

Course Objectives

At the end of this session, participants will be able to:

1. Define and identify Fire sprinkler systems; Fire-extinguishing systems; Standpipe systems; Fire alarm and detection systems; Smoke control systems; and Smoke removal systems
2. Explain why a fire protection system must conform to code criteria and referenced standards.

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Course Objectives

3. Determine where and when fire protection systems are required.
4. Explain the principles of how a fire protection system detects and manages a fire.
5. Understand the relationship between the codes and the referenced standards including the IFC, the IBC, State Fire Prevention Code and reference standards including from NFPA.

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Fire Protection Systems Types

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Fire Protection System Types

- Active Systems
 - Power needed for operation
- Passive Systems
 - Do not require power



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Active Systems

- Built to achieve a goal of fire protection
 - Detect
 - Suppress
 - Notify



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Automatic Sprinkler Systems

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Sprinkler Systems



Where a system is needed



How a system is to be installed

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Sprinkler Systems

- Built to control or suppress a fire
- Need one capable automatic water supply
 - Flow
 - Pressure
 - Duration



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Installation Rules

- Mandated by NFPA 13, 2013 edition
- Sprinklers installed throughout
- Specific distances from standard and listing rules
 - Max/min from ceiling
 - Max/min from next sprinkler
 - Max/min from wall or obstructions
- Areas where sprinklers can be omitted

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Occupancy Classification

- Each area classified based on expected fire
 - Heat release and speed of movement
- Dictates location of sprinklers and water discharge requirements
- A change requires an evaluation of the system
 - NFPA 25

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Light Hazard



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Ordinary Hazard



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Extra Hazard



<https://www.hurricanesteelbuildings.com/>



Manufactured Hoop Pipes

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Commodity Classification



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Commodity Classification

- Type of product
- Type of packaging
- Type of pallet



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System Types

- Wet System
- Dry System
- Preaction System
- Deluge System
- Antifreeze
- Circulating Closed Loop
- Commercial Cooking Protection

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Wet System



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Dry System



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Preaction System



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Deluge System



<https://www.reliableprinter.com/>

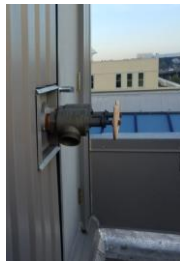
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Standpipe Systems

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Standpipe Systems

- Types
 - Automatic
 - Semi-automatic
 - Manual
- Classes
 - Class I
 - Class II
 - Class III



• NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2013 edition

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Standpipe Types

- **Manual**
 - No automatic water supply
 - FD supplies flow and pressure
- **Automatic**
 - Built in water supply
 - Building supplies flow and pressure
- **Semi-automatic**
 - Needs manual intervention to start
 - Otherwise, same as above

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Standpipe Classes

- **Class I**
 - 2 ½" hose connection for FD use
- **Class II**
 - 1 ½" hose station for trained occupant use
- **Class III**
 - Both Class I and II combined

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Class I



<https://www.usfa.fema.gov/>

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Class II



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Class III



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Fire Pumps and Tanks

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Fire Pumps

- Not required by building or fire code
- Necessary where pressure increase needed to meet design
- Follows NFPA 20, *Stationary Pumps for Fire Protection*, 2013 edition



Tanks for Fire Protection

- May be required by building or fire code
 - Special circumstances, very tall buildings
- Necessary where volume of water is needed and not available
- Follows NFPA 22, *Standard for Water Tanks for Private Fire Protection*, 2008 edition



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Fire Alarm Systems

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Fire Alarm System Types

- Protected Premises Fire Alarms
- Emergency Communications Systems (ECS)
- Supervising Station Alarms



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Protected Premises

- Signals on-site
- Notify occupants or staff of emergency
- Activated by manual and automatic means



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Emergency Communications

- Voice alarm
- Mass notification
- Wide-area notification
- Two-way communication



An Errant Knight [CC BY-SA 4.0] (<https://creativecommons.org/licenses/by-sa/4.0/>)

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Supervising Station

- Central Station
- Proprietary Station
- Remote Station



<https://www.fireltx.com/>

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Initiating Devices

- Automatic
 - Respond to certain conditions (smoke/heat)
- Manual
 - Need human intervention



Ben Schumin



<https://www.lifesafety.com/>

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Notification

- Public mode
 - Meant for notification and evacuation of occupants
- Private mode
 - Notify staff and elicit response



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Smoke Control Systems

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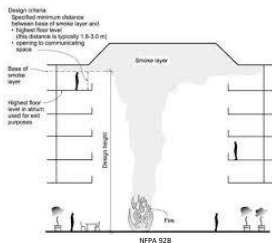
Smoke Control

- Managing the movement of smoke in certain areas
- Uses mechanical venting
- Pressurizing areas such as stairwells and elevator lobbies
- Used in large spaces such as atria, mall buildings and high-rise

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Smoke Control

- Not prescriptive in nature
- Goal based design by engineer
- NFPA 92A, *Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences*



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Smoke and Heat Venting

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Smoke and Heat Venting

- Applies to large areas open areas
- Attempts to limit horizontal fire spread
- Uses curtains to create compartment and vents in roof
- Controversial when used with sprinklers
- NFPA 204, *Standard for Smoke and Heat Venting*

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Building Code Requirements

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Sprinklers Required

- For A-1, A-3, and A-4
 - >12,000 ft²
 - OL >300
 - Multitheater (A-1 only)



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Group A-2 – Fire Area

- >5,000 ft²
- OL >300 or >100 in...



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Ambulatory Care

- Sprinklers cover entire floor and to level of exit discharge
- 4 or more occupants incapable of self-preservation
- Any located above L.E.D.



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Educational

- Fire area >12,000 ft²
- Below L.E.D.
- Gen Statutes of CT, Sec 29-315 supersedes building code



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Group F-1 – Fire Area

- >12,000 ft²
- >3 stories above grade
- >24,000 ft² cumulative of all F-1 fire areas
- >2,500 ft² when
 - Upholstered furniture
 - Mattresses
 - Woodworking



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High-Hazard Occupancies

- Required in all
- Specific sprinkler criteria for H-5



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Institutional

- Required in all with some exception
 - 13R allowed in I-1 Cond 1
 - I-4 at L.E.D with each room having exterior door
 - I-4 just that level and down to L.E.D



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Mercantile

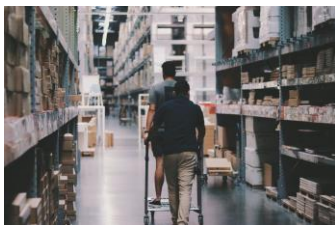
- Throughout building
- Group M fire area
 - >12,000 ft²
 - >3 stories above grade
 - Combined area of all group m 24,000 ft²
- Throughout stories below L.E.D >2,500 ft²



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High-Piled Storage

- “Big-box” stores
- All require sprinklers



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Residential

- All newly constructed
- Existing with change of use or addition
- Exceptions:
 - Bed and breakfast
 - R-2 conversion with criteria
 - Older R-2 conversion
 - Horizontal additions, sprinkler in new only
 - Only 2 dwelling units with criteria

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Storage

- Moderate Hazard (S-1) fire area
 - >12,000 ft²
 - >3 stories above grade
 - Combined areas >24,000 ft²
 - Commercial motor vehicle storage >5,000 ft²
 - Upholstered furniture or mattress storage >2,500 ft²
- Enclosed Parking Garage (S-2)
 - 12,000 ft²
 - Beneath other use groups other than R-3

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Storage

- Repair Garage
 - ≥ 2 stories and >10,000 ft² fire area
 - 1 story and >12,000 ft² fire area
 - Below grade repair garage
 - Commercial motor vehicle repair >5,000 ft²



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Tire Storage

- Storage over 20,000 ft³
- Whole building protected



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Other Areas

- Buildings with limited openings
- Trash & linen chutes
- Tall buildings
- Special occupancy requirements, Building Code Ch 4

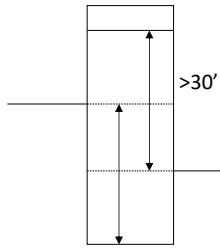


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Standpipe Requirements

Standpipes

- Class III required where...
 - Floor level
 - FD Access
- Class I with sprinklers



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Open Parking

- Manual allowed up to 150'
- Manual dry allowed



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Assembly Use

- OL >1,000 and nonsprinklered
 - Class I automatic wet
- Exception
 - Open-air seating
 - Can be manual or semiautomatic in non-highrise

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Covered Malls

- If not triggered by height then...
- Class I hose connections to sprinkler system
 - Design for 250 gpm, <50 psi drop



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Stages

- When >1,000 ft²
 - Class III wet
 - 1 ½" connections with sprinklers



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Other Areas

- Underground buildings
- Helistops and heliports
- Marinas and boatyards
- Rooftop gardens and landscaped roofs



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Fire Alarm Requirements

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Fire Alarm Requirements

- Driven by occupancy or hazard
- Minimum one manual pull station
 - Exempts systems dedicated to elevator recall and...
 - R-2



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Assembly

- OL >300
- OL >1,000 needs voice communication



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Business

- OL on all floors ≥ 500
- OL >100 above or below L.E.D.
- Ambulatory Health Care
 - Smoke detection throughout and in public use areas
 - Above exempt with sprinklers

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Education

- EVAC system
- No manual w/OL <50
- No EVAC w/OL <100
- Manual omitted w/automatic detection
 - Corridor smokes
 - Heat detection in other areas

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Factory/Industrial

- Manual when...
 - ≥ 2 stories
 - ≥ 500 above or below L.E.D.
- Sprinkler exception

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Hazard/Industrial

- Manual in...
 - H-5 and organic coatings manufacture
- Automatic smoke detection
 - Highly toxic gases, organic peroxides, and oxidizers
 - Follow IFC

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Institutional

- Manual fire alarm required
 - Can be at attended staff locations
 - Private mode signaling acceptable

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Occupancy Requirements

- Continues through remaining sections of 907 of the building code
- Specific for hazards found in certain occupancies

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Smoke Control Systems

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Smoke Control

- Atria
 - Connecting more than 2 stories
 - All in I-2 and I-1 Cond 2
- Underground Buildings
- Windowless Buildings
- Some stages
- Smoke-protected Assembly Seating

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Smoke Removal

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Smoke Removal

- Industrial or Storage
 - >50,000 ft²
- High-Piled Storage

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Questions?

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