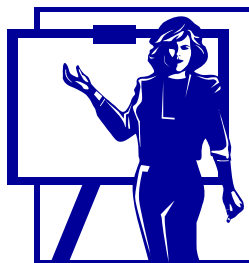




Housekeeping

- Remain muted with video off
- Ask questions
- Polling
- Demonstrations
- Post-webinar assessment



Guidelines for earning IACET CEUs

- Attendee must register/sign-in with all required information.
- Attendee must attend the entire online session (monitored by polling and the host).
- Attendee must actively participate in discussion via polling and chat function.
- A passing score of 70% on the final assessment (within 24 hours).
- Successful completion will earn attendee 0.1 CEU



3 Johnson Controls — Inspection, Testing, and Maintenance of Dry Systems



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4

4 Johnson Controls — Inspection, Testing, and Maintenance of Dry Systems



Portfolio of Flagship Brands



5

Johnson Controls — Inspection, Testing, and Maintenance of Dry Systems



Learning Records

If you need copies of your records from class
or the learning record policy
Please Contact Talya Pacheco
training@tycofp.com
401-781-8220 ex 0500
1467 Elmwood Avenue
Cranston, RI 02910

6

Johnson Controls — Inspection, Testing, and Maintenance of Dry Systems



Objectives

- Describe the equipment and installation requirements, as they relate to operation, maintenance, and application.
- Discuss and demonstrate trip time, transit time and water delivery time
- Identify the variables that effect water delivery in dry type systems
- Explain methods to predict water delivery times

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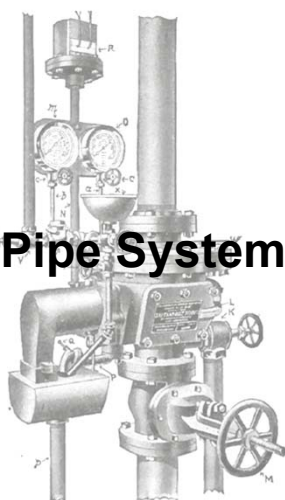
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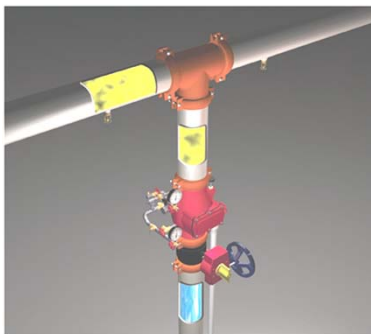
Dry Pipe Systems



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Dry Pipe Systems

- **3.3.206.4 Dry Pipe Sprinkler System.** A sprinkler system employing automatic sprinklers that are attached to a piping system containing air or nitrogen under pressure, the release of which (as from the opening of a sprinkler) permits the water pressure to open a valve known as a dry pipe valve, and the water then flows into the piping system and out the opened sprinklers.



10 Johnson Controls —




Common Dry System Applications	Alternative Solutions
<ul style="list-style-type: none"> ▪ Parking garages ▪ Coolers/Freezers ▪ Loading Docks ▪ Outdoor Covered Areas ▪ Attics 	<ul style="list-style-type: none"> ▪ Engineering Heat Loss Calculation ▪ Listed Premixed Antifreeze ▪ Dry-Barrel Sprinklers ▪ Other Dry Type Systems ▪ Condition Space


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Dry Pipe Systems



Differential Dry Valve



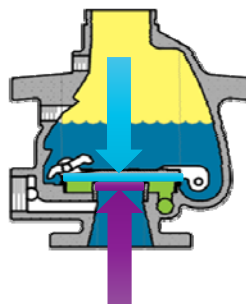
Mechanical Latching Dry Valve

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Traditional Dry Pipe Valves

- **Operates on a pressure differential concept**
 - 1 pound (.68 bar) of air pressure holds back approximately 6 pounds (.41 bar) 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
 - Costly to manufacture and ship

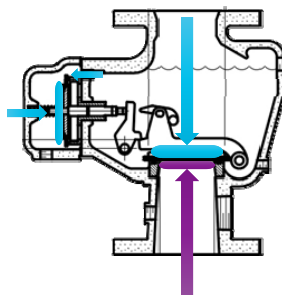


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Mechanical Latching Dry Valves

- **Operates on a pressure differential concept**
 - 1 pound (.68 bar) of air pressure holds back approximately 6 pounds (.41 bar) of water pressure
 - 6:1 differential is achieved from 2 seat surfaces
 - Some models are have external reset
 - Often required prime water
- **More moving parts**
 - More difficult to operate and maintain
 - Increases chances of malfunction
- **Smaller valve body**
 - Lighter
 - Takes up less floor space



14 Johnson Controls —



Air Pressure Requirements

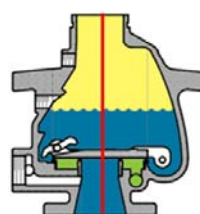
- To determine proper air pressure settings:
 - Water Supply / Valve Differential = Valve Trip Point
 - Valve Trip Point + Safety Pressure = System Set Pressure
- For an example:
 - City Water Pressure 72 psi (4.9 bar)
 - Valve Differential 6:1
 - Safety Pressure 20 psi or in Accordance with Valve Listing
 - $72 / 6 = 12$ (.82 bar)
 - $12 + 20$ (1.4 bar) (NFPA 13 Requirements) = 32 psi (2.2 bar)
 - $12 + 10$ (.68 bar) (Listed Safety Pressure) = 22 psi (1.5 bar)

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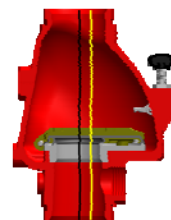


DPV-1 Dry Pipe Valves

- **Operates on a pressure differential concept**
 - 1 pound of air pressure holds back 5.5 pounds (.37 bar) of water pressure
- **Few moving parts**
 - Less likely to malfunction
 - Easy to operate and maintain
- **Smaller valve body**
 - Takes up less floor space
 - Lighter weight
 - Easier to install for larger pipe sizes



Common Centerline



Offset Clapper

16 Johnson Controls —



DPV-1 Dry Pipe Valves

▪ Lip seal gasket design

- Eliminates need for prime water
- Lowers minimum air pressure settings
 - Can speed water delivery
 - May allow use of smaller air compressors



▪ 250 PSI (17.2 bar) pressure rating

- Higher than many other valves

▪ External Reset

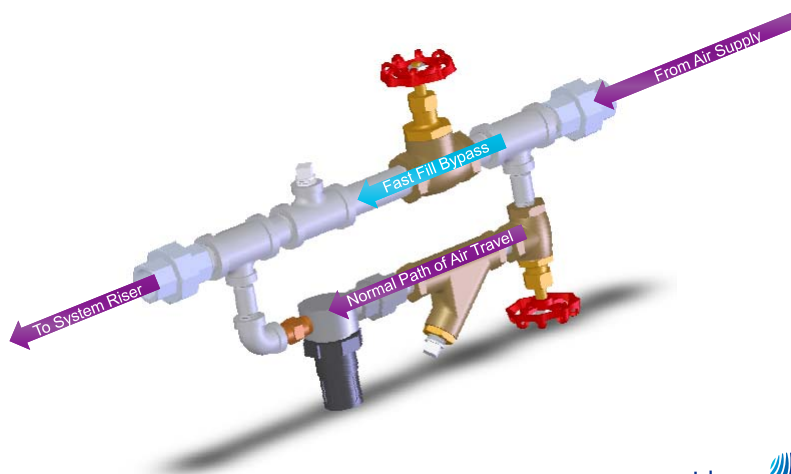
- Reduces need for removal of cover plate
- Decreases time needed for resetting the system
- Minimizes need for clean up during system restoration



17 Johnson Controls —



Automatic Air Maintenance



18 Johnson Controls —



Component Demonstration

- DPV-1 Cutaway
 - Trim
 - Drum Drip
- Air Maintenance Device

19 Johnson Controls —



Poll Question #1

What pressure should be lower in a dry pipe valve?

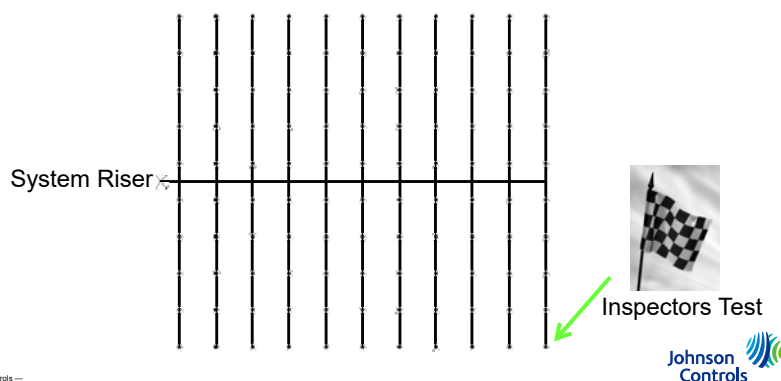
- A. Air
- B. Water

20 Johnson Controls — Inspection, Testing, and Maintenance of Dry Systems



Water Delivery Requirements

- **8.2.3.2** System size shall be such that initial water is discharged from the system test connection in not more than 60 seconds, starting at the normal air pressure on the system and at the time of fully opened inspection test connection.



21 Johnson Controls —

Water Delivery Requirements

- **8.2.3.3** A system size of not more than 500 gal (1900 L) shall be permitted without a quick-opening device and shall not be required to meet any specific water delivery requirement to the inspection test connection.
- **8.2.3.4** A system size of not more than 750 gal (2850 L) shall be permitted with a quick-opening device and shall not be required to meet any specific water delivery requirement to the inspection test connection.



Johnson Controls

22 Johnson Controls —

Live Trip Test Demonstration

- Simulation of 1000 Gallon Dry Pipe System
 - K-5.6 Test Header
 - Light Hazard Occupancy
- Quick Opening Device Out of Service

23 Johnson Controls —



Quick Opening Devices

- Exhausters
- Mechanical Accelerators
- Electrical Accelerators



24 Johnson Controls —



Exhausters

- **Speeds valve trip times**

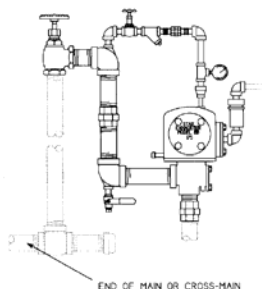
- Operates upon loss of air pressure from sprinkler activation
- Exhausts air at a rate similar to multiple sprinkler activations

- **Complex**

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

- **Expensive**

- Installation
- Maintenance



25

Johnson Controls —



Mechanical Accelerators

- **Speeds valve trip times**

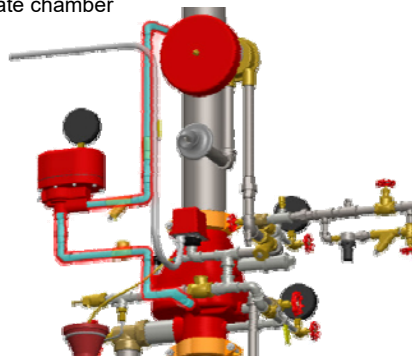
- Operates upon loss of air pressure from sprinkler activation
- Directs air from system piping into intermediate chamber

- **Complex**

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

- **Expensive**

- Installation
- Maintenance

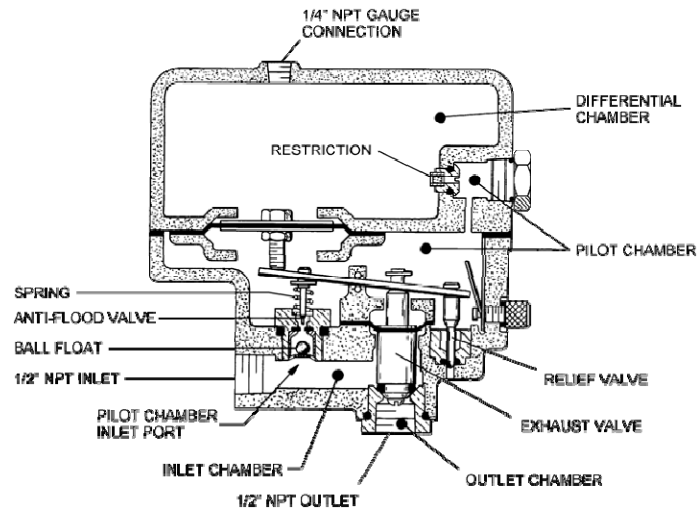


26

Johnson Controls —



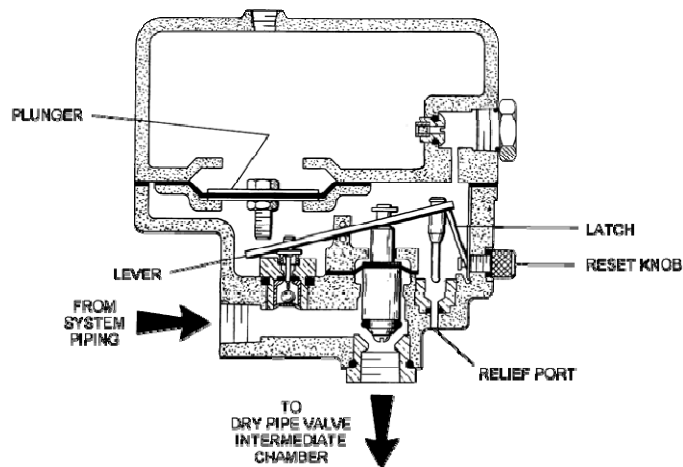
Mechanical Accelerators



27 Johnson Controls —



Mechanical Accelerators



28 Johnson Controls —



Electrical Accelerators

Original design requirements

- QRS Switch
- Solenoid
- Potter 4410RC Panel

Speeds valve trip times

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



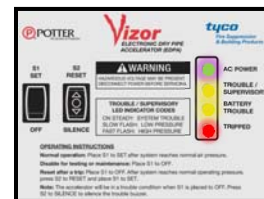
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Electrical Accelerators

Very Responsive

- Takes 2 pressure readings every second
- Sees pressure loss of .1 psi (.006 bar) or greater
- Valve trips in less than 4 seconds

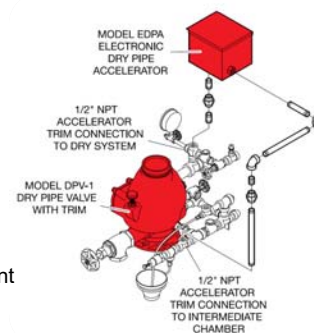


User friendly

- Push button operation
- Easier to test

Cost effective

- Less expensive to install
- Can be used as direct replacement to the mechanical accelerator



30 Johnson Controls —



Live Trip Test Demonstration

- Simulation of 1000 Gallon Dry Pipe System
 - K-5.6 Test Header
- Light Hazard Occupancy (60 Seconds)
- Mechanical accelerator (ACC-1) in service

31 Johnson Controls —



Water Delivery Time



Johnson Controls —

Objectives

- Identify water delivery requirements
- Discuss conditions that impact water delivery
- Identify options to decrease water delivery times
- Explain methods to predict water delivery times

33 Johnson Controls —



Terminology

- Trip Time
 - Time required to cause the valve to trip
- Transit Time
 - Time from valve trip to water discharge from ITC
- Water Delivery Time
 - Combination of trip & transit times

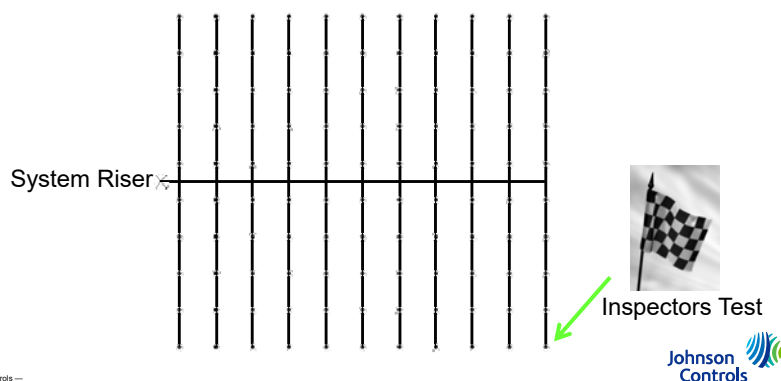


34 Johnson Controls —



Water Delivery Requirements

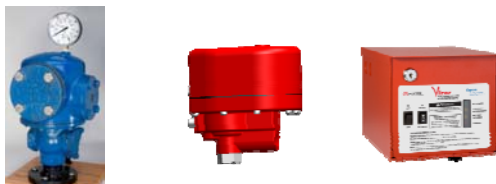
- System size shall be such that initial water is discharged from the system test connection in not more than 60 seconds, starting at the normal air pressure on the system and at the time of fully opened inspection test connection.



35 Johnson Controls —

Water Delivery Requirements

- A system size of not more than 500 gal (1893 L) shall be permitted without a quick-opening device and shall not be required to meet any specific water delivery requirement to the inspection test connection.
- A system size of not more than 750 gal (2839 L) shall be permitted with a quick-opening device and shall not be required to meet any specific water delivery requirement to the inspection test connection.



36 Johnson Controls —

Johnson
Controls

Dry Pipe System Water Delivery

Hazard	Number of Most Remote Sprinklers Initially Open	Maximum Time of Water Delivery
Residential	1	15 Seconds
Light	1	60 Seconds
Ordinary I	2	50 Seconds
Ordinary II	2	50 Seconds
Extra I	4	45 Seconds
Extra II	4	45 Seconds
High Piled Storage	4	40 Seconds

37 Johnson Controls —



Poll Question #2

Why does the NFPA standard allow for different amounts of sprinklers to be operated at a test header?

- A. More sprinklers are expected to operate with higher heat release rates
- B. To help speed up dry pipe valve trip test
- C. No reason, it has been like this for years
- D. To make the test more difficult to organize

38 Johnson Controls — Inspection, Testing, and Maintenance of Dry Systems



Factors Affecting Water Delivery

- Air pressure
- Water pressure
- Orifice size
- System piping
- Dry Valve
- Quick Opening Devices
- Existing Systems



39 Johnson Controls —



Air Pressure

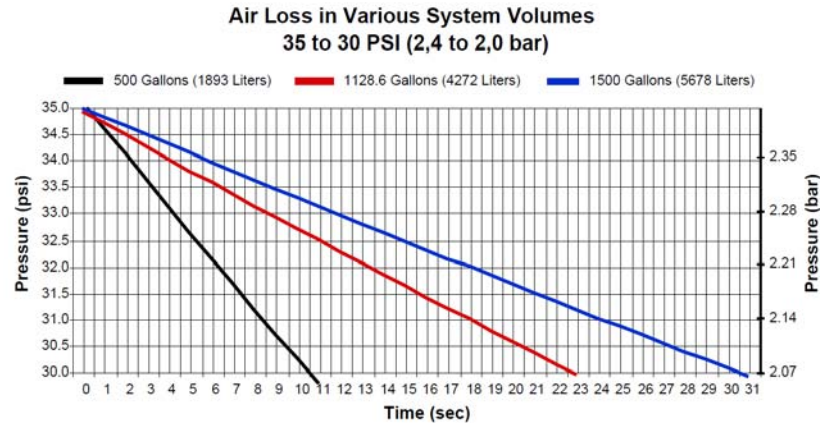
- A higher air pressure in the system will cause a faster discharge of air at the test connection, but a larger volume of air must be discharged for the valve to reach its trip point.
- Lowering the initial air pressure will slow the air discharge from the system, but a smaller volume of air must discharge before the valve trips.



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Air Pressure

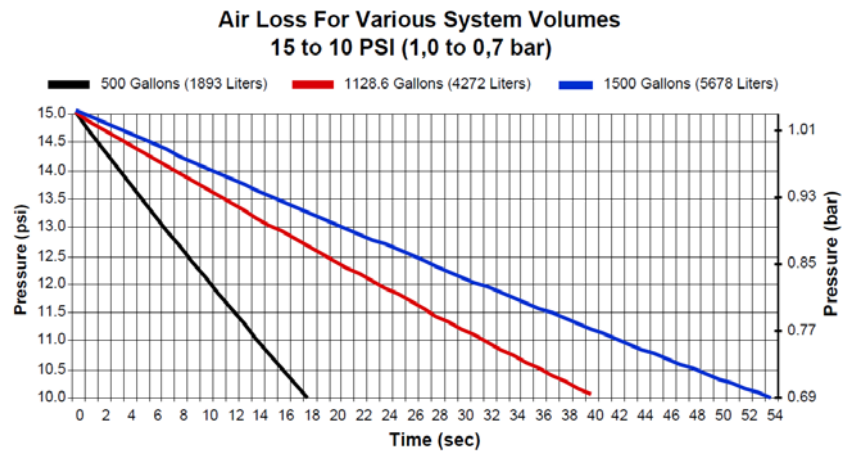


Pressure drop through a K5.6 (K80) sprinkler



41 Johnson Controls —

Air Pressure



Pressure drop through a K5.6 (K80) sprinkler



42 Johnson Controls —

Water Supply

- Water Pressures
 - Static pressure
 - Residual Pressure



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Water Supply

- Pipe Sizing
 - Reduce pressure loss due to friction
 - May increase system volume
 - Impact on water delivery
 - Change NFPA requirements
- Fire Pump
 - May be used to assist with water delivery



44 Johnson Controls —



Orifice Sizes

- Test orifice size
 - A larger orifice at the test connection will allow air to discharge more rapidly from the system.



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Test Orifices and Trip Times

Air Pressure vs. Time for Various Test Orifices
 Single Sprinkler at Test Connection
 60 PSI (4.1 bar) Start Air Pressure
 1128.6 Gallon (4272 Liter) System Volume

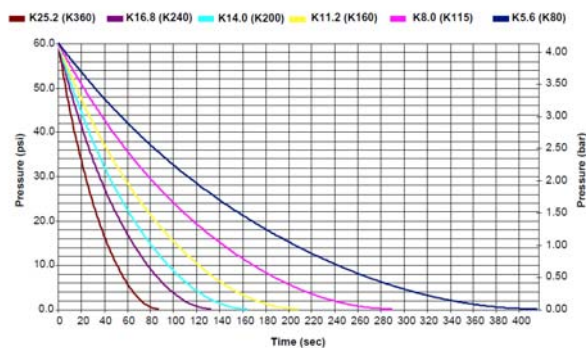


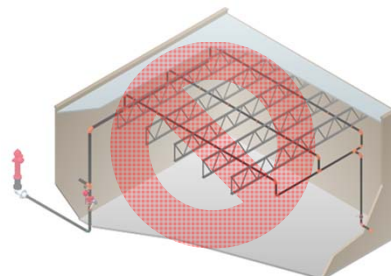
Figure 3 – The Effect of Test Orifice Size on the Rate of Pressure Drop in a Dry System

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Factors Affecting Water Delivery

- System Capacity Piping & Configuration
 - Capacity
 - System volume
 - Configuration
 - Tree
 - Loop
 - Grid (prohibited by NFPA section 13 (19) 8.2.3.10)



47 Johnson Controls —



Factors Affecting Water Delivery

- Dry Pipe Valves



48 Johnson Controls —



Decreasing Water Delivery Times

- Splitting the system
 - Make 2 smaller systems
- Use of Q.O.D.'s
 - Exhausters
 - Mechanical Accelerators
 - Electrical Accelerators



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Live Trip Test Demonstration

- Simulation of 1000 Gallon Dry Pipe System
 - K-5.6 Test Header
- Light Hazard Occupancy (60 Seconds)
- VIZOR Electronic Accelerator Installed

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Existing Systems

- Internal Inspections
 - Function of the valve
- Obstruction Investigations
 - Debris in the pipe
- Flushing the System
 - Cleaning of the pipe



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Poll Question #3

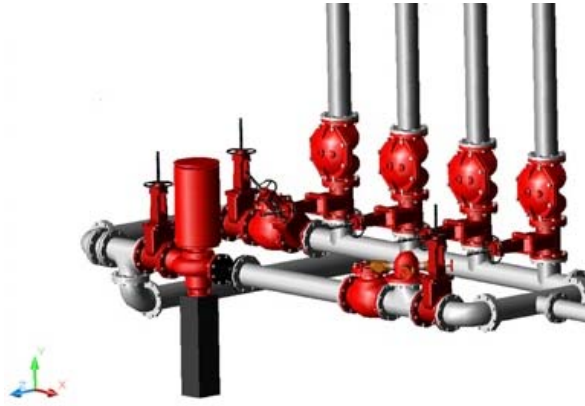
Why is it important that water delivery times are tested every 3 years?

- A. There is a delay in water reaching the fire in dry pipe systems
- B. To see if there are any blockages in the pipe network
- C. To ensure the dry pipe valve is in good condition
- D. All the above

52 Johnson Controls — Inspection, Testing, and Maintenance of Dry Systems



Predicting Water Delivery with FDT



53 Johnson Controls —



Predicting Water Delivery with FDT

- Computer Requirements
 - System Specifications
- Information Requirements
 - Required information
- When can it be used?
 - New Systems
 - Existing Systems



54 Johnson Controls —



Questions?

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