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SPRINKLER SECTION

Sprinkler systems

A presentation for fire brigade staff

Sprinkler systems

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Content

- Sprinkler system benefits
- Operation by fire brigade
- FAQ
- System description
- Basic system design

Sprinkler systems

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- In this presentation the pictures shown are taken from “classical” sprinkler system, only, due to their wide presence.
- Nevertheless, it shall be understood that the general concept of system operation also applies to watermist systems.

Sprinkler systems

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- Fire brigades will be called into buildings with or without an installed sprinkler system

- If you find a sprinkler system installed in the building, you are lucky!
  The sprinkler system will help you

  - by having controlled the fire while you were driving to the building
  - by further controlling the fire while you are rescuing the people from the building
  - by allowing you to locate the fire by identifying the section
  - by limiting the amount of smoke produced by keeping the fire small
  - by limiting the heat produced by the fire and thus preventing the building to collapse

Operation by fire brigade

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Turning the system on

- The fire brigade does not have to turn on a sprinkler system. The sprinkler system is always in stand-by.
- Sprinklers will open and discharge water onto the fire, whenever the temperature at ceiling level reaches excessive values, typically 68° C
- Upon release the sprinkler system will generate an alarm and remain on until manually turned off.

Operation by fire brigade

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Gate valve

Operation by fire brigade

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Turning the system off

- The fire brigade should only turn the sprinkler system off after the fire is extinguished.
- Never turn off the system until the fire is under control! Otherwise a dangerous situation for fire development and building stability may be generated.
- To turn off the sprinkler system, just close the main control valve of the relevant section.
- There are different configurations of the main control valve:
  - Gates valves and butterfly valves and ball valves
  - Valves installed below the alarm valve and valves installed with the wheel outside the building and valves installed in the yard

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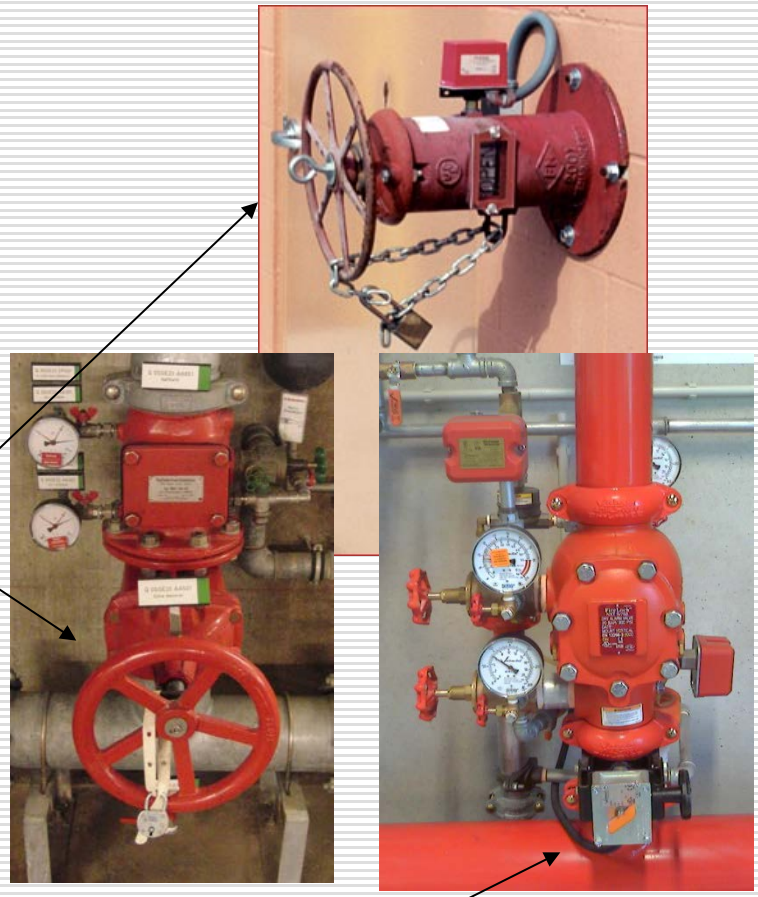

Alarm devices (I)

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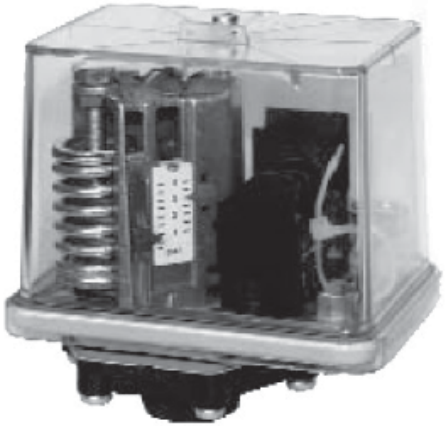
- Sprinkler systems may be divided into different sections with individual alarm device.
  Each section has its dedicated alarm valve.

- Upon release of a sprinkler in one of the sections, the relevant alarm valve will
  - provide water flow to a water motor alarm
  - and/or pressurise an alarm pressure switch to allow identification of the section where the fire is



Alarm devices (II)

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- The separation into different sections is unique for every individual sprinkler system.

- Typically separate sections are used for
  - individual floors
  - individual fire zones, separated by fire walls
  - individual buildings within a plant
  - large racks

- Separate alarms allow
  - for a quicker location of the fire by the fire brigade
  - to take appropriate means (like shutting down machinery)

Technical opportunities –Alarm devices (III)

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- Sprinkler systems may be equipped with devices (flow switches) that allow to electrically indicate the portion of a sprinkler section where sprinklers have released

- Typically portions within sections identifiyable by flow switches are
  - individual shops within a shoppings center
  - individual floors where sections incude multiple floors

- Flow switches are typically installed outside the pump room

Technical opportunities –Alarm devices (IV)

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- There are different ways to identify the section (valve) involved
  - Check which water motor is driven and ringing the alarm gong
  - Check where water is flowing from the water motor alarm piping
  - Check which indicating light at the section valve is lit
  - Check which section is released on the alarm panel

Basic operation – Turning off Alarm devices

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- In case of fire the fire brigade may turn off the alarm upon arrival
  - by closing the valve in the water motor alarm piping
  - by pushing the alarm-off button on the alarm panel

FAQ

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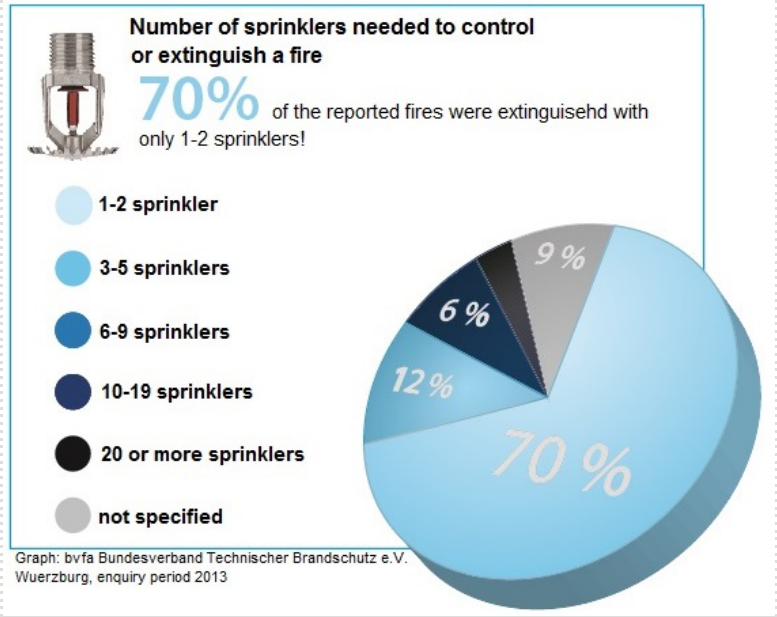
- Does the sprinkler system extinguish a fire?
  - In ~98% of the cases where a sprinkler system is released it will successfully fight the fire
  - In more than 80% of the cases only 1-5 sprinkler heads will release and control or suppress the fire.



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- Do all sprinklers in a room open in case of a fire?
  - Sprinkler heads will only release when exposed to high temperature.
    Consequently, only the sprinklers in the vicinity of the fire will open and spray water onto the fire.

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- Does fire or smoke kill the people?
  - Most people are killed by the smoke produced by a large fire.
  - Sprinklers are not directly acting on the smoke, although the water drops will wash out some of the smoke particles, but
  - sprinkler systems will help to keep the fire small and, consequently, will reduce the amount of smoke produced.

- What should be done, if the sprinkler system is protecting equipment including electric items?

  - Normally electric power is not automatically shut off upon sprinkler system activation, because modern equipment is self protected against over-current or faults.
  - The fire brigade may shut off the electric supply to the area of the fire before entering that area, provided, that the power supply to the sprinkler system is maintained.

What about the smoke venting?

- Except in very specific cases, smoke venting systems and sprinkler systems do not significantly interfere with each other. Special cases require engineering to the actual situation.

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- Do sprinklers produce false releases?
  - Except from the case of a direct mechanical damage of a sprinkler head, sprinkler systems have a proven history not to produce accidental releases.

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- Do sprinklers support the work of the fire brigade or make it more difficult?

The sprinkler system will

- send an early alarm in case of fire
- locate and indicate the location of the fire zone
- prevent from a flashover in the room, allowing the fire fighters to enter for rescue and extinguishing activities
- prevent the building to collapse by limiting the temperatures below critical values, whichever the structural elements are made of (e.g. steel or prefabricated concrete)
- buy the fire fighters more time to evacuate people from the building

Links

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- What do fire brigades say about sprinklers?
  - Jersey fire brigade
    https://www.youtube.com/watch?v=mv2cRK0pcRA

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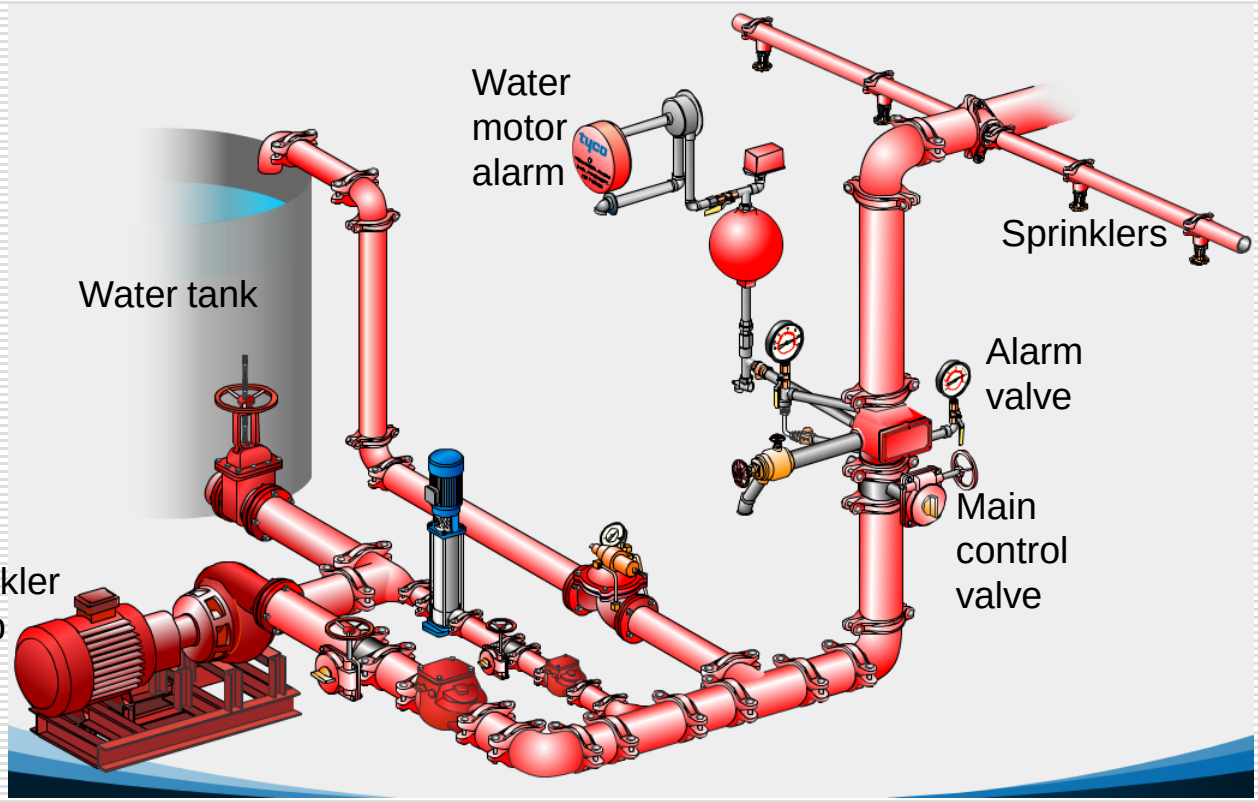
General layout of a sprinkler system



System design – Hazard classes

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- Sprinkler systems are designed acc. to private rules from the insurance world (e.g. CEA 4001 or FM Global datasheets) or standards (e.g. EN 12845)

- Such rules classify the building to be protected, based on
  - their type (residential, production, storage)
  - their use (e.g. Hotel, retail shop, car park)
  - their content (metal goods, flammable liquids, wood or plastic goods)

- Based on such characteristics each individual building is given a Hazard Class

System design – Design characteristics

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- The higher the hazard class, the more demanding the requirements:
  - Minimum amount of water to be sprayed onto 1m²
  - Minimum area of sprinklers to be supplied simultanuously
  - Minimum duration, which the water source has to be capable of supplying the values stated above

System design – Examples

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- Hotel, acc. to CEA 4001
  - Minimum amount of water to be sprayed onto 1m²:
    5 l/min per m2
  - Minimum area of sprinklers to be supplied:
    72m², i.e. ~6 sprinklers
  - Minimum duration:
    30min

- Chipboard factory, acc. to CEA 4001
  - Minimum amount of water to be sprayed onto 1m²:
    10 l/min per m2
  - Minimum area of sprinklers to be supplied:
    260m², i.e. ~29 sprinklers
  - Minimum duration:
    90min

System design – Hydraulic design

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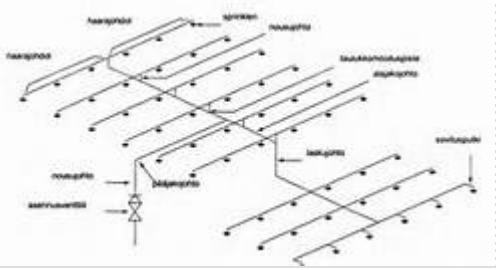
- The hydraulic calculation of the sprinkler system for an individual building has to show



  - that the required number of sprinklers can be supplied simultanously
  - that there is enough water pressure available at every sprinkler, even when several sprinklers are open at the same time
  - that the tank size is enough for the required duration time

System design – Water/Energy supply

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- Depending on Hazard Class, the size of the building and local regulations additional requirements may need to be fulfilled:
  - More than one sprinkler pump
  - Use of diesel driven pumps to be independent of the electric mains
  - More than one water tank

Sprinkler - Function

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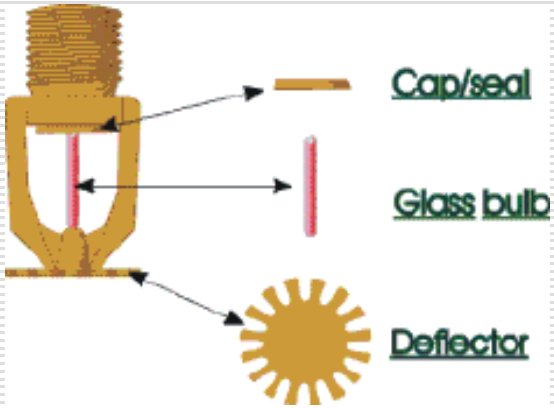
- Each sprinkler has a temperature-sensitive element and is individually activated by heat.



- Sprinkler systems are the ultimate fire safety technology available today. Experts agree the most comprehensive protection from fire is a total system of safety:
  - Early warning
  - Connection to fire brigade
  - Fire control or suppression

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- Function of a wet alarm valve

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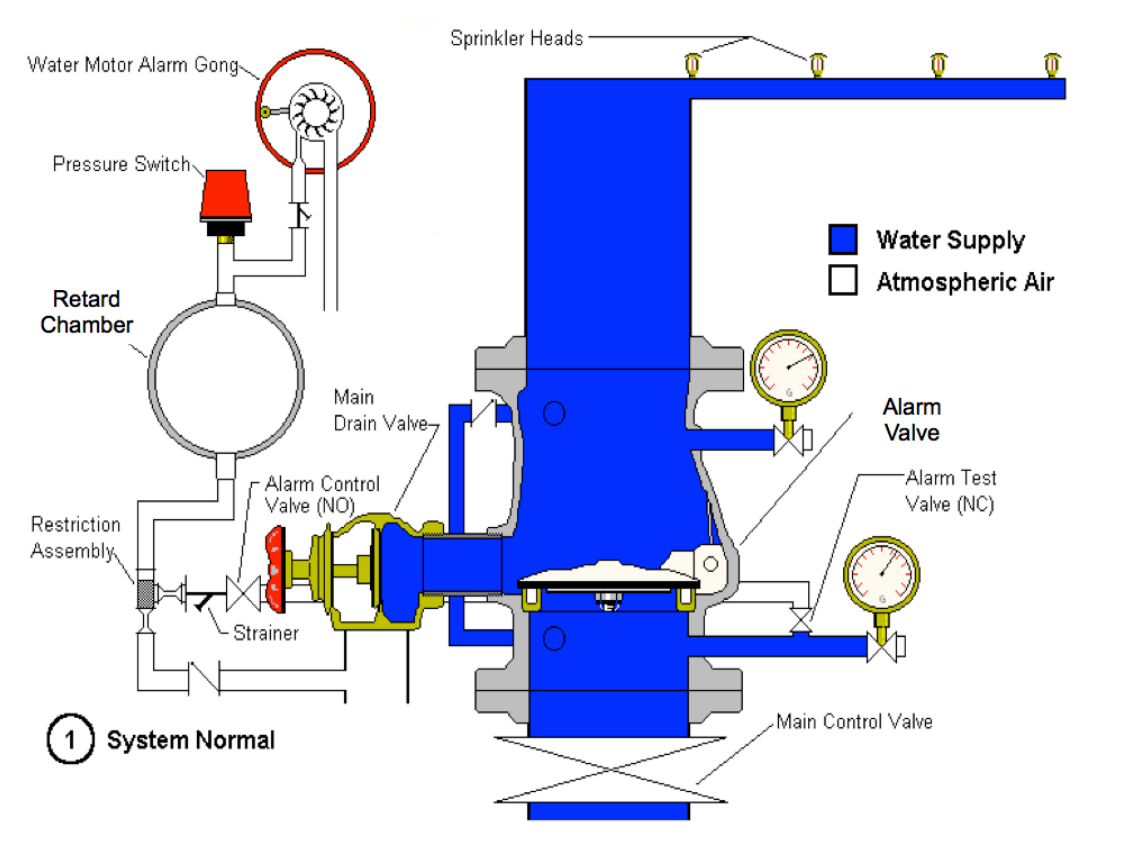
Function of a wet alarm valve



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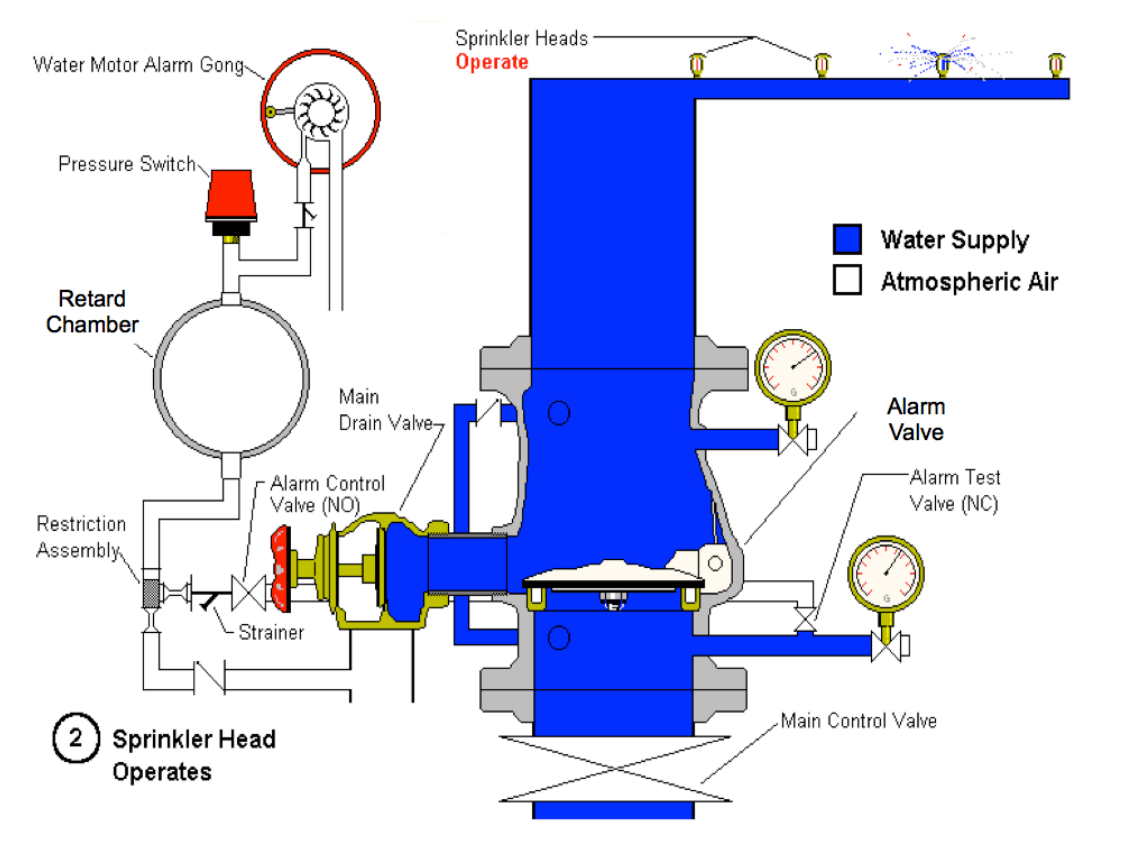
Function of a wet alarm valve



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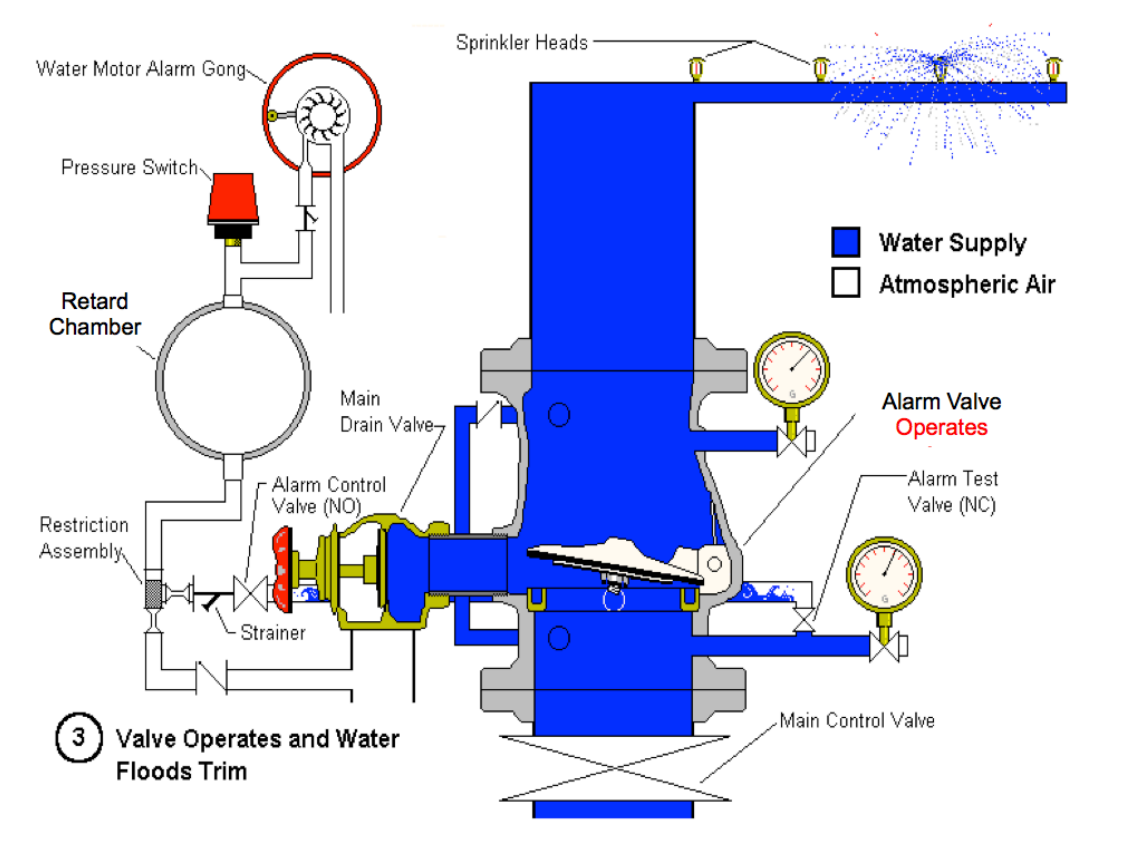

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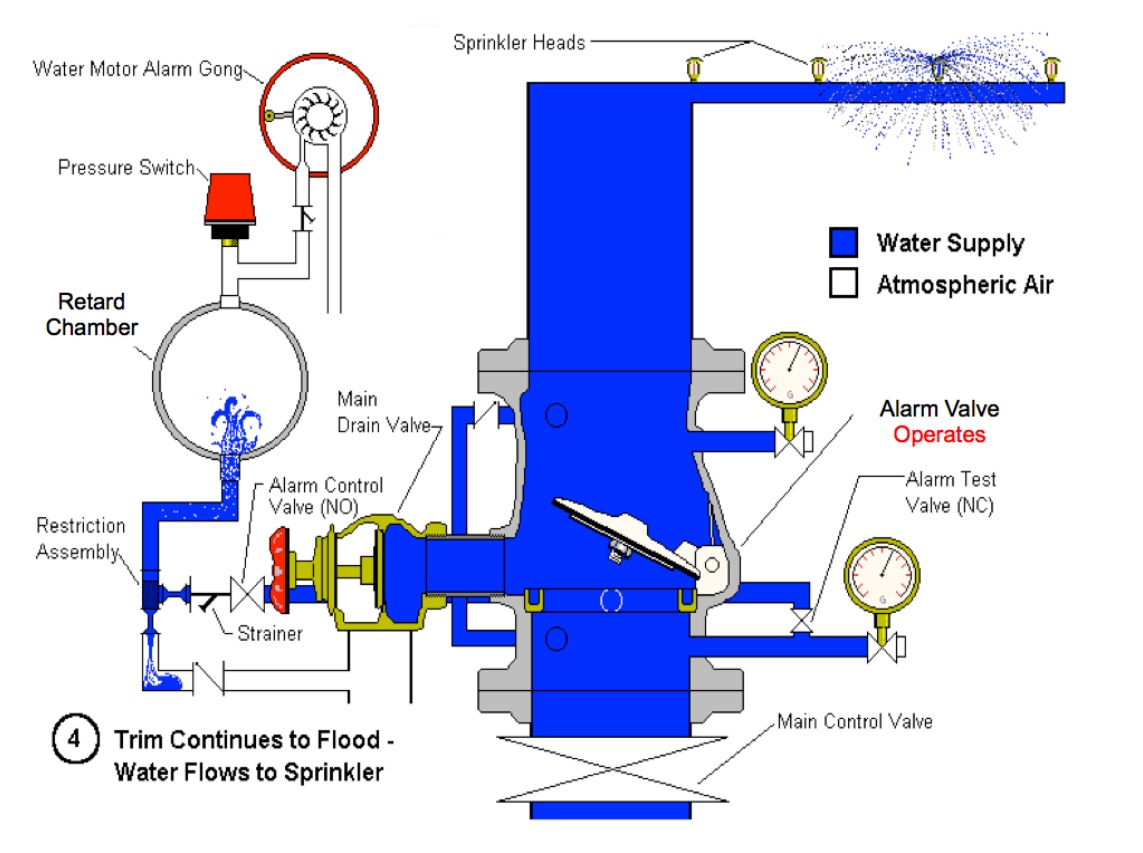

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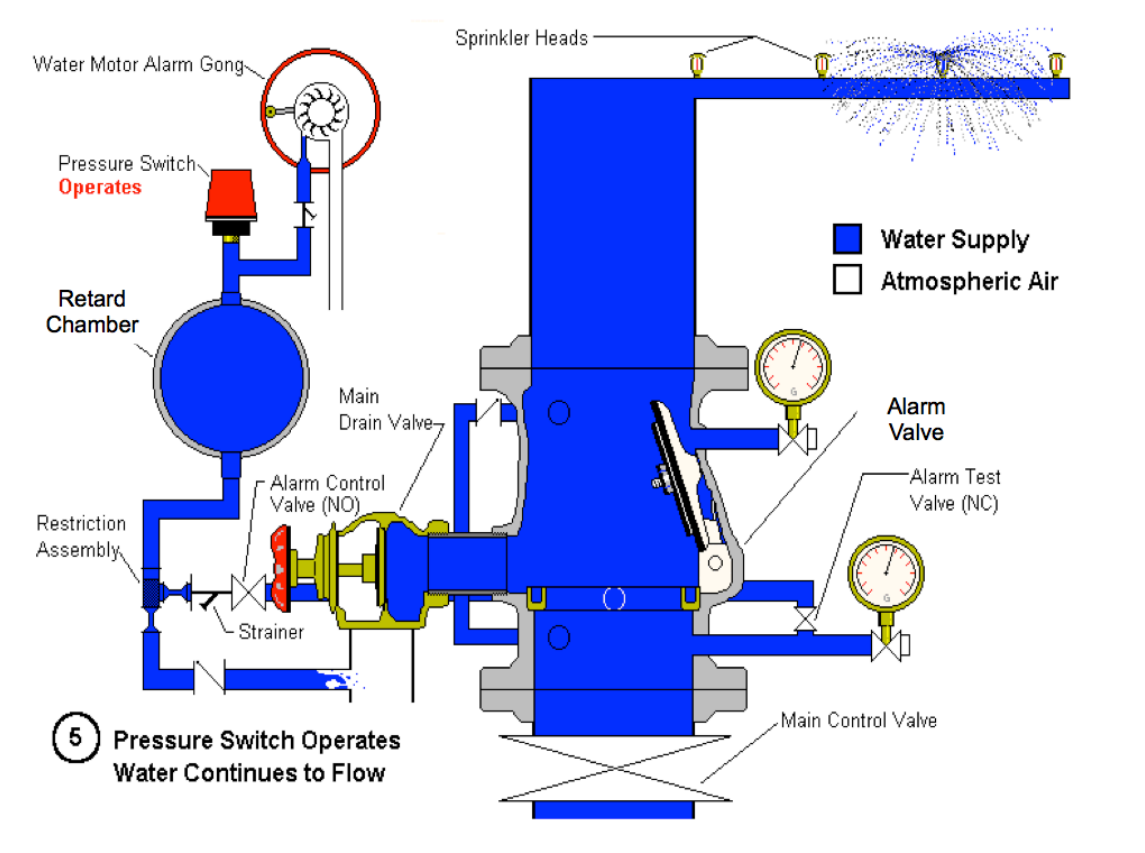

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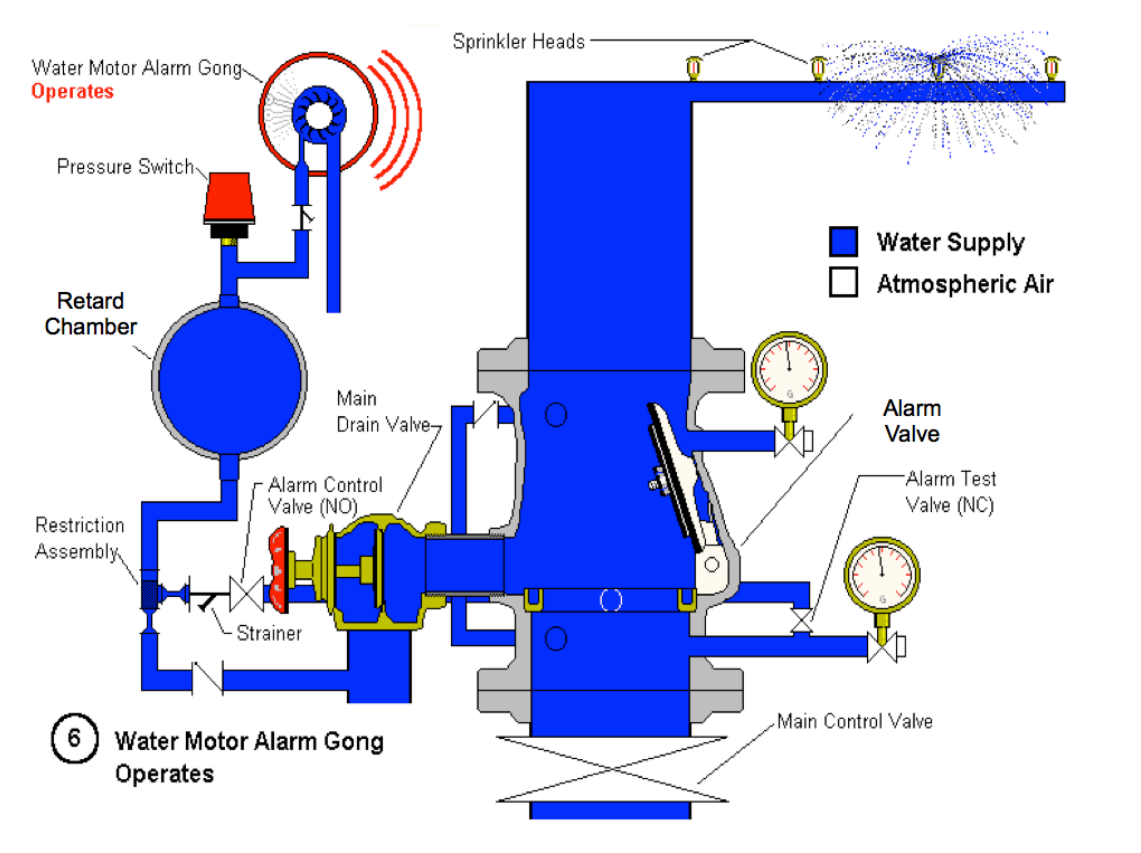

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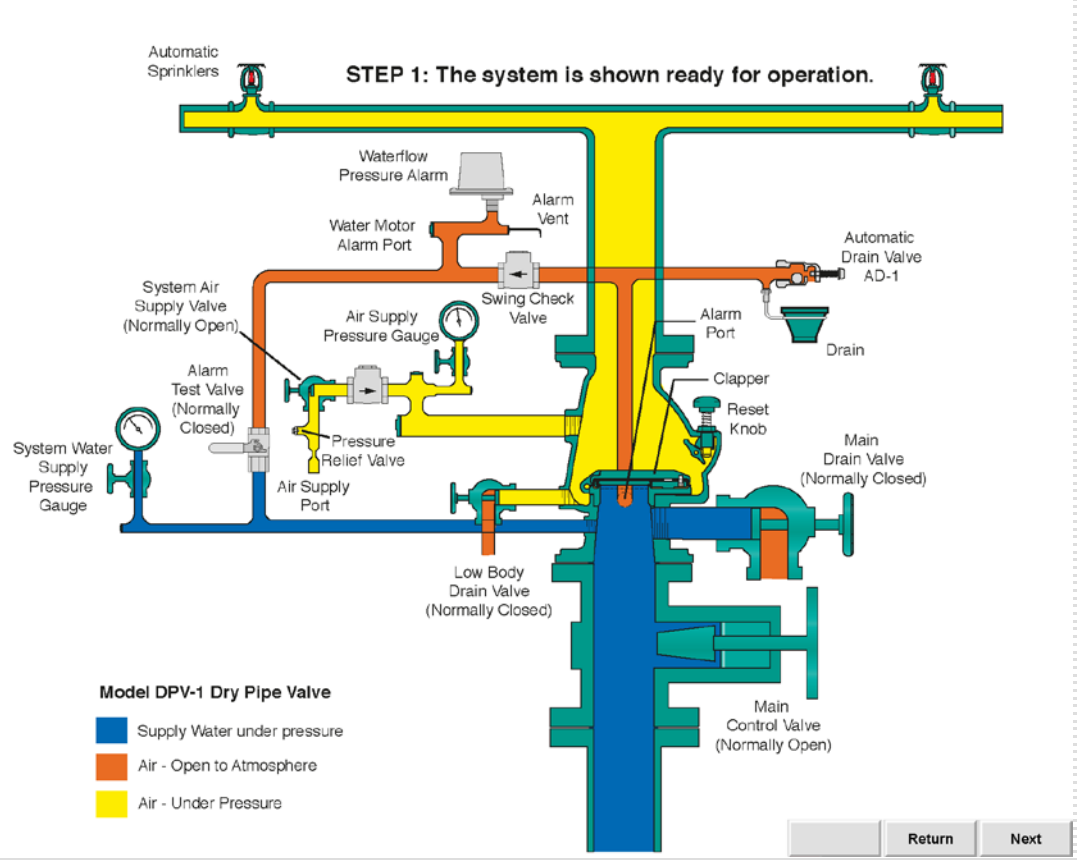
Function of a dry alarm valve



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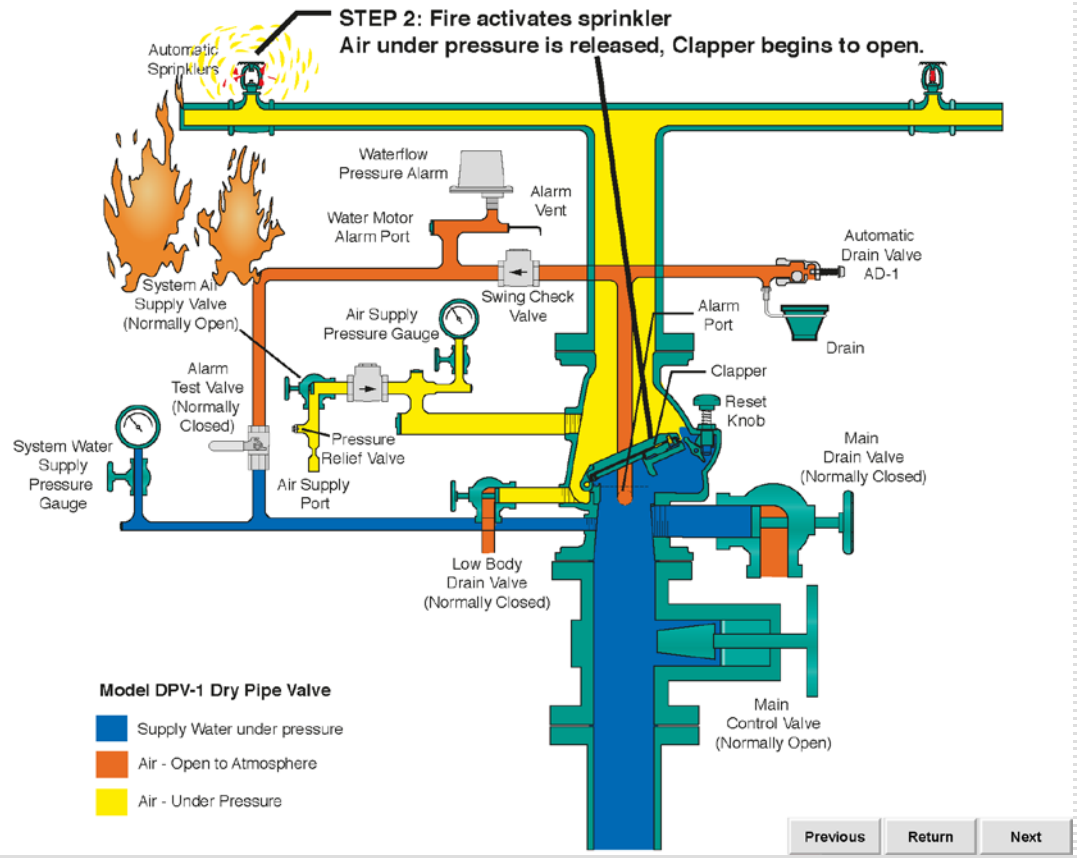

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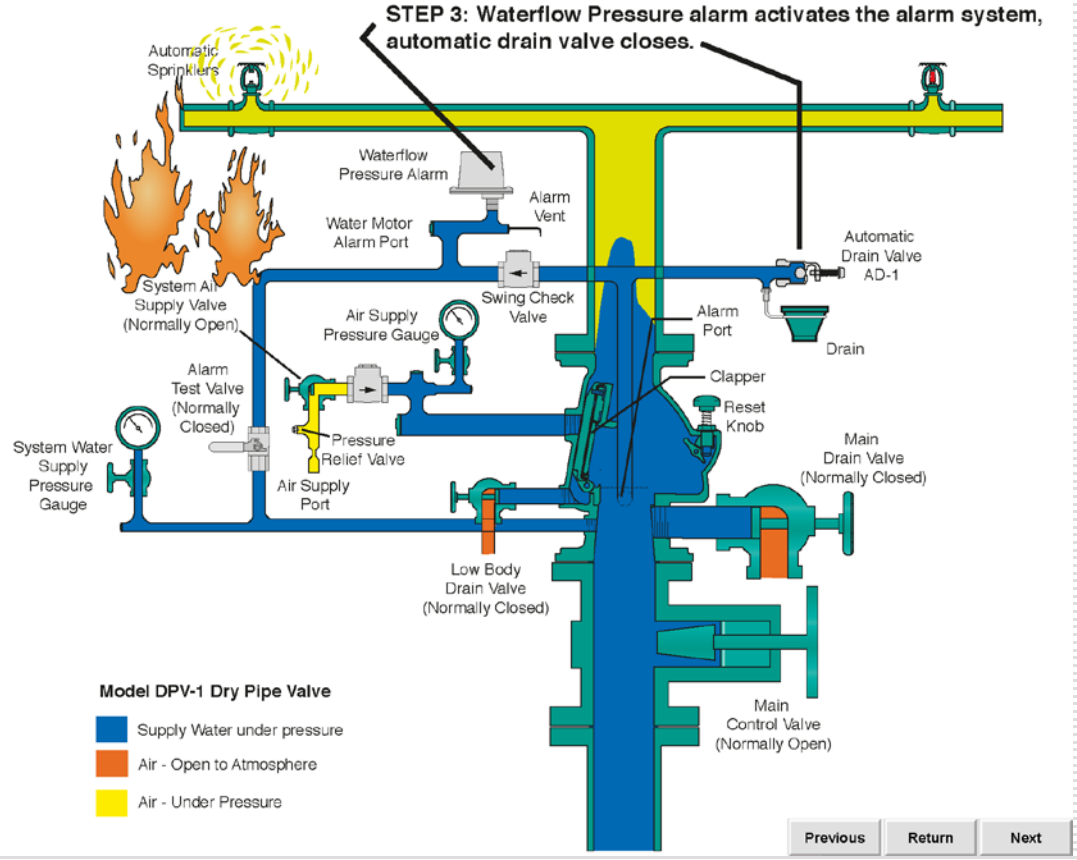

Dry alarm valve - Function

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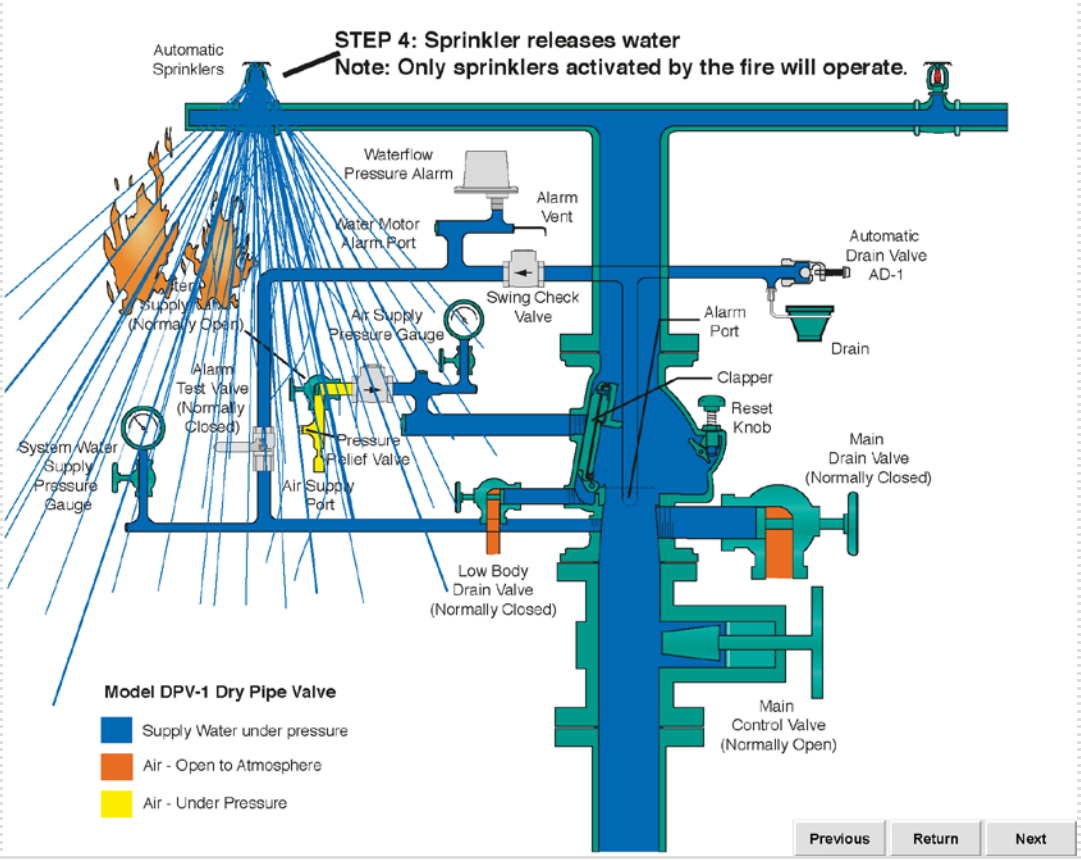
Function of a dry alarm valve



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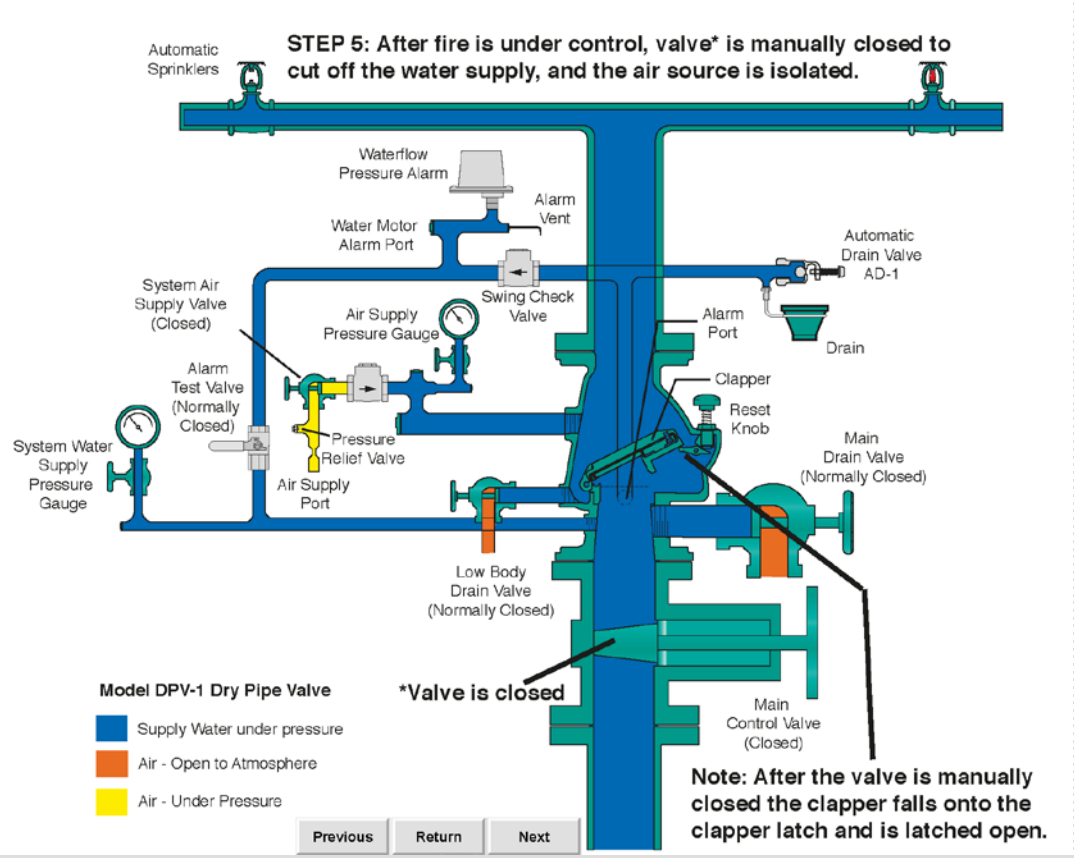

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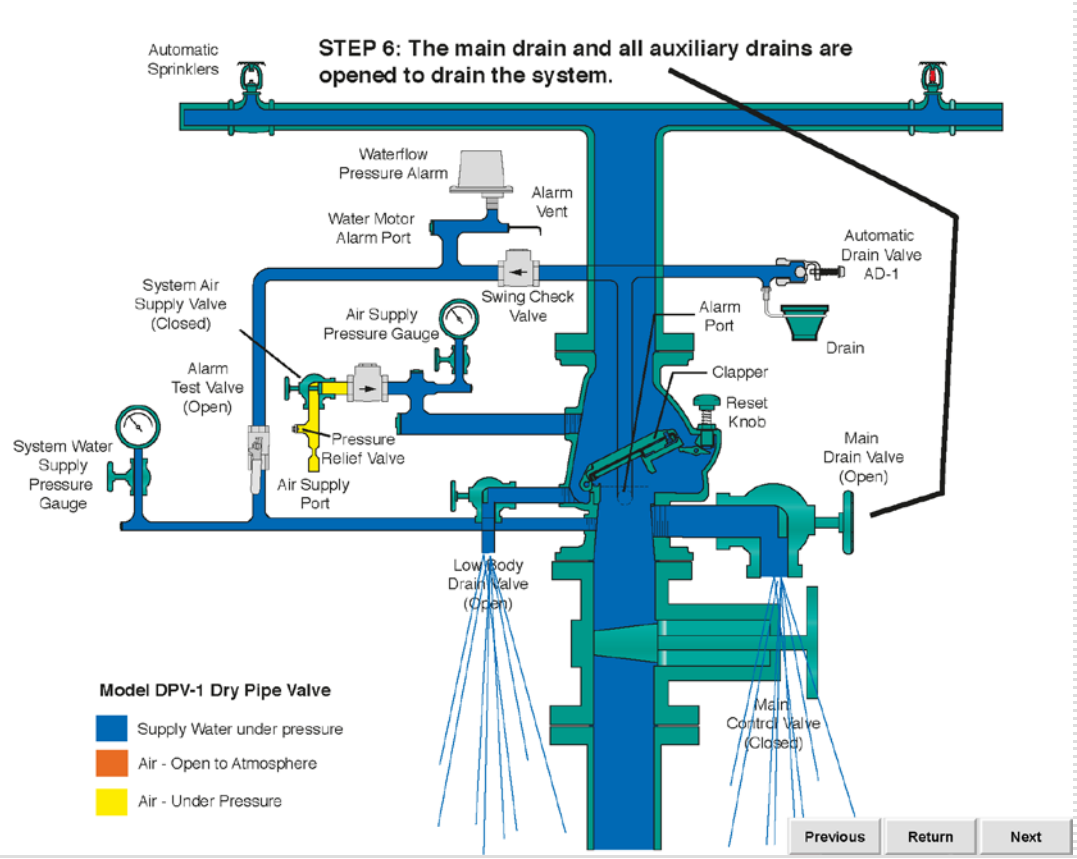

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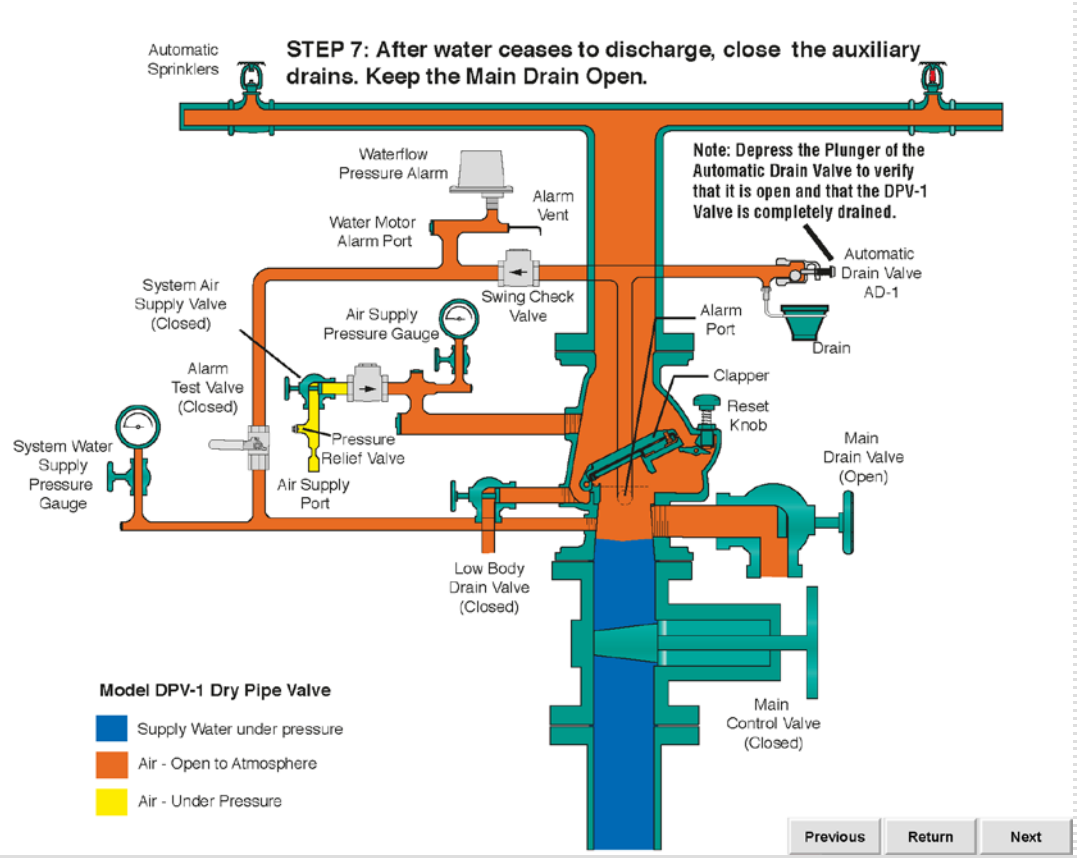

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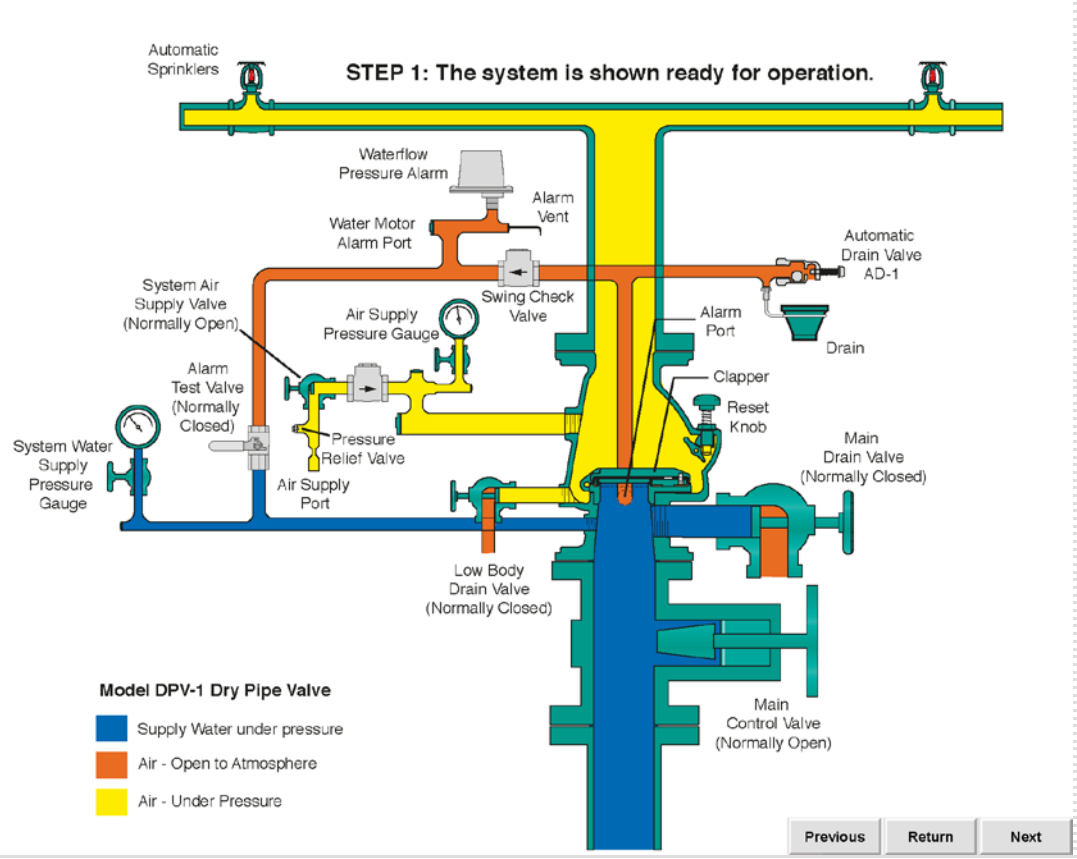

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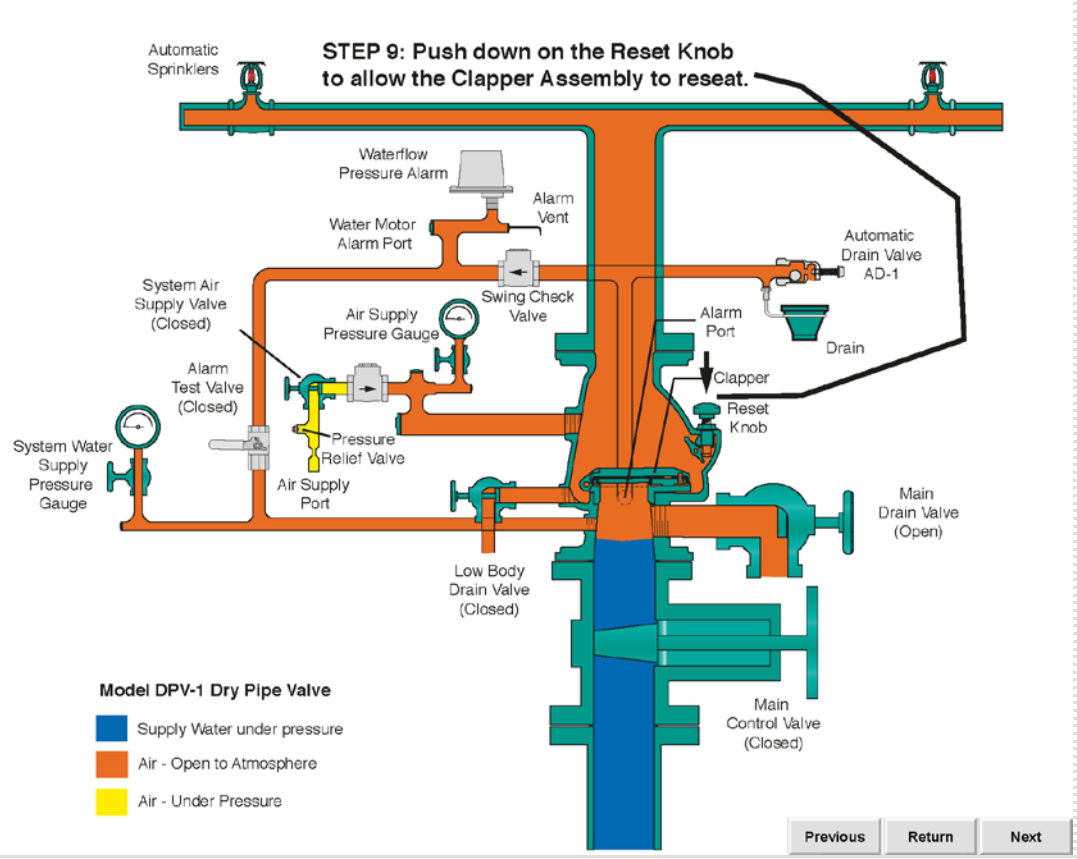

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