Welcome

- Instructor Introduction
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Emergency Preparedness

§403

- Fire Safety and Evacuation Plans
- Required for
  - Group A, other than church with OL <2,000
  - Buildings with both Group A and atrium
  - Group B, F, M with OL >100 on floor other than LED
  - Groups E, H, I, R-1, R-4, R-2 college/univ dormitories

Defend-in-Place is a method of emergency response that engages building components and trained staff to provide occupant safety during an emergency. Emergency response involves remaining in place, relocating within the building, or both, without evacuating the building.
Combustible Materials in Plenums
§315.6, §605.12
- Storage is prohibited
  - It must be removed
- Abandoned wiring is deemed to be storage
  - It must be removed in the accessible areas
  - Unless the wiring is tagged for future use

Protection of Elevators
§607.6
- Design must keep water from fire sprinklers outside of lobby from reaching
  - Fire service access elevators, and
  - Occupant evacuation elevators

Type I Hood – Commercial Cooking Appliances
§609.2
- New exception eliminates Type I hood over electric cooking appliances based on a test in UL 710B
  - Emissions Test
  - Effluent from cooking contains <5mg/m³ or less
  - Does NOT need to be listed to UL 710B; only must meet this particular test

If Type I hood is not required, neither is fire-extinguishing system in that hood.
Fire Sprinklers in Group A
§903.2.1
- Fire sprinklers installed on entire floor and all floor levels to all LEDs

Assembly Occupancies on Roofs
§903.2.1.6
- WHEN:
  - Rooftop is used for assembly, AND
  - Assembly OL >100 for Group A-2 uses, OR
  - OL >300 for other Group A uses
- THEN:
  - Sprinklers required in all floors below the roof, down to and including the level of exit discharge

Multiple Group A Fire Areas
§903.2.1.7
- Sprinklers required where multiple fire areas contain Group A-1, A-2, A-3 or A-4 occupancies that share egress components and OL ≥300
- All occupancies separated by 2-HR fire barriers
  - All fire areas considered separately
  - Sprinklers not required

Aggregate occupant load = 309
- Group A-2 Restaurant OL = 93
- Group A-3 Art Gallery OL = 123
- Group M Book Store OL = 50
- Group A-2 Restaurant OL = 93

All occupancies separated by 2-HR fire barriers
- All fire areas considered separately
- Sprinklers not required
Sprinklers in Elevator Machine Rooms
§903.3.1.1.1

- Elevator shunt trip is specifically prohibited in both fire service access elevators and occupant evacuation elevators
- New exempt sprinkler locations have been added to protect the elevator hoistway
  - Machinery rooms
  - Machinery spaces
  - Control rooms
  - Control spaces

Exempt Locations for NFPA 13 Sprinklers
§903.3.1.1.2

- Sprinklers not required in Group R-1, R-2, R-3 bathrooms ≤55 ft² provided they are located within individual dwelling units or sleeping units
- Walls and ceilings must be of noncombustible or limited-combustible materials with a 15-minute thermal barrier rating

NFPA 13R Sprinkler Systems
§903.3.1.2

- NFPA 13R applicable to:
  - Group R buildings ≤4 stories
  - Group R buildings ≤60’ in height

- Height for Group R measured from grade plane
- Number of stories measured from horizontal separation
- 3-HR horizontal separation
- Parking
Water Mist Systems §904.2.1, §904.11
- Must comply with NFPA 750
- When used as alternative to fire sprinkler system, building is considered “NOT sprinklered throughout”
- When 2nd water is required for building, water mist must have 2nd water supply

Fire Alarm Shop Drawings §907.1.2
- Minimum audibility level for occupant notification
  - New item to be included with fire alarm drawings
- Public Operating Mode
  - ≥15dB above the average ambient sound or 5 dB above the maximum sound
- Private Operating Mode
  - ≥10dB above the average ambient sound or 5 dB above the maximum sound

Manual Fire Alarm System in Group E §907.2.3
- Group E requires a manual fire alarm system WITH emergency voice/alarm communications
- Exceptions:
  1. Manual fire alarm not required when OL ≤50
  2. EVAC system not be required when OL ≤ 100
  3. Manual fire alarm boxes not required when corridors, shops, labs, auditoriums, gymnasiums have heat or smoke detection
  4. Manual fire alarm boxes not required when building is sprinklered
Fire Detection in Atriums §907.2.14
- Atriums with >2 stories
- Smoke detection design in accordance with:
  - Rational analysis in §909.4
  - Types of smoke control systems
  - System operations
  - Methods of system activation
  - Operating sequence
  - Firefighter’s control panel
  - System response time

Elevator Hoistway Pressurization §909.21
- Elevator hoistway pressurization in lieu of elevator lobby
- Lobby for fire service access elevators and occupant evacuation elevators is still required
- Pressure differential of 0.1 to 0.25 inches of water column

Smoke and Heat Removal §910
- Smoke & heat removal required:
  - Groups F-1 & S-1 with more than 50,000 ft² of undivided area
  - High-piled storage areas where required by Table 3206.2
- Not required in frozen food warehouses with Class I or II commodities
- Not required in areas with ESFR sprinkler system
- Not required in areas with CMSA sprinkler system, if RTI is 50 or less
Smoke and Heat Removal
§910

- Selection of smoke & heat removal method

<table>
<thead>
<tr>
<th>Method of Smoke &amp; Heat Removal</th>
<th>Sprinklered Building</th>
<th>Nonsprinklered Building</th>
<th>1st Story with Stories Above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoke/Heat Vents</td>
<td>Option 1</td>
<td>Required</td>
<td>Not allowed</td>
</tr>
<tr>
<td>Mechanical Smoke Removal</td>
<td>Option 2</td>
<td>Not allowed</td>
<td>Required</td>
</tr>
</tbody>
</table>

Smoke and Heat Removal
§910

- Smoke/heat vents
  - Calculation for sprinklered building
    - \( AVR = \frac{V}{9000} \)
  - Calculation for unsprinklered building
    - \( AVR = \frac{V}{50} \)

  **NOTE**: formula is based on volume; no longer based on floor area

  **AVR** = the aggregate vent area required
  **V** = the volume of the area to be vented

  **For example**: 120,000 ft\(^2\) building with 27’0” ceiling height
  \[
  3,240,000 + 9,000 = 360 \text{ ft}^2 \text{ of vent area} \\
  360 ÷ 32 = 11.25 \text{ smoke/heat vents}
  \]

Smoke and Heat Removal
§910

- Mechanical smoke removal
  - 2 air changes per hour
  - Based on empty building
  - Makeup air openings 66\(^2\) of floor providing 8 ft\(^2\) for every 1,000 cfm
  - Automatic shutdown upon sprinkler operation
  - Manual controls in room accessible from the exterior with 1-HR separation
Electric Circuits Supplying Fire Pumps
§913.2.2
- Circuits for electric fire pumps must be designed and listed for survivability
- UL 2196
  - 2” concrete covering
  - 2-HR rated assembly
  - Cable with a fire-resistance rating of 2-HR
  - Cable and installation method tested

Carbon Monoxide Detection
§915.1.1
- CO detection required in Groups I-1, I-2, I-4 and R occupancies, and Group E classrooms
- CO detection is only required when the following potential sources exist:
  - Fuel-burning appliances in the space or building
  - Fuel-burning fireplace in the space or building
  - Fuel-burning, forced air furnace
  - Attached private garage

Exit and Exit Access Doorways
§1007.1.1.1
- Distance between doorways measured to any point in doorway width
Door Operations—Locking Systems
§1010.1.9

- Egress doors must be readily openable, EXCEPT:

<table>
<thead>
<tr>
<th>2015 Locking Method</th>
<th>2012 Locking Method</th>
<th>2015 Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled Egress Doors in Groups I-1 and I-2</td>
<td>Special Locking Arrangements in Group I-1</td>
<td>§1010.1.8.6</td>
</tr>
<tr>
<td>Delayed Egress Doors</td>
<td>Delayed Egress Locks</td>
<td>§1010.1.9.7</td>
</tr>
<tr>
<td>Sensor Release of Electrically Locked Egress Doors</td>
<td>Access-Controlled Egress Doors</td>
<td>§1010.1.9.8</td>
</tr>
<tr>
<td>Electromagnetically Locked Egress Doors</td>
<td>Electromagnetically Locked Egress Doors</td>
<td>§1010.1.9.9</td>
</tr>
<tr>
<td>Locking Arrangements in Correctional Facilities</td>
<td>Locking Arrangements in Correctional Facilities</td>
<td>§1010.1.9.10</td>
</tr>
<tr>
<td>Stairway Doors</td>
<td>Stairway Doors</td>
<td>§1010.1.9.11</td>
</tr>
</tbody>
</table>

Activation time of 3 seconds with 15 or 30 second delay

Allowances to lock doors from stairway side

Travel Distance for Groups F-1 and S-1
§1017.2.2

- 200’ – not sprinklered
- 250’ – sprinklered
- 400’ if:
  - Building is only 1 story
  - Sprinklered
  - ≥24’ from floor to underneath side of roof or ceiling above

LP-gas Dispensing
§2307.4

- Point of transfer
  - 25’ from wall <1-HR
  - 25’ from combustible eave
  - 25’ from property line
  - 25’ from centerline of RR
  - 10’ from public street, driveways, sidewalks
- Self-service fueling of vehicles is allowed
  - Special nozzle required
Class I Commodities §3203.2
- Class I commodities stored on plastic pallets are no longer classified as Class I
- NFPA 13 §5.6.2.2
  - 1 classification level increase for unreinforced PE or PP pallets
  - 2 classification level increase for reinforced PE or PP pallets
  - Listed plastic pallets are equivalent to wood pallets

Dead-end Aisles in High-piled Storage §3206.9.3
- Limitations for dead-end aisle lengths are now specifically addressed in high-piled storage areas
- Maximum length of dead-ends
  - Group S = 50'
  - Group M = 20'

Exception for Dead-end Aisles in High-piled Storage §3206.9.3, Exception
- If length of aisle < 2.5 time the wide, then not considered dead-end aisle
  - Dead-end aisle maximum 50'
  - Dead-end aisle maximum 20'
  - Length = 79'
  - Width = 98'
  - 2.5 x 98 = 245'
  - Length is less than 245'
  - Not a dead-end aisle
Cleaning Piping Systems with Flammable Gas §3306.2

- Significant gas explosions have occurred when cleaning/purging gas piping
  - 6/9/2009 – ConAgra Foods Slim Jim™ meat processing facility in Garner, NC: 4 workers killed and 67 others injured
  - 2/7/2010 – Kleen Energy power plant in Middletown, CT: 6 workers killed and 50 others injured

- Flammable gas shall not be used as the cleaning media
- Cleaning and purging of flammable gas piping systems must comply with NFPA 56
- Fuel gas piping in accordance with IFGC©
- Compressed gas piping in accordance with IFC Ch 53
- LP-gas piping in accordance with IFC Ch 61

MAQs Table 5003.1.1(1)

<table>
<thead>
<tr>
<th>MATERIAL CLASS</th>
<th>GROUP</th>
<th>MAXIMUM QUANTITIES</th>
<th>STORAGE</th>
<th>OPEN-CLOSED SYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solid</td>
<td>Liquid</td>
<td>Gas</td>
<td>Solid</td>
</tr>
<tr>
<td></td>
<td>pounds</td>
<td>gallons</td>
<td>(cubic feet)</td>
<td>pounds</td>
</tr>
<tr>
<td>Solid</td>
<td>1</td>
<td>5</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>Liquid</td>
<td>1</td>
<td>5</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>Gas</td>
<td>1</td>
<td>5</td>
<td>25</td>
<td>5</td>
</tr>
</tbody>
</table>

Footnote q requires an evaluation of the hazard
Footnote d is deleted which UR gases increased to correlate with NFPA 55
## MAQs
### Table 5003.1.1(1) – Footnotes

c. The quantities of alcoholic beverages in retail and wholesale sales occupancies shall not be limited providing the liquids are packaged in individual containers ≤ 1.3 gal. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs, or consumer or industrial products, and cosmetics containing ≤ 50% by volume of water-miscible liquids with the remainder of the solutions not being flammable shall not be limited, provided that such materials are packaged in individual containers ≤ 1.3 gallons.
e. MAQ shall be increased 100% when stored in approved storage cabinets, day boxes, gas cabinets, gas rooms, exhaust cabinets, or listed safety cans. Listed safety cans shall be in accordance with §5003.9.10. Where Note d also applies, the increase for both notes shall be applied accumulatively.
p. The following shall not be included in determining the maximum allowable quantities:

1. Vehicle fuel tanks on vehicles; motorized equipment; regulated by IFGC or IMC
2. Alcohol based hand rubs classified as Class I or II liquids in dispensers that are installed in accordance with §5705.5 and §5705.5.1. The location of the alcohol based hand rub (ABHR) dispensers shall be provided in the construction documents.

### CO₂ Systems in Beverage Dispensing

#### §5307

- Multiple small gaseous CO₂ cylinders are being replaced with single larger vessels which contain liquefied CO₂
- Accidental release can fill an enclosed space
  - Odorless and colorless gas
  - Heavier than air
- Systems >100 pounds (≈9.5 gallons) are regulated

#### Operational permit required >100 pounds

- Protection required
  - Protection from damage
  - Continuous gas detection system, or
  - Monitor levels of CO₂

- External systems:
  - 1 cfm/square foot
  - Intake within 12” of floor
  - Room operates at negative pressure
Hydrogen Fuel Gas Rooms
§5808

H2 gas detectors at high points in the room
Ventilation outlets – in roof/ceiling, or high in exterior wall
Supply air inlets – low in exterior walls

Mechanical ventilation system:
- Maintains a negative pressure compared to adjacent rooms
- Minimum ventilation rate of 1 cfm/12 ft³ of room volume
- Failure of ventilation system results in shutdown of H2 fueling operation

Audible/visual device connected to gas detection system:
- Activates when 25% LFL of H2 gas is detected
- Alarm inside and outside hydrogen fuel gas room

Fire-resistance-rating of walls and ceiling:
- Comply with IBC Table 509.1, and
- 1-HR minimum

No Smoking signs
Supply air inlets – low in exterior walls

Fire-Flow Appendix B

Revision of fire-flow tables

Table B105.2
Required fire-flow for Buildings Other Than 1- and 2-family Dwellings, Group R-3 and R-4 Buildings and Townhouses

<table>
<thead>
<tr>
<th>AUTOMATIC SPRINKLER SYSTEM</th>
<th>MINIMUM FIRE FLOW (gallons per minute)</th>
<th>FLOW DURATION (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No automatic sprinkler system</td>
<td>Value in Table B105.1(2)</td>
<td>Duration in Table B105.1(2)</td>
</tr>
<tr>
<td>Section 903.3.1.1</td>
<td>25% of the value in Table B105.1(2)</td>
<td>Duration in Table B105.1(2) at reduced flow rate</td>
</tr>
<tr>
<td>Section 903.3.1.2</td>
<td>25% of the value in Table B105.1(2)</td>
<td>Duration in Table B105.1(2) at reduced flow rate</td>
</tr>
</tbody>
</table>

- Required water supply for sprinklered buildings shall meet:
  - Sprinkler demand with hose
    - 300 GPM @ 50 PSI
  - Required fire-flow
    - 1,500 GPM @ 20 PSI

Fire-Flow Appendix B

Water Supply Curve
**Existing Ambulatory Care Facilities**

Appendix K

- When ≥4 patients, separated from remainder of building with 1-HR fire partitions
- When >10,000 ft² must be separated into 2 smoke compartments
- Sprinklers in IIB, IIIB or VB construction with:
  - ≥4 patients incapable of self-preservation, OR
  - 1 patient incapable of self-preservation on floor other than LED
- Smoke detection system
  - Detectors can be eliminated if building is sprinklered

**Fire-fighter Air Replenishment Systems**

Appendix L

- Appendix L does not require a FF Air Replenishment System, but it provides design criteria when FARS is installed
- SCBA bottle refilling stations
  - 5th floor above or below grade
  - Every 3rd floor thereafter
- Refilling stations consist of either:
  - Bottle refill with secondary containment
  - RIC/UAC quick fill connections

Source of air

- On-site air storage system
- External mobile air connection

Quality of air

- NFPA 1989
- Constantly monitored
- Air sample tested
Sprinklers in Existing High-rise Buildings
Appendix M

- Automatic sprinkler system is required in existing high-rise buildings
  - High-rise is a building with an occupied floor level >75' above LLFDVA
  - Exceptions for:
    - Airport traffic control towers
    - Open parking garages
    - Group U
    - Group F-2


Sprinklers in Existing High-rise Buildings
Appendix M

- Automatic sprinkler system must meet current requirements
  - 2015 IFC
  - 2013 NFPA 13

- Compliance schedule
  - Develop schedule within 365 days
    - Design
    - Plan review & permit
  - Installation completed within 12 years

Thank you for participating

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