Construction Safety Week 2011

Safety Design in High-Rise Construction

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April 26, 2011 – 280 Broadway, 6th Floor Training Room

NYC Buildings

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Best Practices

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

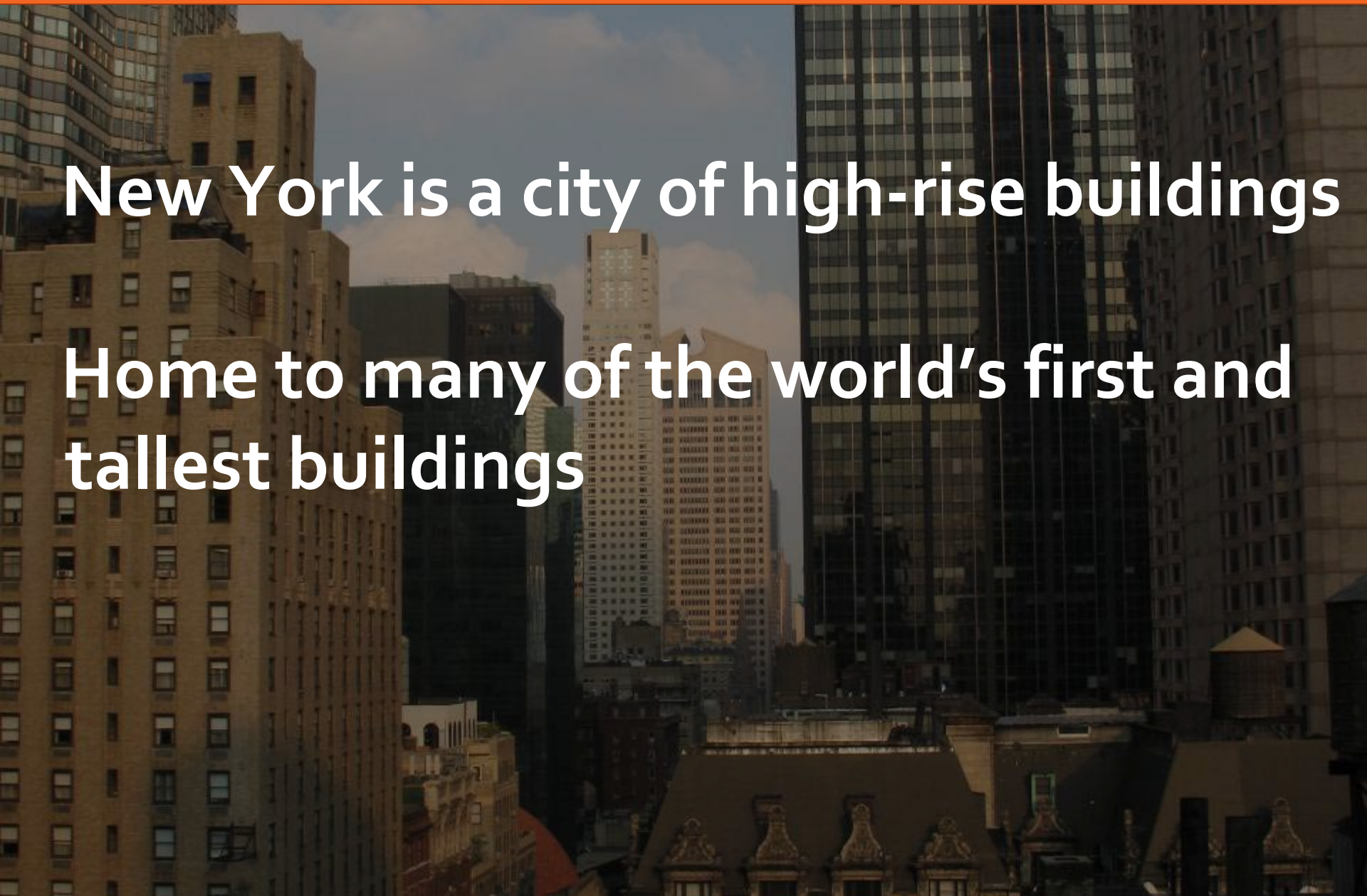
Course Objectives

- Participants will be able to learn fire protection requirements for high rise buildings
- Participants will be able to assess special requirements for egress in high rise buildings
- Participants will be able to navigate the code with respect to special use and occupancies
- Participants will understand recently enacted local laws that affect safety during high rise construction of high rise buildings

Today's Agenda

- Participants will be able to understand the special fire protection systems required for high-rise buildings
- Participants will be able to identify the egress provisions of the code for high-rise buildings
- Participants will be able to apply the structural integrity provisions for high-rise buildings based upon occupancy and seismic importance
- Participants will be able understand the changes to the International Codes for high-rise buildings and the relationship between the New York City code and the International Code

New York City



New York is a city of high-rise buildings

Home to many of the world's first and tallest buildings

International Code Council

- NYC has adopted the International Code Council body of construction codes
- NYC is an active participant in the code development process

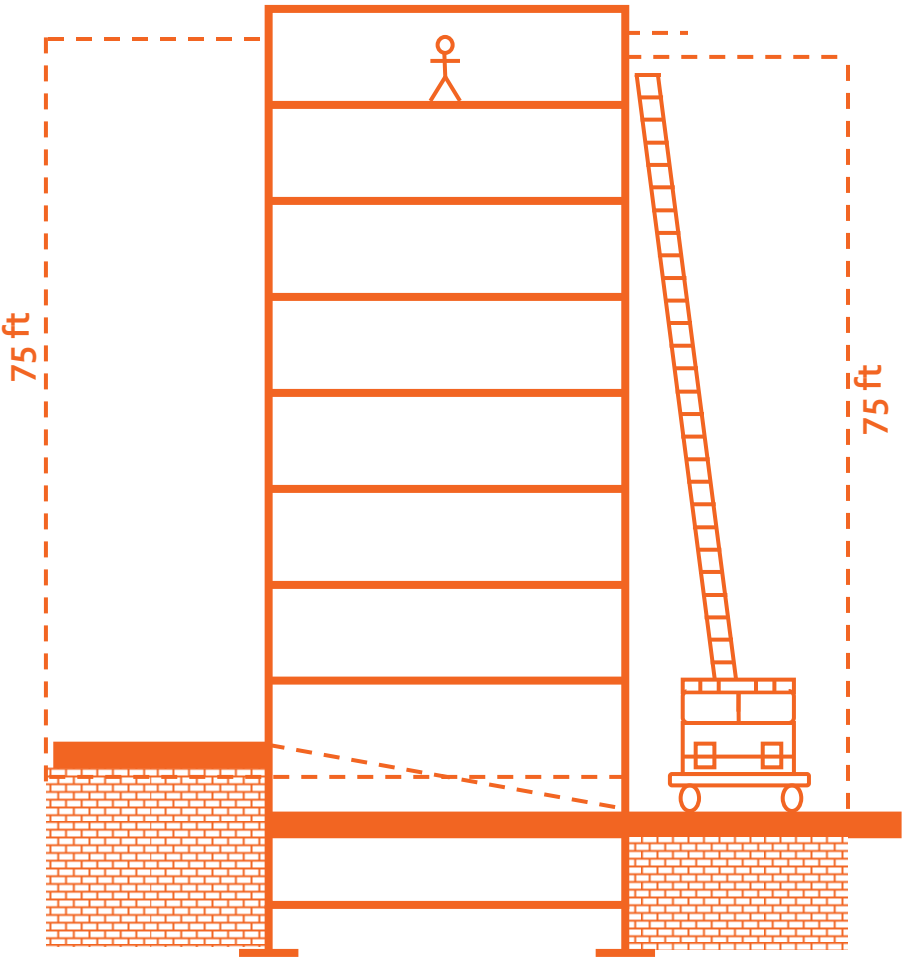
High-Rise Buildings

Specifically addressed in section BC 403

- Defined as having occupied floors located more than 75 feet above the lowest level of fire department vehicle access

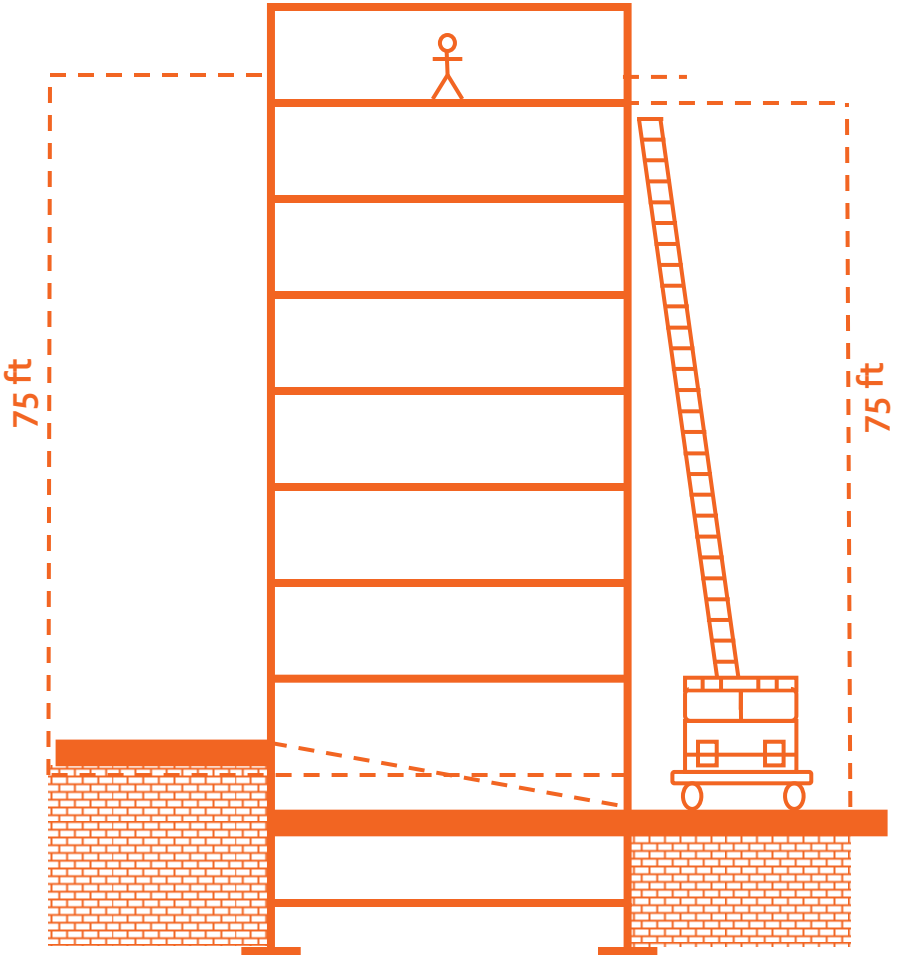
High-Rise Buildings

Average Curb Elevation



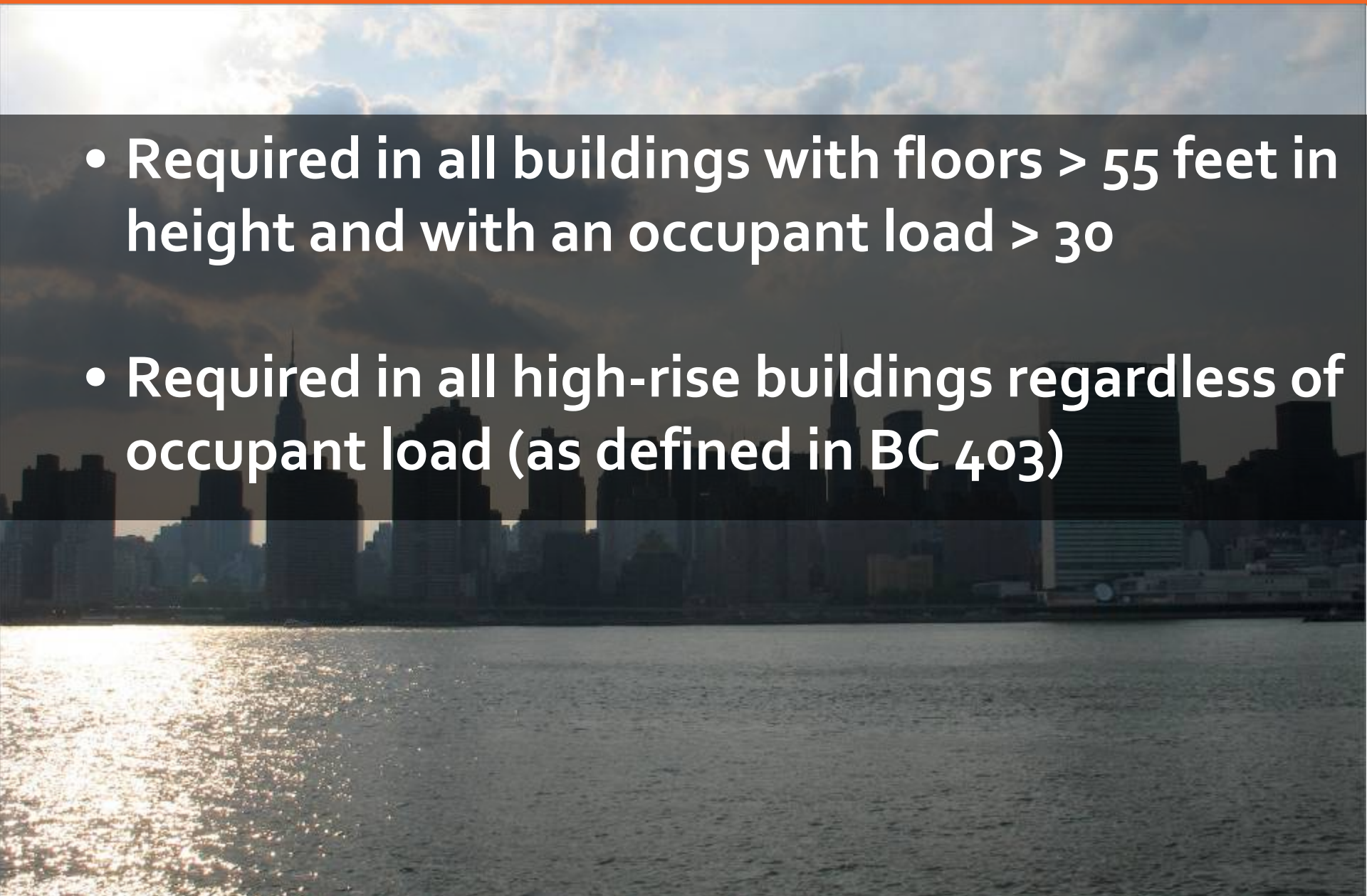
1968 Code: ✓
2008 Code: X

Lowest Level of FD Vehicle Access



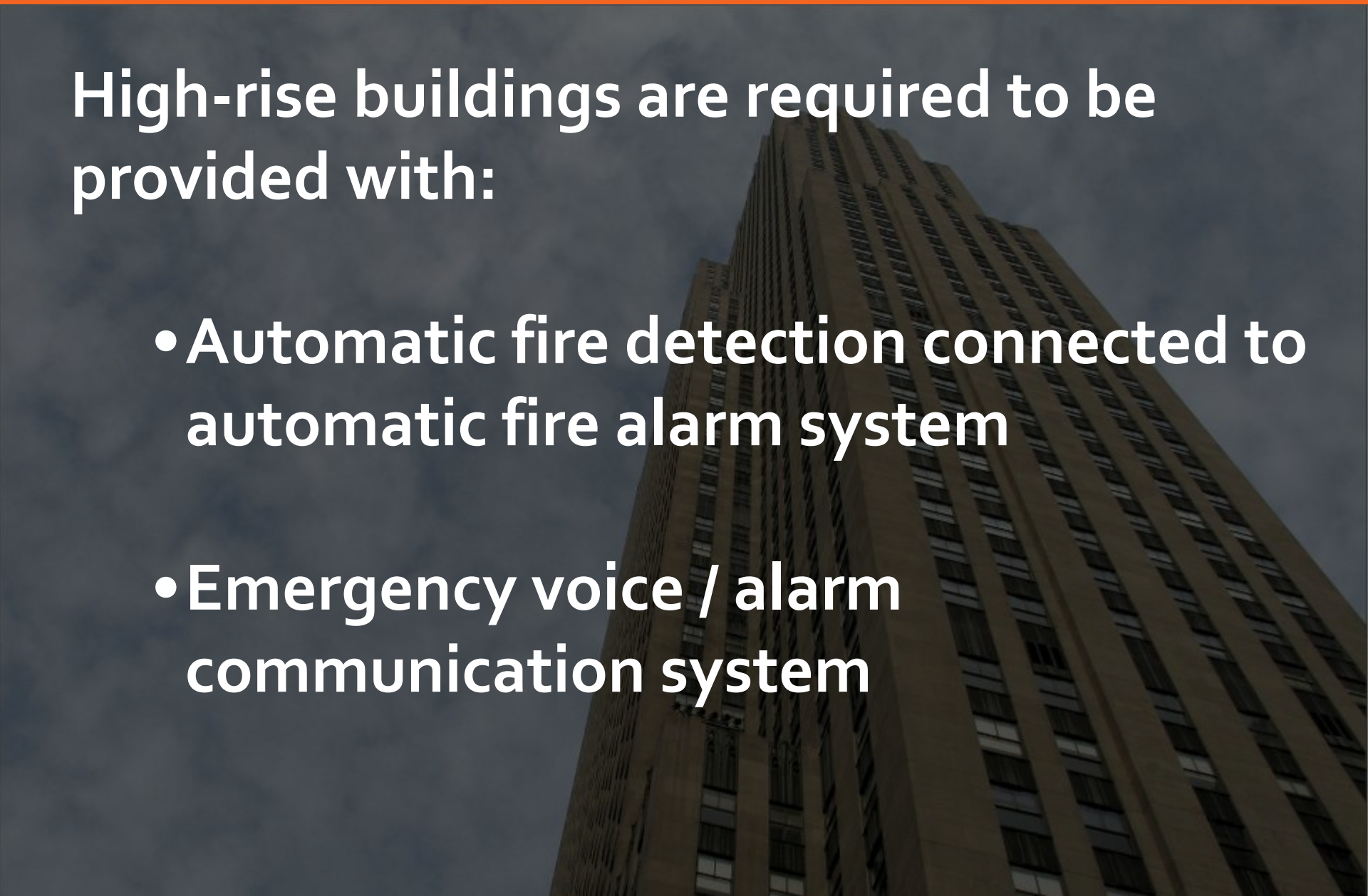
1968 Code: ✓
2008 Code: ✓

Automatic Sprinkler Systems



- Required in all buildings with floors > 55 feet in height and with an occupant load > 30
- Required in all high-rise buildings regardless of occupant load (as defined in BC 403)

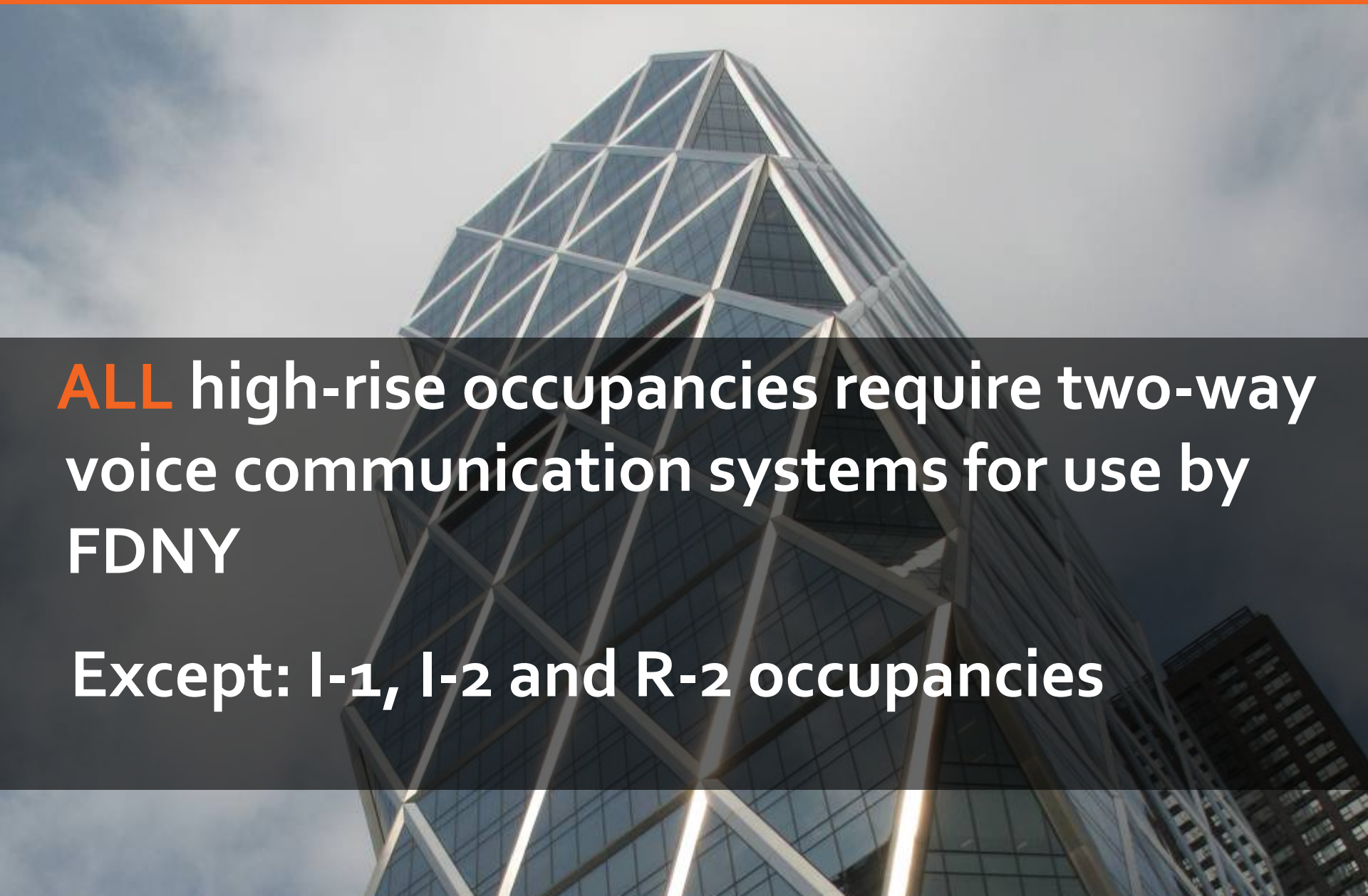
Fire Detection & Fire Alarms



High-rise buildings are required to be provided with:

- Automatic fire detection connected to automatic fire alarm system
- Emergency voice / alarm communication system

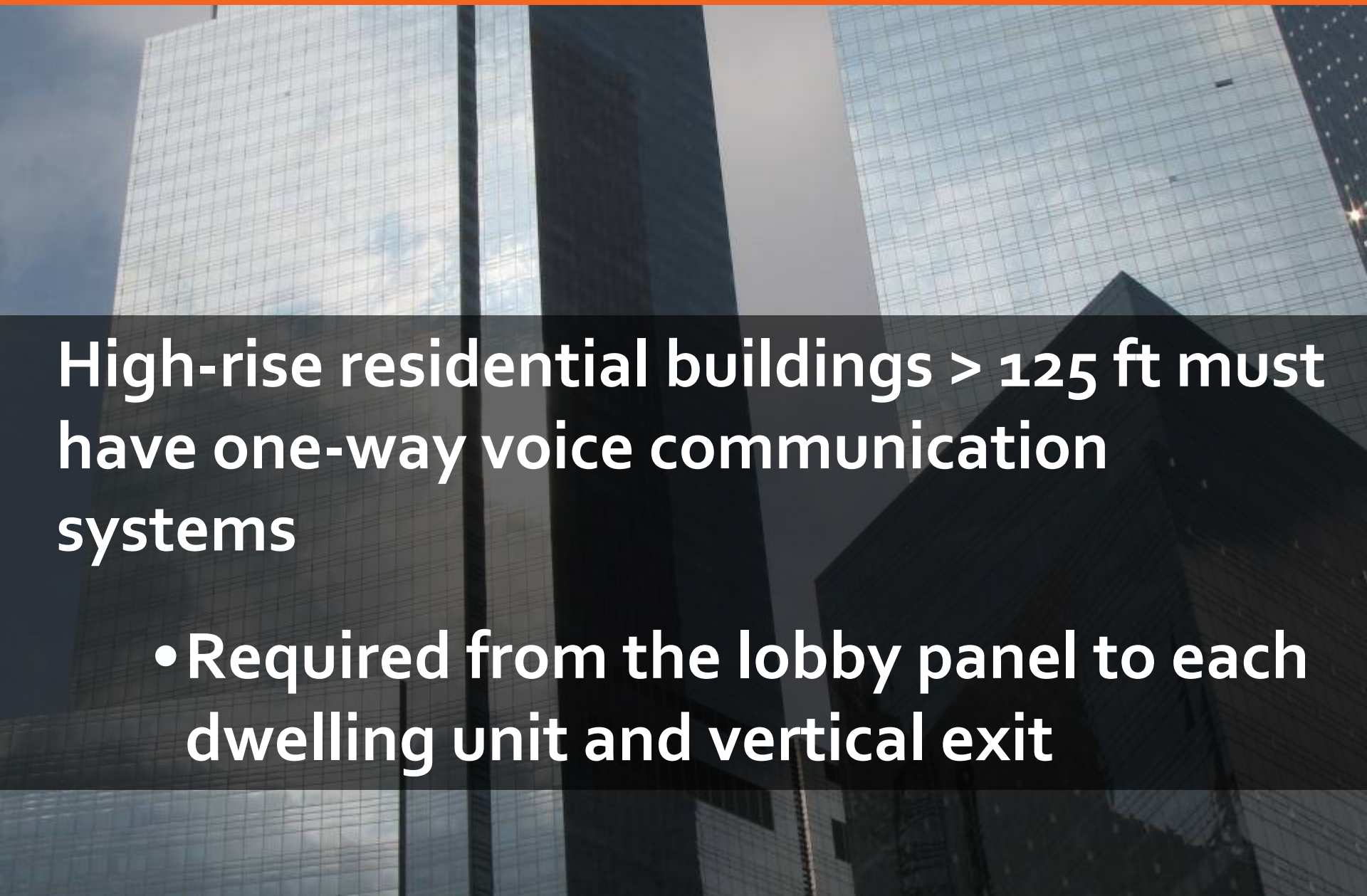
Voice Communication Systems



ALL high-rise occupancies require two-way voice communication systems for use by FDNY

Except: I-1, I-2 and R-2 occupancies

Voice Communication Systems



High-rise residential buildings > 125 ft must have one-way voice communication systems

- Required from the lobby panel to each dwelling unit and vertical exit

Fire Command Center

Required in ALL high-rise occupancies in the lobby on the entrance floor for Fire Department operations

Emergency Power Systems

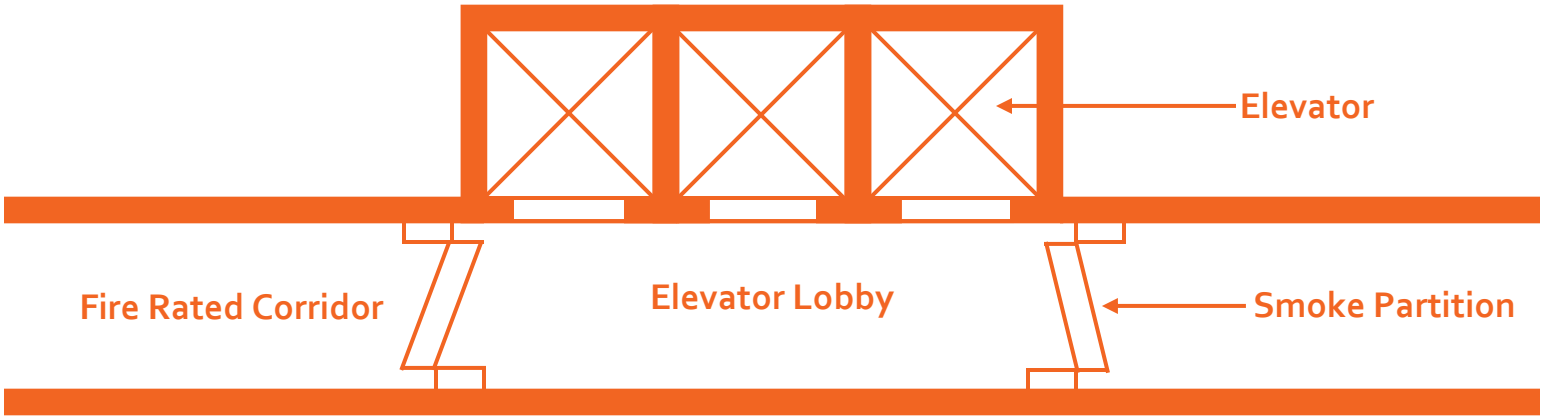
Required in high-rise buildings and residential buildings > 125 feet to provide back-up power for emergency systems

Elevator Lobbies

- When elevators open onto a fire-resistance-rated corridor

OR

- When elevators serve a Group B occupancy with four or more stories



Impact Resistant Stairs/Elevators

Stair and elevator enclosures in high-rise buildings must be constructed of impact-resistant walls

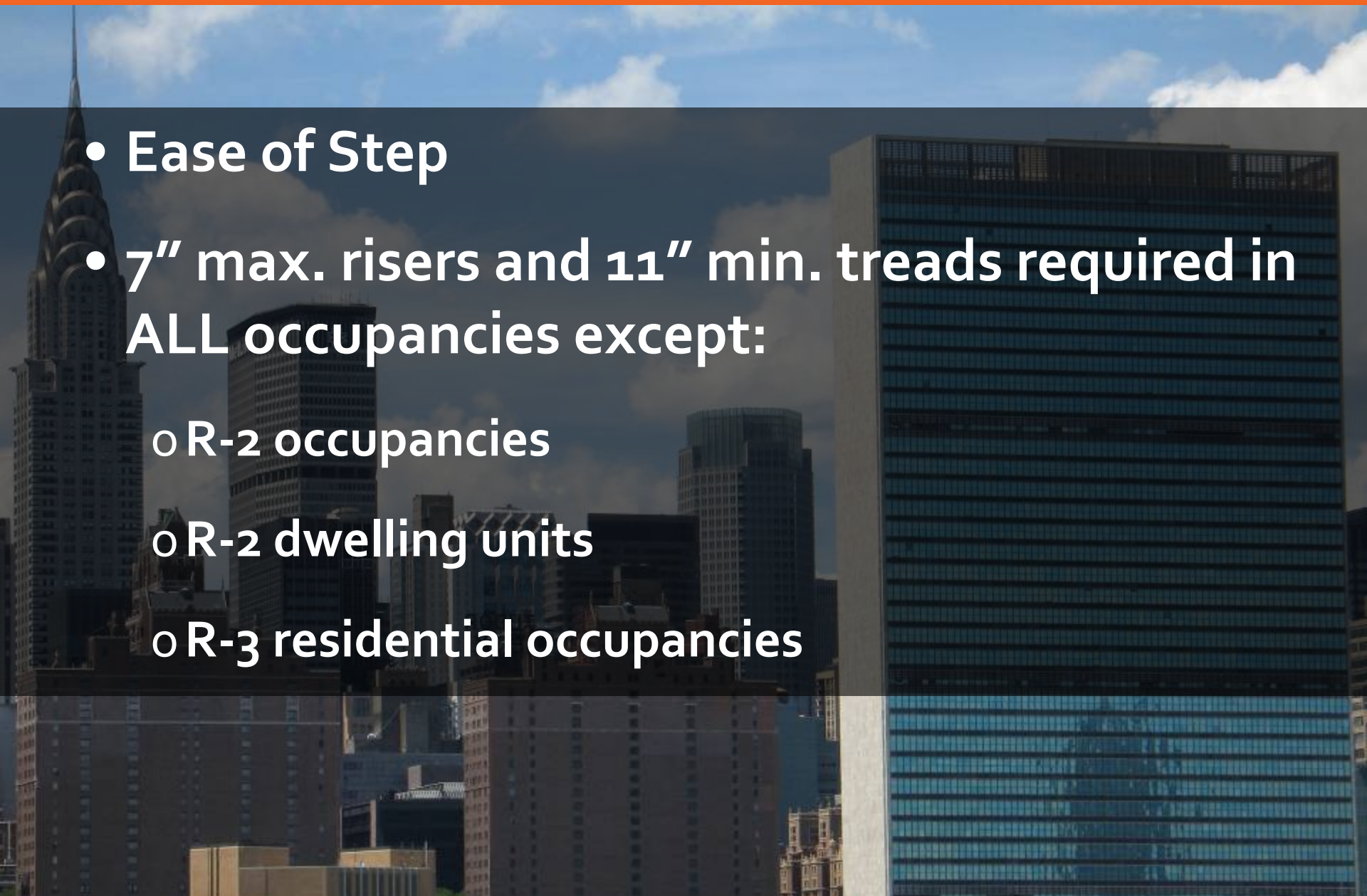
Stair Design

Wider Stairway Width

44" min. stairway width required in ALL occupancies except :

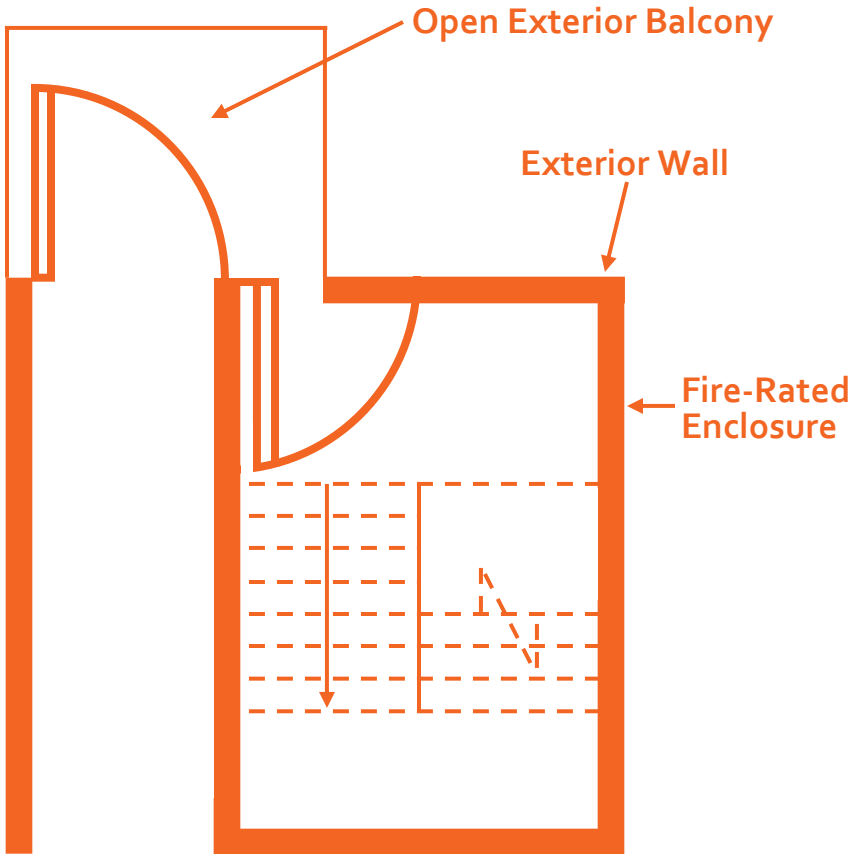
- Stairways that handle 50 persons cumulative for all stories
- R-2 occupancies not more than 125' high and each stairway serves < 30 occupants per floor

Stair Design

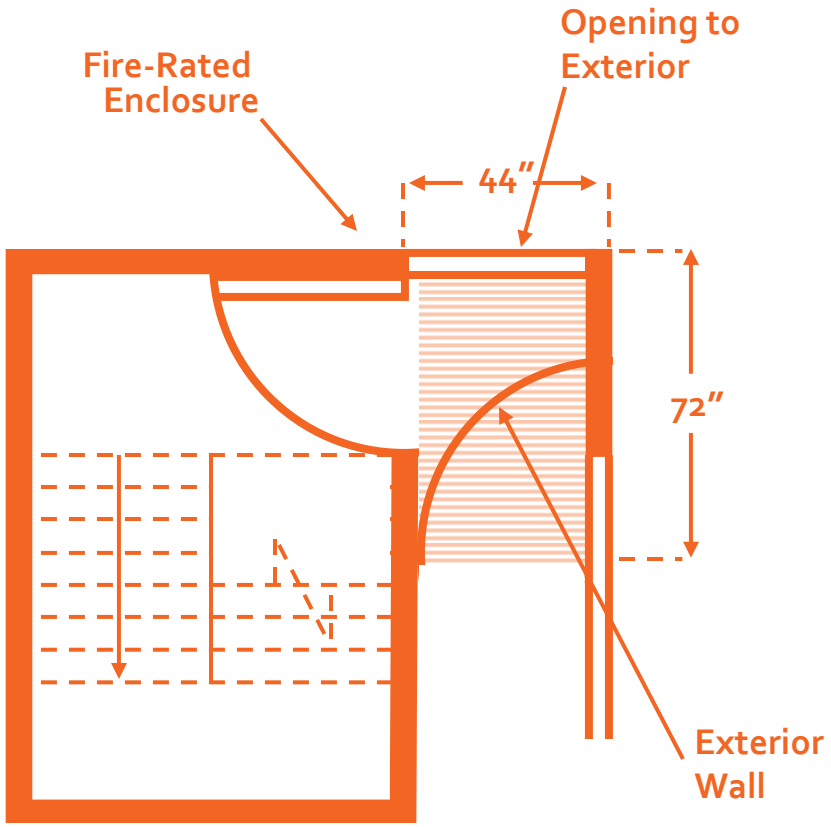


- Ease of Step
- 7" max. risers and 11" min. treads required in ALL occupancies except:
  - R-2 occupancies
  - R-2 dwelling units
  - R-3 residential occupancies

Smoke-Proof Enclosures



Open Exterior Balcony



Naturally Ventilated Vestibule

Post-Fire Smoke Purge Systems

- Required in all high-rise buildings and other buildings listed in section BC 912
- Intended for the timely restoration of operations and overhaul activities once a fire is extinguished

Elevators as Means of Egress

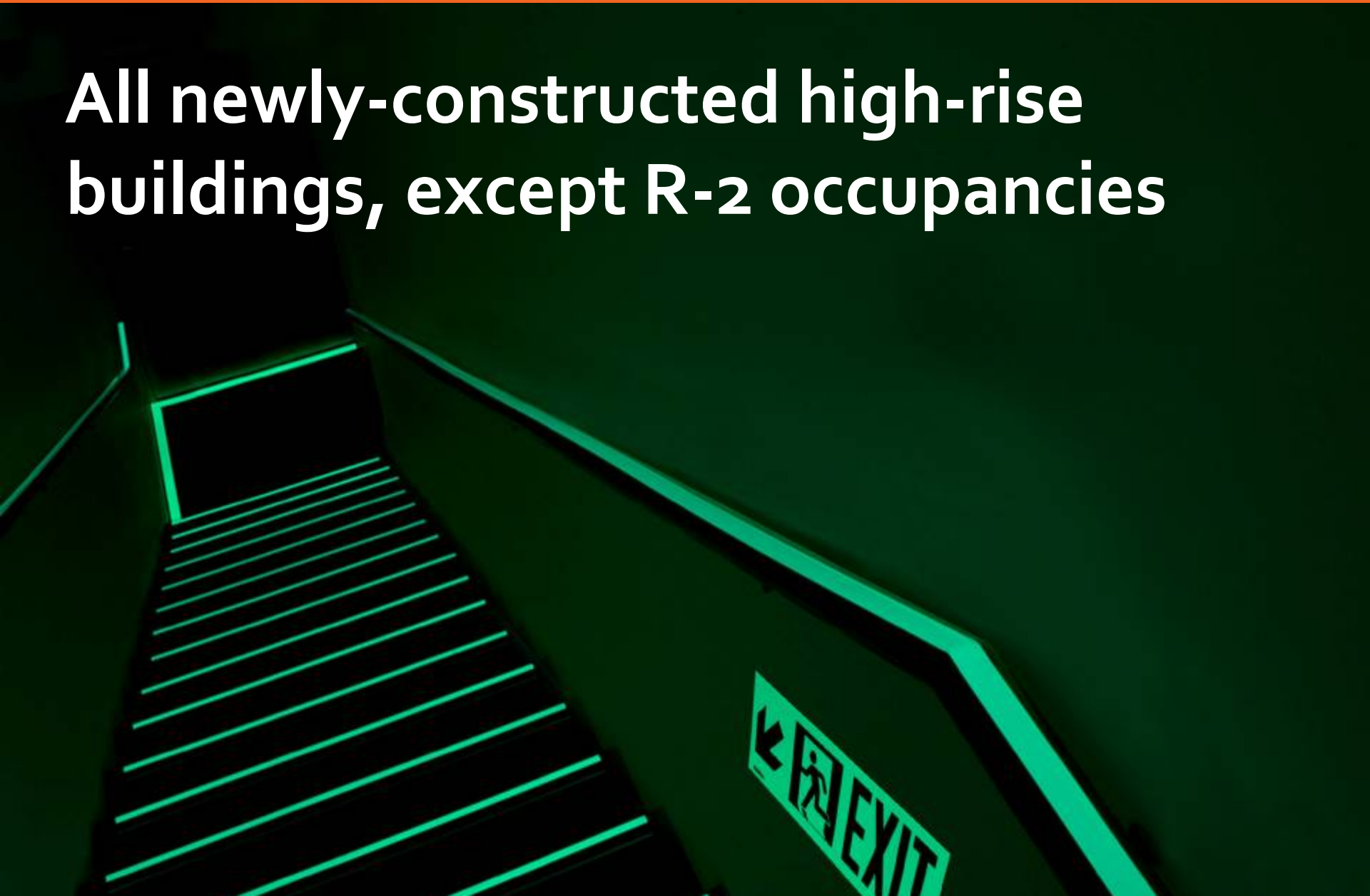
May be used as a component of accessible means of egress, except in:

1. Residential buildings > 125 feet in height

1. In other occupancies where the occupied floor is > 75’ above the lowest level of fire department access

Photoluminescent Requirements

All newly-constructed high-rise buildings, except R-2 occupancies



Super High-Rise Buildings

Buildings taller than 300 feet:

- Redundant automatic and gravity fed water supplies
- Larger tank sizes for on-site storage of water for fire fighting purposes
- Dedicated express Siamese riser
- Zoned system

On-site secondary water supply required at buildings taller than 300 feet and in Seismic Design Category C or D

Structural Design

- Proposed Structural Integrity Provisions
- Applicable to all buildings
  - Vehicular Impact Design Load requirement, Section 1625.5
  - High-pressure Gas explosion Design Load requirement, Section 1625.6
  - Continuity and Ties requirements – Requiring additional strength and detailing of members and their connections
    - Steel Construction –Section 2213
      - » Structural Steel Members
      - » Composite Concrete Slabs on Metal Deck
    - Concrete Construction –Section 1917
      - » Cast-In-Place Concrete
      - » Precast Concrete
    - Masonry Construction – Section 2114
      - » Bearing walls
      - » Piers & Columns

Structural Design

Structural Integrity – Key Element Analysis

- Key Element Analysis – Section 1626
- Two Options:
  - Alternate Load Path Method – Design to prevent a disproportionate collapse assuming a "Key Element" will fail due to an extreme event
  - Specific Local Resistance Method - Design key elements for code prescribed loads

Structural Design (cont)

Key Element Analysis required for:

- Buildings more than 600 feet (183 m) tall or more than 1,000,000 square feet (92 903 m^2)
- Essential Facilities larger than 50,000 square feet (4645 m^2)
- Building with an Aspect Ratio greater than 7
- Buildings taller than 7 stories where one structural member supports more than 15% of the aggregate building area
- Buildings designed using non-linear time history analysis or utilizing special seismic energy dissipation systems (Base Isolation or Dampers)

Structural Peer Review by a qualified independent structural engineer also required – Section 1627

Building Under Construction

- Standpipe Air Pressurized Alarms
  Local Law 64 of 2009
- Air pressurized alarms on standpipe systems at:
  - New buildings 75 feet+
  - Full Demolitions
- Required:
  - Drawings of alarm system
  - Alteration 2 Standpipe Application & Permit
- Testing

Buildings Under Construction

- Standpipe Hydrostatic Pressure Testing
  Local Law 63 of 2009
- Hydrostatic pressure tests must be performed on standpipes at:
  - New buildings 75 feet+
  - Full Demolitions
  - Certain alteration work
- Required:
  - Alteration 2 Standpipe Application & Permit
- Testing

Where Do We Go from Here?

What's Happening Outside NYC?

Changes to the ICC

- ICC now requires impact resistant stair and elevator enclosures
- ICC now requires photoluminescent exit path markings
- Fire service elevator and occupant evacuation elevators

What's Happening Outside NYC?

Changes to the ICC

Buildings taller than 420 feet:

- Two sprinkler risers serving each sprinkler zone
- Three exit stairs
  - Exception for R-2 (residential) buildings
  - Exception for buildings with occupant evacuation elevator

Questions?

This concludes the American Institute of Architects Continuing Education Systems Course

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