Sprinkler Systems: Review and Response Considerations

Brothers Fire & Security

Objectives

- Review basic sprinkler systems. Understand the differences between each system and their purposes and limitations.
- Recall the various types of sprinkler valves and their classifications and functions.
- Review the types and functions of the various styles of sprinkler heads.
- Discuss response actions when dispatched to miscellaneous alarms involving sprinkler activation.
- Determine important tactics for firefighting operations in buildings containing a sprinkler system.

• Wet System

- •Most common
- •Least expensive



- Piping is always filled with water
- •Water begins to flow from system immediately if any sprinkler head is activated
- •Problematic if sprinkler head is broken or activated accidentally
- •Cannot be used in locations that may freeze

• Dry System

- Pipes are filled with pressurized air instead of water.
 Air pressure holds closed a clapper valve that holds back water on the other side
- •Upon activation of a sprinkler head:
 - •Air escapes
 - Pressure in piping drops
 - •Water flows from the other end of the clapper valve into the system, reaching the activated sprinkler head



• Dry System continued...

•Good for locations that may freeze (unheated attics in winter)

•Accelerators and exhausters can be installed to decrease time between air release and water arrival (which should be no more than 90 seconds)

Pre-action

•Dry system



- •Only difference is that it requires that a secondary device (e.g. smoke detector, manual pull alarm) must be activated before water is released into the system
- •Utilizes a deluge valve that will not release without the secondary device activation
- •More expensive
- •Meant to prevent accidental discharge of water (sometimes used in conjunction with clean agents)

• Deluge System

•Dry system



- •Upon Activation, the water will release and tlow through ALL sprinkler heads – all sprinkler heads are always open "The Hollywood sprinkler system"
- •Activation of deluge valve can occur by a detection system or manually

Sprinkler Valves

Valves in a sprinkler system allow for the system to be controlled and water to be shut-off or redirected. Valves can be classified by function and by type.

•Function

- Water supply valve/Shut-Off valve
- Alarm valve
- Testing/service valves

•Type

- OS&Y
- PIV
- Wall PIV
- Indicating Butterfly Valve



Retrieved from: https://hardhatengineer.com/gate-valve-types-parts/

Sprinkler Valves



- Water Supply Valve/Shut-Off Valve
 - •Main control valve responsible for controlling water flowing into the system
- Alarm Valve
 - •Activates alarm when sprinkler system is activated
- Drain valves, test valves, various control valves

Sprinkler Valves continued...

- Outside Stem & Yoke (OS&Y)
 - •Stem moves in as valve is closed, stem is exposed if valve is open
- Post-Indicator Valve (PIV)
 Reads OPEN or SHUT if valve is open or shut
- Wall PIV
 - •Same as PIV, mounted to the wall of a building
- Indicating Butterfly Valve
 - •Open valve will show the yellow bar in line (parallel) with piping when open

Sprinkler Heads

The working end of the sprinkler system, responsible for applying water to the fire, and often responsible for activating the system altogether. Sprinkler heads are classified by mechanism of action and by mounting style.

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Mechanism of Activation

- Fusible-link sprinkler head
- •Frangible-bulb sprinkler head
- Early-Suppression Fast-Response sprinkler head
- •Deluge sprinkler head

•Mounting Style

- •Pendant
- •Upright
- •Sidewall

Sprinkler Head

Mechanism of Activation

- Fusible-Link Sprinkler Head
 - •A metal alloy (e.g. solder) melts when it reaches a prerated temperature, breaking a link and releasing the cap that retains the water/air pressure in the system
- Frangible-Bulb Sprinkler Head
 - •A glass bulb filled with alcohol or glycerin and air breaks when heated to a pre-rated temperature, releasing the cap that retains the water/air pressure in the system

Sprinkler Head

Mechanism of Activation

- Early-Suppression Fast-Response Sprinkler Head
 Larger orifices meant for discharging larger amounts of water
- Deluge Sprinkler Heads
 - •No cap or releasing mechanism

Sprinkler Head Mounting Styles

Conventional



Horizontal Sidewall



Recessed Pendent



Upright



Vertical Sidewall



Concealed Pendent



Retrieved from: https://www.firesprinkler.com/fire-sprinkler-heads





Recessed Pendent



Concealed Pendent



Responding to Sprinkler Activation

- Automatic Fire Alarms, Sprinkler Activation Alarms, Water Alarms, Miscellaneous Alarms
 - Response to the activation of a sprinkler system in a building could be the result of a number of factors
 - False alarm
 - Accidental activation
 - Broken component (e.g. bursts/ruptures from freezing, accidental damage)
 - Error of a civilian (i.e. accidentally using sprinkler system instead of domestic water line, children engaging a sprinkler head)
 - Fire/smoke conditions
- Consider all alarms involving the activation of a sprinkler system to be a potential fire until proven otherwise
 - Always ensure that there was no fire

Responding to Sprinkler Activation

- Automatic Fire Alarms, Sprinkler Activation Alarms, Water Alarms, Miscellaneous Alarms
 - Possible result of a number of factors
 - False alarm
 - •Accidental activation
 - •Broken component (e.g. bursts/ruptures from freezing, accidental damage)
 - Error of a civilian (i.e. accidentally using sprinkler system instead of domestic water line, children engaging a sprinkler head)
 - •Defective alarm system
 - •Surge in water pressure
 - Fire/smoke conditions

Responding to Sprinkler Activation

- Consider all alarms involving the activation of a sprinkler system to be a potential fire until proven otherwise
 - •Always ensure that there was no fire

Firefighter Response to Accidental Activation

- Control/stop the water flow
 - •Shut down the system
 - •Attempt to shut down only the portion of the system involved in the unwanted water discharge, if possible. Shut down entire system if necessary. Open main drain to divert water out of the system.
 - •Contact the fire marshal building may be on "fire watch" until system is returned to service
 - •Ensure property owners are aware that they must contact their respective sprinkler company to have system repaired/replaced

Firefighter Response to Accidental Activation

- Control/stop the water flow
 - •Utilize wedges to reduce or stop the leak at the broken sprinkler head
 - •Replace the discharged sprinkler head
 - •Some departments discourage installation of new sprinkler heads by fire department personnel due to liability
 - •Be aware of SOPs in your jurisdiction
 - •Salvage
 - •Move or cover expensive/valuable equipment and furniture
 - •Attempt to collect water in large basin if system cannot be shut down



Retrieved from: https://line2design.com/firefighter-door-and-sprinkler-wedges/

Firefighter Response to Accidental Activation

Safety considerations

- •If water flow has flooded an area, control utilities to ensure no electrical hazards
- •Make necessary notifications when putting a building's sprinkler system out of service
 - •Fire Marshal
 - •"Fire watch"
 - •Ensure building owners/managers understand to contact respective sprinkler company to schedule repairs as necessary
- •Maintain reasonable suspicion of fire until proven otherwise

Firefighting Considerations in a Sprinklered Building

- Support sprinkler operations by connecting to and pumping through Fire Department Connection (FDC)
 - •Understand system requirements and demands with regard to pumping and pressure
- Pre-plan sprinklered buildings in first-due area prior to emergency response to understand the demands and requirements of the system
 Know where FDC and Sprinkler Maintenance Room are located
 Know which portions of the building are and are not protected by the system
 - •Some buildings do not have sprinklered attics
 - •Be aware of pressure reducing valves (PRVs)

Firefighting Considerations in a Sprinklered Building

- Do not assume the situation is mitigated by the sprinkler system
 - •Continue the box assignment
 - •Check for extension
 - •Sprinkler systems subdue fire spread but cannot readily access all areas in which fire may have spread
- Do not prematurely shut the sprinkler system down prior to extinguishment of fire
- Continue fire suppression operations as though the fire were not subdued by the sprinkler system
 - $\bullet Do$ not be complacent
 - •Ensure adequate water supply to fully extinguish the fire and its extension

Firefighting Considerations in a Sprinklered Building

Safety Considerations

- •Never assume that the sprinkler system in a sprinklered building is functioning properly or at all
 - •Building owners and occupants may have illegally shut down sprinkler systems
 - •Not all dysfunctional systems are reported right away to sprinkler companies for repair
 - •Not all sprinkler systems are well maintained
- Many sprinklered buildings are often sprinklered for a reason
 Life safety hazard
 - •Construction type
 - •Fuel load

Review

- Review operations in buildings containing a sprinkler system.
- Review basic sprinkler systems. Describe the differences between each system and their respective purposes and drawbacks.
- Describe the various types of sprinkler valves and their classifications and functions.
- Describe the types and functions of the various styles of sprinkler heads.
- Discuss response considerations when dispatched to miscellaneous alarms involving sprinkler activation.
- Determine important tactical considerations for firefighting