




Verdugo Fire Academy
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Fire Detection, Protection, and Suppression Systems
 Chapter 36


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Objectives (1 of 5)

- Explain why all firefighters should have a basic understanding of fire protection systems.
- Describe the basic components and functions of a fire alarm system.
- Describe the basic types of fire alarm initiation devices and where each type is most suitable.


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Objectives (2 of 5)

- Describe the fire department's role in resetting fire alarms.
- Explain the different ways that fire alarms may be transmitted to the fire department.
- Identify the four different types of sprinkler heads.
- Identify the different styles of indicating valves.


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Objectives (3 of 5)

- Describe the operation and application of the following types of automatic sprinkler systems:
 - ◆ Wet-pipe system
 - ◆ Dry-pipe system
 - ◆ Preaction system
 - ◆ Deluge system


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Objectives (4 of 5)

- Describe when and how water is shut off to a building's sprinkler system and how to stop water at a single sprinkler head.
- Describe the differences between commercial and residential sprinkler systems.
- Identify the three types of standpipes and the differences among them.


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Objectives (5 of 5)

- Describe two problems that fire fighters could encounter when using a standpipe in a high-rise.
- Identify the hazards that specialized extinguishing systems can pose to responding fire fighters.


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Introduction (1 of 3)

- Fire prevention and building codes require that most new structures have some sort of fire protection system installed.
- Understanding how these systems operate is important for fire fighter safety and effective customer service.


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Introduction (2 of 3)

- From a safety standpoint:
 - ◆ The operations and limitations of fire detection and suppression systems.
- From a customer service standpoint:
 - ◆ Help dispel misconceptions about fire protection systems.
 - ◆ Advise building owners and occupants after an alarm is sounded .


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Introduction (3 of 3)

- Fire protection systems have fairly standardized design requirements across North America.
 - ◆ Most areas follow the applicable NFPA standards.
 - ◆ Local fire prevention and building codes may require different types of systems for different buildings.


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Fire Alarm and Detection Systems
 (1 of 2)

- A fire detection system recognizes when a fire is occurring and activates the fire alarm system.
 - ◆ Alerts occupants.
 - ◆ May alert the fire department.
 - ◆ May automatically activate fire suppression systems.

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Fire Alarm and Detection Systems
 (2 of 2)

- Fire alarm and detection systems can be very simple or very complex.
 - ◆ These systems generally have the same basic components.


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Residential Fire Alarm Systems
 (1 of 4)

- Single-station smoke alarm most common type of residential fire alarm system.
 - ◆ Includes both a smoke detection device and an audible alarm within a single unit.
 - ◆ Millions installed in private dwellings and apartments.


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Residential Fire Alarm Systems
 (2 of 4)

- Smoke alarms can be battery-powered or hard-wired to a 110-volt electrical system.
 - ◆ Most building codes require hard-wired, AC-powered smoke alarms in all new construction.
 - ◆ Batter-powered units are popular in existing occupancies.
 - ◆ Drawback, dead batteries.


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Residential Fire Alarm Systems
 (3 of 4)

- Up-to-date codes require new homes to have a smoke alarm in every bedroom and on every floor level.
 - ◆ Also require a battery backup, incase of power failure.
 - ◆ Newer installations, interconnected, (one sounds all sound).

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Residential Fire Alarm Systems
 (4 of 4)

- Many home fire alarm systems are part of security systems.
 - ◆ Have an alarm control panel & require a pass code to set or reset the system.
 - ◆ These systems may or may not be monitored by a central station.
 - ◆ Note: CSFM does not approve any combined system, must be approved fire only.

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Ionization versus Photoelectric Smoke Detectors

- Ionization detectors are triggered by the invisible products of combustion.
- Photoelectric detectors are triggered by the visible products of combustion.

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Ionization Detectors (1 of 2)

- Ionization detectors work on the principle that burning materials release many different products of combustion.
 - ◆ Senses the presence of invisible charged particles (ions).
 - ◆ Small amount of radio active material.

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Ionization Detectors (2 of 2)

- Smoke particles enters the chamber, they neutralize the charged particles and interrupts the current flow. This interruption activates the alarm.

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Photoelectric Detectors (1 of 2)

- Photoelectric smoke detectors use a light beam & a photo cell to detect larger visible particles of smoke.
 - ◆ Operate by reflecting a light beam, into or away from the photocell, depending on the design.
 - ◆ When visible particles reflect in or away from the photocell, the alarm is activated.

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Photoelectric Detectors (2 of 2)

The diagram illustrates the internal components of a photoelectric smoke detector: Light source, Lens, Light beam, Reflected light, Alarm, Photo-cell, Lens, Smoke particles, and Light catcher. It shows two modes of operation: 1) Reflector mode, where a light beam is reflected off a mirror back to a photo-cell. 2) Scatter mode, where smoke particles scatter the light beam towards a photo-cell. Labels include: Light source, Lens, Light beam, Reflected light, Alarm, Photo-cell, Lens, Smoke particles, Light catcher, and two diagrams labeled 'REFLECTOR' and 'SCATTER'.

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Ionization versus Photoelectric Smoke Detectors

The diagram compares ionization and photoelectric smoke detectors. On the left, it shows an ionization detector circuit with a current detector, chamber, and radioactive material. Text explains: 'The radioactive material releases charged particles into the chamber, and a small electric current flows between two plates.' On the right, it shows a photoelectric detector with a light source, chamber, and light sensor. Text explains: 'When smoke particles enter the chamber, they neutralize the charged particles and interrupt the current flow. The detector senses the interruption and activates the alarm.'

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Pros and Cons

- Ionization
 - ◆ More common & less expensive.
 - ◆ React more quickly to fast burning fires.
 - ◆ Fumes, dust and steam trigger unwanted alarms.
- Photoelectric
 - ◆ More responsive to slow-burning or smoldering fires.
 - ◆ Less prone to fumes, dust and steam unwanted alarms.

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Ionization / Photoelectric Smoke Detectors

- Both types are acceptable life-safety devices.
- Combination ionization/photoelectric smoke detectors are available.
- Most ionization and photoelectric smoke alarms look very similar to each other.
 - ◆ Only way to identify correct type is to read the label on the back of the case.

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Fire Alarm System Components

- Three basic components in a fire alarm system:
 - ◆ Alarm initiation device
 - ◆ Alarm notification device
 - ◆ Control panel




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Fire Alarm System Components


- ◆ Alarm initiation device is either an automatic or manually operated.
- ◆ Alarm notification devices are generally an audible device.
 - ◆ Can be accompanied by a visual device.
- ◆ Control panels link the initiation device to the notification device.



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Fire Alarm System Control Panels
(1 of 8)



- Serves as the “brain” of the system.
- Manages and monitors the proper operation of the system.
- Can indicate the source of an alarm.

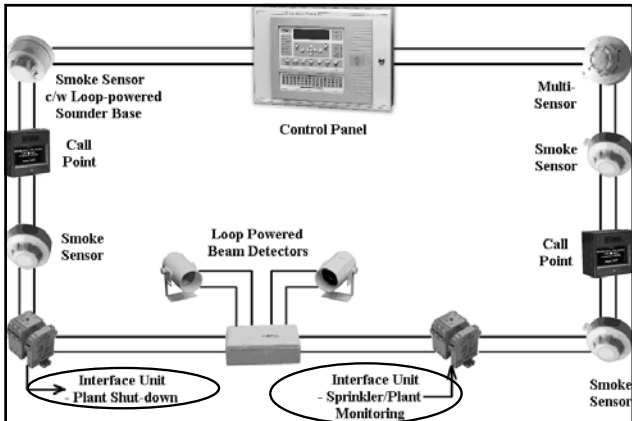
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Fire Alarm System Control Panels
(2 of 8)

- Also manages primary power supply and provides backup power supply for the system.
 - ◆ It may perform additional functions.
 - ◆ Notify the Fire Department.
 - ◆ Be interfaced with other systems and facilities .
 - Example shut down HVAC systems (see next slide...).

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Fire Alarm System Control Panels

(3 of 8)

- Vary greatly depending on age of system and manufacturer.




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Fire Alarm System Control Panels

(4 of 8)

- Used to silence the alarm and reset the system.
- Many buildings have an additional display panel, called a remote annunciator in a separate location.
- In some systems, a battery in the fire alarm control panel will automatically activate when the external power is interrupted.


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Fire Alarm System Control Panels
 (5 of 8)

- Used to silence the alarm and reset the system.
 - ◆ Panels should always be locked, keys in the key box (KNOX box).
 - ◆ Alarms should NOT be silenced or reset until the activation source is located.
 - ◆ Refer to Department SOP's.


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Fire Alarm System Control Panels
 (6 of 8)

- Many buildings have an additional display panel, called a remote annunciator.
 - ◆ Usually located at the front entrance.
 - ◆ It enables firefighters to ascertain type & location of the alarm as they enter the building.

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Fire Alarm System Control Panels
 (7 of 8)

- Fire alarm control panels should monitor the condition of the entire system to detect faults.
- Usually they are powered by 110-volt line.
 - ◆ Some systems have a batter backup.
 - ◆ Fire code specifies they battery time.
 - ◆ If the main power or back up power source fails, a trouble alarm should sound.

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Fire Alarm System Control Panels

- Other features: (8 of 8)
 - Reset button
 - Silence switch
 - Power supply

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Alarm Initiating Devices

- Components that activate a fire alarm system.
- Manual initiation devices require human activation.
- Automatic devices function without human intervention.

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Manual Initiation Devices

- Designed so that building occupants can activate the fire alarm system.
- Primary manual initiation device is the manual fire alarm box, or manual pull-station.
- Once activated, should stay in the "activated" position until it is reset.


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Double-Action Pull Stations

- Variation on the *double-action* pull-station, designed to prevent malicious false alarms, is covered with a piece of clear plastic.
- Often used in areas where malicious false alarms frequently occur.




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Manual Initiation Devices

- Once activated, a manual pull-station should stay in the "active" position until it is reset.
 - ◆ Enables responding firefighters to determine which pull-station initiated the alarm.
 - ◆ Resetting requires a special key, screwdriver, or allen wrench.



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Automatic Initiating Devices

- Designed to function without human intervention.
- Can use several different types of detectors.
 - ◆ Some detectors activated by smoke or by invisible products of combustion.
 - ◆ Others react to heat, light produced by an open flame, or specific gases.


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Smoke Detectors

- Designed to sense the presence of smoke.
- Commonly found in school, hospital, business, and commercial occupancies with fire alarm systems.
- Most common are ionization and photoelectric detectors.

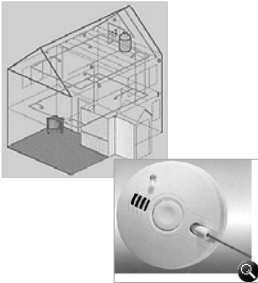


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Smoke Detectors



- Each detector device is rated to protect a certain floor area, large areas place detectors in a grid pattern.
- A beam detector is photoelectric smoke detector used to protect large open areas such as church's or auditoriums.

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Heat Detectors



- Common automatic alarm devices.
- Can provide property protection, but cannot provide reliable life safety protection.
- Generally used in situations where smoke alarms cannot be used.
- Often installed in unheated areas.
- Generally very reliable and less prone to false alarms than smoke alarms.

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Heat Detectors

- There are several types of heat detectors.
 - ◆ **Single-station**, usually in unoccupied areas of buildings that have not fire alarms system, attic/storage rooms.
 - ◆ **Spot detectors** are individual units spaced throughout an occupancy covering a specific floor area.
 - ◆ **Line detectors** use wire or tubing strung along the ceiling of large open areas to detect increase in heat.

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Fixed Temperature Heat Detectors

- Designed to operate at a preset temperature.
- Usually use a metal alloy that will melt at the preset temperature.

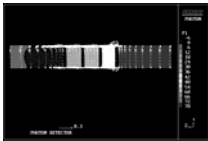


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Rate-of-Rise Detectors

- Will activate if the temperature of the surrounding air rises more than a set amount in a given period of time.
- Most rate-of-rise heat detectors are self-restoring.
- Generally respond faster to most fires than fixed-temperature heat detectors.



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Line Heat Detectors

- Use wires or a sealed tube to sense heat
- One type has two wires inside, separated by an insulating material.
- Another type measures changes in the electrical resistance of a single wire as it heats up.
- The tube-type line heat detector has a sealed metal tube filled with air or a nonflammable gas.

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Flame Detectors

- Specialized devices that detect the electromagnetic light waves produced by a flame.
- Typically found in places where early detection and rapid reaction to a fire is critical.
- Also used in explosion suppression systems
- Complicated and expensive.



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Flame Detectors



- Can be activated by the sun or welding operations.
 - ◆ Combining infrared and ultraviolet sensors lessen the chances of a false alarm.


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Gas Detectors

- Calibrated to detect the presence of a specific gas.
- Need regular calibration.
- Usually found only in specific commercial or industrial applications.




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Air Sampling Detectors

- Continuously capture air samples and measure the concentrations of specific gases or products of combustion.



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Air Sampling Detectors

- Draws air sample in and analyzes it using an ionization or photoelectric smoke detector.
- Installed in air ducts of large buildings.
 - ◆ Will sound alarm and shut down the air conditioning system if smoke is detected.
- More complex systems are sometimes installed in special hazard areas.

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Alarm Initiation by Fire Suppression Systems

- System alerts building occupants and the fire department to a possible fire.
- Ensures that someone is aware water is flowing, in case of an accidental discharge.



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False, Unwanted, and Nuisance Alarms

- Malicious False Alarms
 - ◆ Caused by individuals who deliberately activate a fire alarm when there is no fire.
- Unwanted Alarms
 - ◆ Occur when an alarm system is activated by a condition that is not really an emergency.
- Nuisance Alarms
 - ◆ Caused by improper functioning of an alarm system or one of its components.

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Alarm Notification Appliances

- Produce an audible signal when fire alarm is activated.
- Some signals play a recorded announcement in conjunction with the temporal-3 pattern.
- Many new systems incorporate visual notification devices.




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Other Fire Alarm Functions

- May also control other building functions, such as air handling systems, fire doors, and elevators.
- Responding fire personnel must understand which building functions are being controlled by the fire alarm.




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Fire Alarm Annunciation Systems

- Almost all alarm systems are now zoned to some extent.
- In a coded system, zone is identified not only at alarm control panel but also through audio notification device.
- Systems can be broken down into four categories: non-coded alarm, zoned non-coded alarm, zoned coded alarm, and master-coded alarm.

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Non-Coded Alarm System

- Control panel has no information indicating where in the building the fire alarm was activated.
- Typically sounds a bell or horn.
- Fire department personnel must search the entire building to find which initiation device was activated.

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Zoned Non-Coded Alarm System


- Most common type of system, particularly in newer buildings.
- Building divided into multiple zones, often by floor or by wing.
- Alarm control panel indicates in which zone the activated device is located.
 - ◆ May indicate the type of device – easy to locate.

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Zoned Coded Alarm

FIRE ZONE 3
Head: 4. 5. 6.
Water flow



- In addition to having all the features of a zoned alarm system, also indicates which zone has been activated over the announcement system.
- Hospitals often use this type of system.

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Master-Coded Alarm

- Audible notification devices for fire alarms also are used for other purposes.
 - ◆ Example: school may use the same bell to announce a change in classes to signal a fire alarm.
- Most of these systems have been replaced by modern speaker systems that use the temporal-3 pattern fire alarm signal and have public address capabilities.


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Fire Department Notification

(1 of 5)

- Fire alarm systems can be broken down into five categories, based on how the fire department is notified of an alarm:
 - ◆ Local alarm system
 - ◆ Remote station system
 - ◆ Auxiliary system
 - ◆ Proprietary system
 - ◆ Central station




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Fire Department Notification

(2 of 5)

- Local Alarm System
 - ◆ Does not notify the fire department.
 - ◆ The alarm sounds only in the building to notify the occupants.
 - ◆ Buildings with this type of system post notice for occupants to call 911.



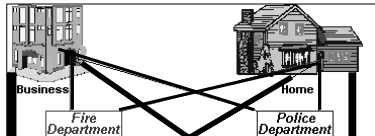
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Fire Department Notification

(3 of 5)

- Remote Station System
 - ◆ Sends signal directly to fire department or to another monitoring location via a telephone line or a radio signal.




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Fire Department Notification

(4 of 5)

- Auxiliary System
 - ◆ Building's fire alarm system is tied into a master alarm box located outside.
- Proprietary System
 - ◆ Building's alarms connected directly to monitoring site owned and operated by building owner.



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Fire Department Notification

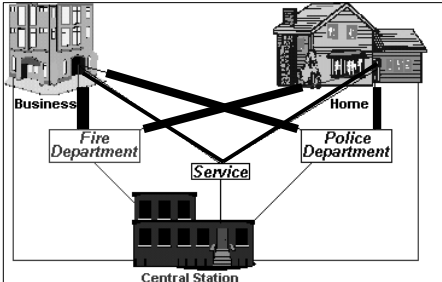
(5 of 5)

- Central Station
 - ◆ Third-party, off-site monitoring facility that monitors multiple alarm systems.
 - ◆ An activated alarm transmits a signal to the central station by telephone or radio.
 - ◆ Personnel at the central station then notify the appropriate fire department of the fire alarm via, phone, cellular or radio.

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Central Station



The diagram illustrates a central station at the bottom, connected by lines to a 'Business' building on the left and a 'Home' building on the right. From the 'Business' building, lines connect to a 'Fire Department' box and a 'Police Department' box. From the 'Home' building, lines connect to a 'Fire Department' box and a 'Police Department' box. A 'Service' box is positioned between the two department boxes, with lines connecting it to both.

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Fire Suppression Systems

- Include automatic sprinkler systems, standpipe systems, and specialized extinguishing systems such as dry chemical systems.
- Understanding how these systems work is important because they can affect fire behavior.
 - ◆ Further, firefighters need to know who to interface with the system and shut them down to avoid unnecessary damage.

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Automatic Sprinkler Systems



- In most automatic sprinkler systems, the sprinkler heads open one at a time as they are heated to their operating temperature.
- One of the major advantages of a sprinkler system is that it can function as both a fire detection system and a fire suppression system.

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Automatic Sprinkler Myths

All fire sprinklers in the building go off at the same time



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Video

The basic operation principles of an automatic sprinkler system

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Automatic Sprinkler System Components

- Four major components:
 - ◆ Automatic sprinkler heads
 - ◆ Piping
 - ◆ Control valves
 - ◆ A water supply, which may or may not include a fire pump.

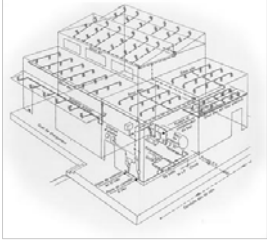
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Design Area

- An area whose size is related to the occupancy.
- Where all sprinklers in the area are expected to actuate.



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Automatic Sprinkler Heads

- The working ends of a sprinkler system, standard 1/2" orifice.
- Composed of:
 - ◆ A body, which includes the orifice (opening).
 - ◆ A release mechanism that holds a cap in place over the orifice.
 - ◆ A deflector that directs the water in a spray pattern.



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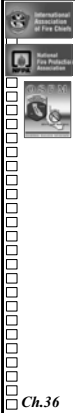
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Fusible Link Sprinkler Heads

- Use a metal alloy, such as solder that melts at a specific temperature.
 - ◆ Alloy links two other pieces of metal that keep the cap in place.
 - ◆ When designated operating temperature is reached, solder melts and the link breaks, releasing the cap.



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Frangible Bulb Sprinkler Heads

- Use a glass bulb filled with glycerin or alcohol to hold the cap in place.
 - ◆ As bulb is heated, liquid absorbs the air bubble and expands until it breaks the glass, releasing the cap.



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Chemical-Pellet Sprinkler Heads

- Use a plunger mechanism and a small chemical pellet to hold the cap in place.
 - ◆ Pellet will liquefy at a preset temperature.
 - ◆ When pellet melts, liquid compresses the plunger, releasing the cap and allowing water to flow.



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Special Sprinkler Heads

- Designed for special applications.
 - ◆ Covering large areas
 - ◆ Discharging the water in extra-large droplets
- ESFR sprinkler heads have improved heat collectors to speed up response and ensure rapid release.



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Video
Sprinkler Head Options

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Deluge Heads

- Easily identifiable, because they have no cap or release mechanism.
- Orifice is always open.
- Only used in deluge sprinkler systems.




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Temperature Ratings

- Typical rating for sprinkler heads in a light hazard occupancy would be 165°F (74°C).
- Rating should be stamped on the body of the sprinkler head, frangible bulb use color-codes.




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Temperature Ratings

- Temperature rating must match the anticipated ambient air temperatures.
- Spare heads that match those used in the system should always be available on-site.



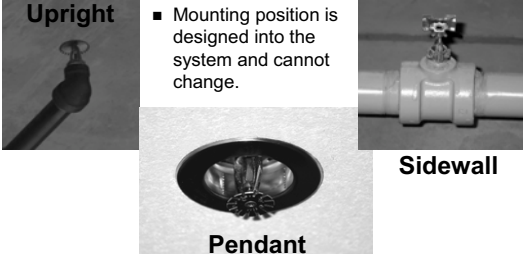
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Mounting Position

- Mounting position is designed into the system and cannot change.



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Other Positions

Sidewall

Flush mount

Pendent Upright sidewall Upright

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Old Style vs. New Style Heads

- Old Style
 - ◆ Until the 1950's, deflectors in both pendant & upright directed part of the water stream up toward the ceiling.
- New Style
 - ◆ After the mid 1950's deflect the entire water stream down to the fire.
 - ◆ Old heads cannot be used today in new systems, old heads also have a 50 year shelf life.

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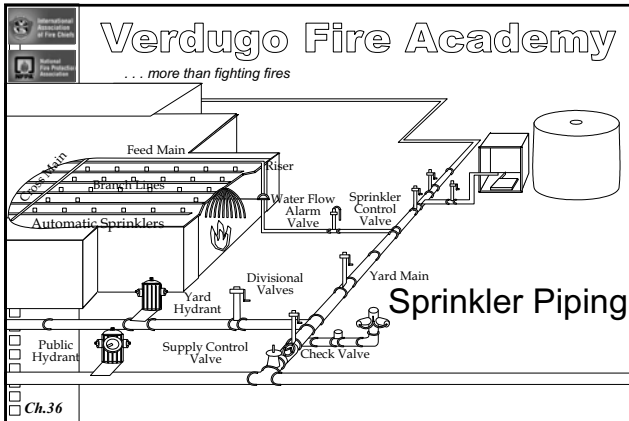
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Sprinkler Piping

- Network of pipes that delivers water to sprinkler heads.
- Includes main water supply lines, risers, feeder lines, and branch lines.
- Usually made of steel.
- Plastic pipe sometimes used in residential systems.

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Sprinkler Piping

- Sprinkler system designers use piping schedules or hydraulic calculations to determine the size of pipe and the layout of the “grid”.
- Most new systems are computer deigned.

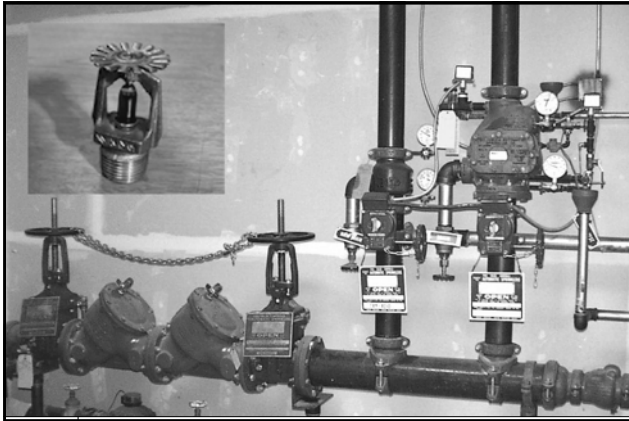
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Valves

- A sprinkler system includes several different valves such as:
 - ◆ Main water supply control valve.
 - ◆ Alarm valve.
 - ◆ Other, smaller valves used for testing and service.
- All of the valves play a critical role in the design and function of the system.

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Water Control Valves

- All water supply control valves must be of the "indicating" type, meaning that the position of the valve itself indicates whether it is open or closed.

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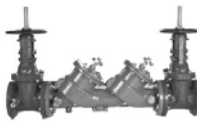
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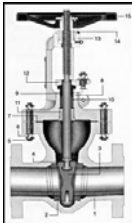
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Control Valves


- OS&Y
- PIV




850 OS&Y




Reads OPEN or SHUT





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Control Valves

- Wall mounted OS&Y/PIV's.




- System control valves.





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Control Valves

- Valves should be locked open and/or have tamper switch alarms to prevent closing.



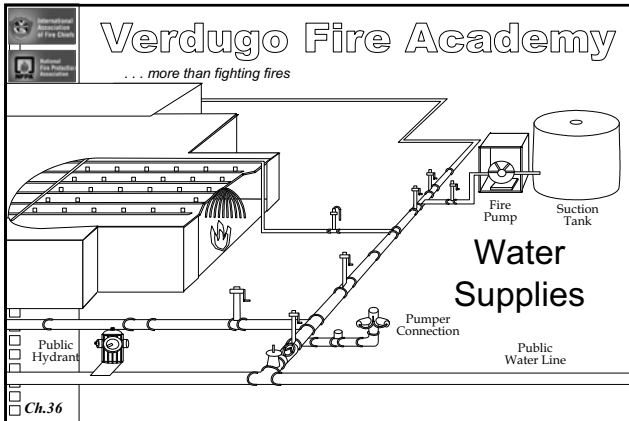
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Water Supplies

- Water may come from municipal water system, on-site storage tanks, or static water sources.
- Water supply must be able to handle demand of the sprinkler system, as well as the needs of the fire department.
- Preferred water source for a sprinkler system is a municipal water supply.

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Fire Pumps

- Used when the water comes from a static source.
- May also be used to boost the pressure in some sprinkler systems, particularly for tall buildings.


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Fire Department Connection (FDC)


The photograph shows a Fire Department Connection (FDC) on a wall. It consists of three vertical ports. A sign is attached to the wall, providing information about the system. The sign reads: LAFAYETTE 140 LINDEN AVENUE CLASS I DRY STANDPIPE NON-LOOPED SYSTEM AREAS SERVED CENTER WEST VALVES IN BREEZEWAY 2ND THRU ROOF. Below the sign, there is a label for COOPER A-20MS. Another label indicates: DRY STANDPIPE PER NFPA 13(4.2.2.1.2).


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Delivery Systems


- Fire department connections (FDC).
 - ◆ For F.D. pumping water to sprinkler, standpipe or other systems furnishing water for fire extinguishment.
 - ◆ Can make a desirable auxiliary supply.
 - ◆ There shall be no shut-off valves in FDC's.
 - ◆ National standard threads.
 - ◆ Equipped with standard caps, easy to remove by F.D.



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Water Flow Alarms

- Most systems incorporate a mechanical flow alarm called a water-motor gong.
- When system is activated and main alarm valve opens, water is fed through a pipe to a water-powered gong located outside the building.





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Types of Automatic Sprinkler Systems

- Divided into four categories:
 - ◆ Wet sprinkler systems
 - ◆ Dry sprinkler systems
 - ◆ Preaction sprinkler systems
 - ◆ Deluge sprinkler systems


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Wet Sprinkler Systems

- Most common and the least expensive type of automatic sprinkler system.
- Piping always filled with water.
- As sprinkler head activates, water is immediately discharged onto the fire.
- Major drawback: cannot be used in areas where temperatures drop below freezing.
- Will also flow water if a sprinkler head is accidentally opened or a leak occurs in the piping.

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Wet Sprinkler Systems

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Wet-Pipe Systems

- Water under pressure at all times and connected to a water supply.
- Most reliable.
- Water discharges immediately.
- Must protect from freezing by an antifreeze loop.
 - ◆ Alcohol or anti freeze solutions may be used (glycol or glycerin).

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Dry Sprinkler Systems (1 of 5)

- Operate much like wet sprinkler systems, except that the pipes are filled with pressurized air instead of water.
- A dry-pipe valve keeps water from entering the pipes until the air pressure is released.
- Dry-pipe is used in large facilities, for cold weather or to protect property for accidental activation.

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Dry Sprinkler Systems (2 of 5)


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Dry Sprinkler Systems (3 of 5)


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Dry Sprinkler Systems (4 of 5)

- Problems with dry sprinkler systems.
 - ◆ The delay between the activation of a sprinkler head and actual water flow.
 - ◆ Accelerators are installed to assist.
 - Rapid drop in air pressure triggers the accelerator, which allows air pressure to flow to the supply side of the clapper valve eliminating the pressure differential.


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Dry Sprinkler Systems (5 of 5)

- Problems with dry sprinkler systems.
 - ◆ The delay between the activation of a sprinkler head and actual water flow.
 - ◆ Exhausters
 - Detects a drop in air pressure and opens a large-diameter portal, so the air in the pipes can escape.
 - Closes when it detects water.

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Preaction Sprinkler Systems

- Similar to a dry sprinkler system with one key difference:
 - ◆ A secondary device must be activated before water is released into the sprinkler piping.
 - ◆ When the system is filled with water, it functions as a wet sprinkler system.

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Preaction Sprinkler Systems



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Deluge Sprinkler Systems (1 of 3)



- Water flows from all of the sprinkler heads as soon as the system is activated.
- Does not have closed heads that open individually at the activation temperature; all of the heads in a deluge system are always open.

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Deluge Sprinkler Systems (2 of 3)

- Activated in one of three ways:
 - ◆ Detection system can release the deluge valve when a detector is activated.
 - ◆ The deluge system is connected to a separate pilot system of air filled pipes with closed sprinkler heads.
 - ◆ Most are released manually.

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Deluge Sprinkler Systems (3 of 3)




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Shutting Down Sprinkler Systems (1 of 2)

- Order to shut down sprinkler system should come only from the IC.
 - ◆ (WAR STORY)
- In most cases, system can be shutdown by closing main control valve (OS&Y or PIV).
- In zoned systems, a particular zone can be closed to isolate the effected zone.

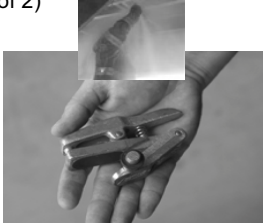
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Shutting Down Sprinkler Systems (2 of 2)

- Placing a wooden wedge or a commercial sprinkler stop into the sprinkler head can quickly stop the flow of water.
 - ◆ This will not work with all types of heads.




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Residential Sprinkler Systems

- Relatively new, but many homes now being built include them.
- Typically use smaller piping and sprinkler heads with smaller orifices and less water discharge
- Use plastic pipe to control cost, usually a wet system from domestic water supply




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Standpipe Systems

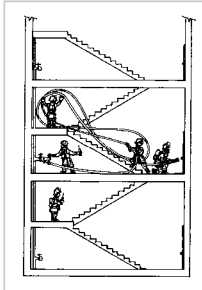
- Network of pipes and outlets for fire hoses built into a structure to provide water for firefighting purposes.
- Usually used in high-rise buildings, although they are found in many other structures as well.



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Standpipe Systems



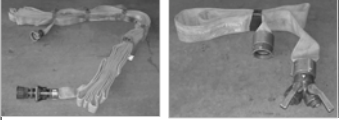
- At set intervals throughout the building, having valves for firefighters to connect hose to.
- Found in buildings with & without sprinklers.

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Standard Firefighter Hose Pack

- 100' High Rise Hose Pack with 50' auxiliary hose roll
 - ◆ Fire conditions and construction determine 1 3/4" or 2 1/2" hose size
- ◆ 1 3/4" Hose Pack Consists of...
 - ◆ Break-Away SAF nozzle
 - ◆ 100' 1 3/4" hose
 - ◆ 2 1/2" to 1 1/2" gated wye
 - ◆ 3" hose stinger
 - ◆ 50' of 1 3/4" hose role




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Class I Standpipes

- Designed for use by fire department personnel only.
- Each outlet has a 2 1/2" male coupling and a valve to open the water supply after the hose is connected.




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Class II Standpipes

- Outlets generally equipped with a length of 1 1/2" single-jacket hose preconnected to the system.
- Intended to enable occupants to attack a fire before the fire department arrives, but safety and effectiveness is questionable.




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Class III Standpipes

- Have the features of both Class I and Class II standpipes in a single system.
- Have 2 1/2" outlets for fire department use as well as smaller outlets with attached hoses for occupant use.
- Fire fighters should use only the 2 1/2" outlets, even if they are using an adapter to connect a smaller hose.


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Water Flow in Standpipe Systems

- Actual flow depends on the water supply, as well as on the condition of the piping system and fire pumps.
- Flow-restriction devices or pressure-reducing valves often installed at outlets to limit pressure and flow.
 - ◆ If not properly installed and maintained, these devices can cause problems for fire fighters.


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Water Supplies

- Wet standpipe systems in modern buildings are connected to a public water supply with an electric or diesel fire pump to provide additional pressure.
- Most dry standpipe systems do not have a permanent connection to a water supply, so the FDC must be used to pump water into the system.


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Specialized Extinguishing Systems


- Specialized extinguishing systems are often used in areas where water would not be an acceptable extinguishing agent.
 - ◆ Example, to protect computer equipment.




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Types of Systems


- Foam
 - ◆ Flammable liquids.
- Carbon dioxide
 - ◆ Where dry chemicals cannot be used.
- Halon (clean agent)
 - ◆ Electronics & electrical equipment.



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Dry Chemical Extinguishing Systems

- Use the same types of finely powdered agents as dry chemical fire extinguishers.
- Agent kept in self-pressurized tanks or in tanks with an external cartridge of carbon dioxide or nitrogen that provides pressure when the system is activated.



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Wet Chemical Extinguishing Systems

- Used in most new commercial kitchens.
- Use a proprietary liquid extinguishing agent.
 - ◆ Much more effective on vegetable oils than the dry chemicals used in older kitchen systems .

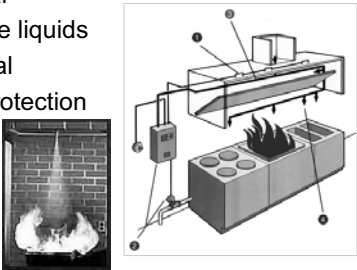


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Types of Systems

- Dry chemical
 - ◆ Flammable liquids
- Wet chemical
 - ◆ Kitchen protection (grease)

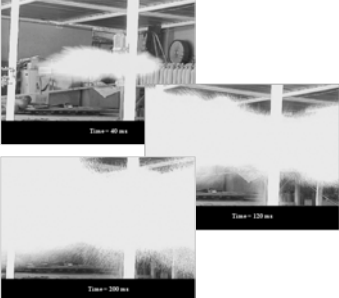


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Dry Chemical Systems

- Total flooding
 - ◆ Discharges agent into an enclosed space or area.
- Local application
 - ◆ Discharge directly on burning material.




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Dry Chemical Systems

- Semiannual service test (6 months).
- Expellant gas
 - ◆ Pressure and weight.
- Dry chemical agent
 - ◆ Agent level and weight.
- Semiannual checks




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Wet Chemical System Applications

- Areas of use.
 - ◆ Flammable liquids and gases
 - ◆ Greases
 - ◆ Ordinary combustibles
- Agent is aqueous solution.
- Contact with animal fat or vegetable oil forms a soap foam.



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Wet Chemical Systems



- Same as dry chemical.
- Semiannual service test.
- Wet chemical agent.
 - ◆ Liquid level
- Semiannual checks.

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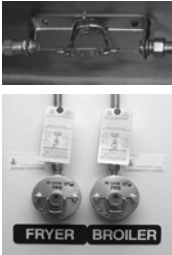
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Initiation Devices

- Fusible links are placed above the target hazard to activate extinguishing systems.
- Manual discharge button also provided so that workers can activate the system if they discover a fire.



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Clean Agent Extinguishing Systems (1 of 3)

- Often installed in areas where computers or sensitive electronic equipment are used, or where valuable documents are stored.
- Nonconductive and leave no residue.
- Halogenated agents or carbon dioxide are generally used.
- Operate by discharging a gaseous agent into the atmosphere at a concentration that will extinguish a fire.

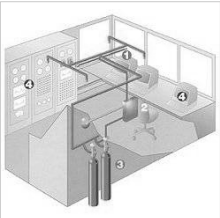
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System Configurations (2 of 3)



- Local application
 - ◆ Portion of a room or specific hazard.
- Total flooding
 - ◆ Entire room or building.
- Pre-engineered
 - ◆ Predetermined, one-of-a-kind hazard.

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Clean Agent Extinguishing



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Clean Agent Extinguishing Systems (3 of 3)

- If there is a fire, the clean agent system should be completely discharged before fire fighters arrive.
- Should be tied to building's fire alarm system and indicated as a zone on the control panel.
 - ◆ Alerts fire fighters that they are responding to a situation where a clean agent has discharged, need SCBA.


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Carbon Dioxide Extinguishing Systems

- Designed to protect a single room or a series of rooms.
- Should be connected to the building's fire alarm system.




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CO₂ Systems

- Installed according to NFPA 12.
- Tested annually.
 - ◆ Discharge test when needed.
 - ◆ Cylinders tested semiannually.
- High Pressure Cylinders weighed recharge if 10% loss by weight.
- Level gauges of low-pressure container inspected and recorded.
- System hoses examined.
 - ◆ 2,500 psi for high-pressure systems.
 - ◆ 900 psi for low-pressure systems.

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SAFETY

All chemical and gas agents create an Hazardous Environment is one of several ways:

1. Agent is toxic once exposed to fire.
2. Agent displaces oxygen.
3. Agent can hazardous to health in its natural form, usually requiring prolonged exposure.

Always use SCBA!!!

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Summary (1 of 2)

- All fire fighters must have a general understanding of how fire protection systems function.
- Fire fighters will respond to more false alarms in their careers than actual fires.
- Although it is not the fire fighter's job to maintain fire protection systems, fire fighters should be able to advise the public on how to restore systems to service.

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Summary (2 of 2)

- Regardless of how sophisticated a fire protection system is, a serious fire can still occur.
- It is every fire fighter's job to try to limit water damage from the activation of a sprinkler system.
- Fire fighters must understand the potential shortcomings of using a standpipe system to prevent injuries and fatalities.

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Video

So why do Sprinklered Buildings Burn

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