- Dry pipe 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) 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) 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, the air source (compressor or shop air) shall be shut off for 4 hours. If the low air pressure alarm goes off within this period, the air leaks shall be addressed.



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Dry Pipe Valves

- During the annual trip test, the interior of the dry pipe valve shall be cleaned thoroughly, and parts replaced or repaired as necessary.
- 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.



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Quick Opening Devices

- Exhausters
- Mechanical Accelerators
- Electrical Accelerators



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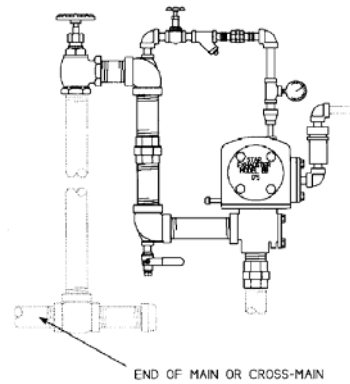
Exhausters

■ Speeds valve trip times

- Operates upon loss of air pressure from sprinkler activation
- Exhausts air at a rate similar to multiple sprinkler activations

■ Complex

- Many parts
- Operation often misunderstood
- Difficult to operate consistently



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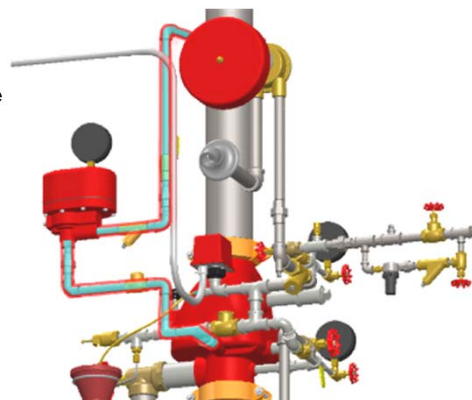
Accelerators

■ Speeds valve trip times

- Operates upon loss of air pressure from sprinkler activation
- Directs air from system piping into intermediate chamber

■ Complex

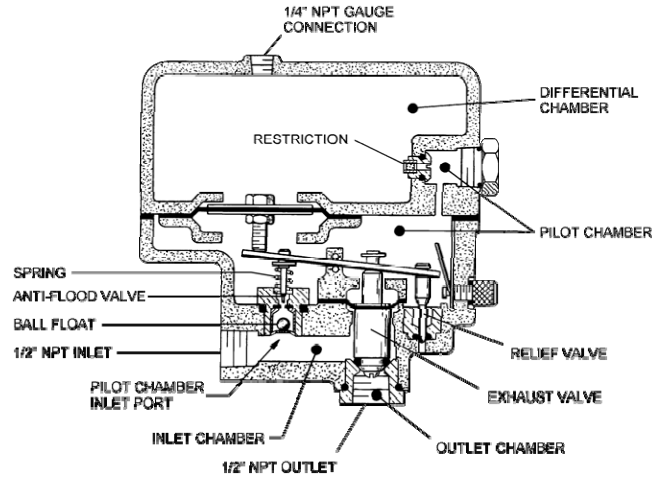
- Mechanical
- Electrical



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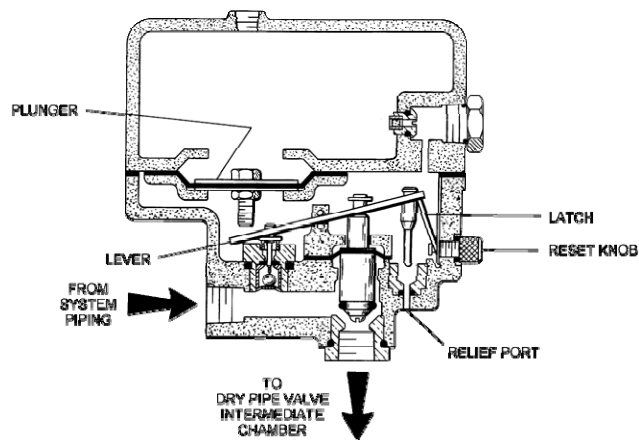
Mechanical Accelerators



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Mechanical Accelerators



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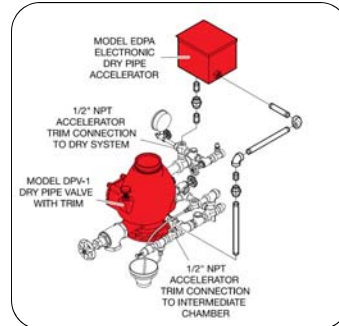
Electrical Accelerators

■ Original design requirements

- QRS Switch (Pressure Transducer)
- Solenoid
- Control Unit

■ Speeds valve trip times

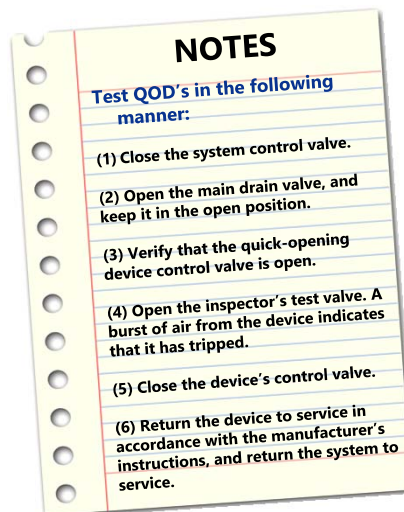
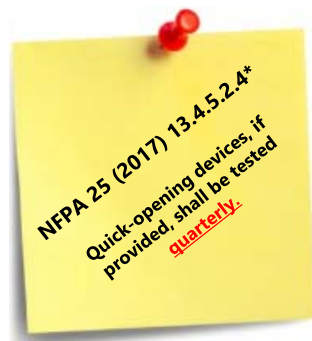
- Operates upon loss of air pressure from sprinkler activation
- Directs air from system piping into intermediate chamber



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Quick Opening Device Testing



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Valves

FDC's



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Fire Department Connections

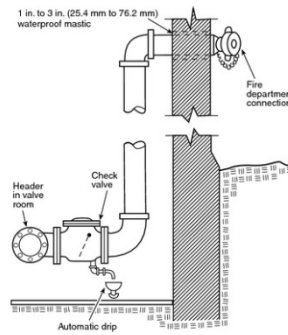
- Fire department connections shall be inspected quarterly to verify the following:
 - (1) The fire department connections are visible and accessible.
 - (2) Couplings or swivels are not damaged and rotate smoothly.
 - (3) Plugs or caps are in place and undamaged.
 - (4) Gaskets are in place and in good condition.
 - (5) Identification signs are in place.
 - (6) The check valve is not leaking.
 - (7) The automatic drain valve is in place and operating properly.
 - (8) The fire department connection clapper(s) is in place and operating properly.
 - (9) Interior of the connection is inspected for obstructions.
 - (10) Visible Piping supplying the fire department connection is undamaged.



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Fire Department Connections

- If fire department connection plugs or caps are not in place, the interior of the connection shall be inspected for obstructions, and it shall be verified that the fire department connection clapper is operational over its full range.
- Any obstructions that are present shall be removed.



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Questions?



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