DEPARTMENT OF MUNICIPAL AFFAIRS

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ABU DHABI CITY MUNICIPALITY

Fire Safety in the New Abu Dhabi International Building Code

Presenter: Fatma M. Amer, P.E.

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

Learning Objectives

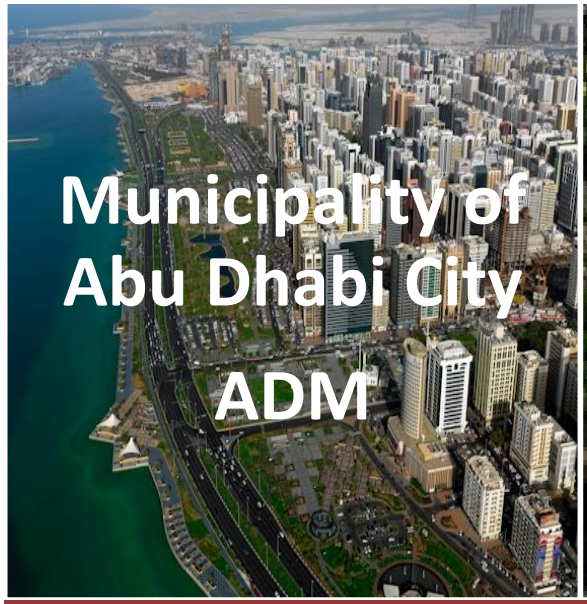
This seminar will focus on Safety provisions of the New Abu Dhabi International Building Code. Participants will learn how to:

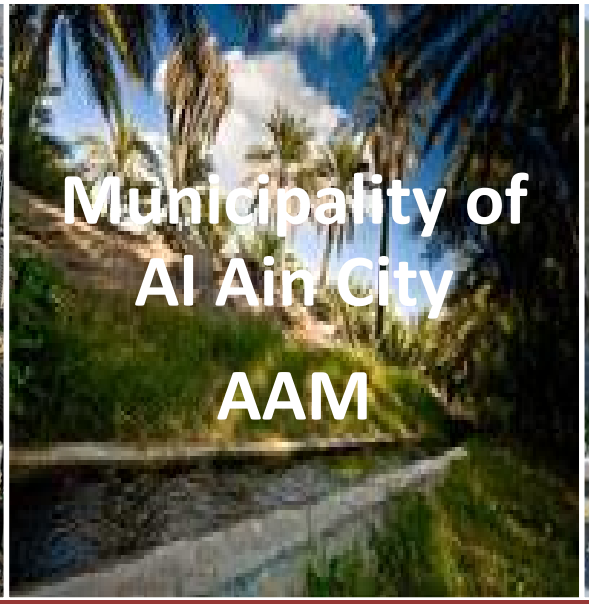
- *Identify the occupancy classification of a building or space thereof.*
- *Identify fire risks and ways to mitigate it through the choice of type of construction and fire safety systems.*
- *Identify height and area limitations of a building based on Occupancy and construction classifications.*
- *Choose the proper construction classification of a building based on the height and area proposed.*
- *Learn different passive fire safety elements in the building as a first line of defense in fire emergencies.*
- *Identify required active fire suppression systems*
- *Identify the different means of egress elements and required exits from each space, each floor and the building*

The Municipal System of the Abu Dhabi Emirate

Department of Municipal Affairs

DMA



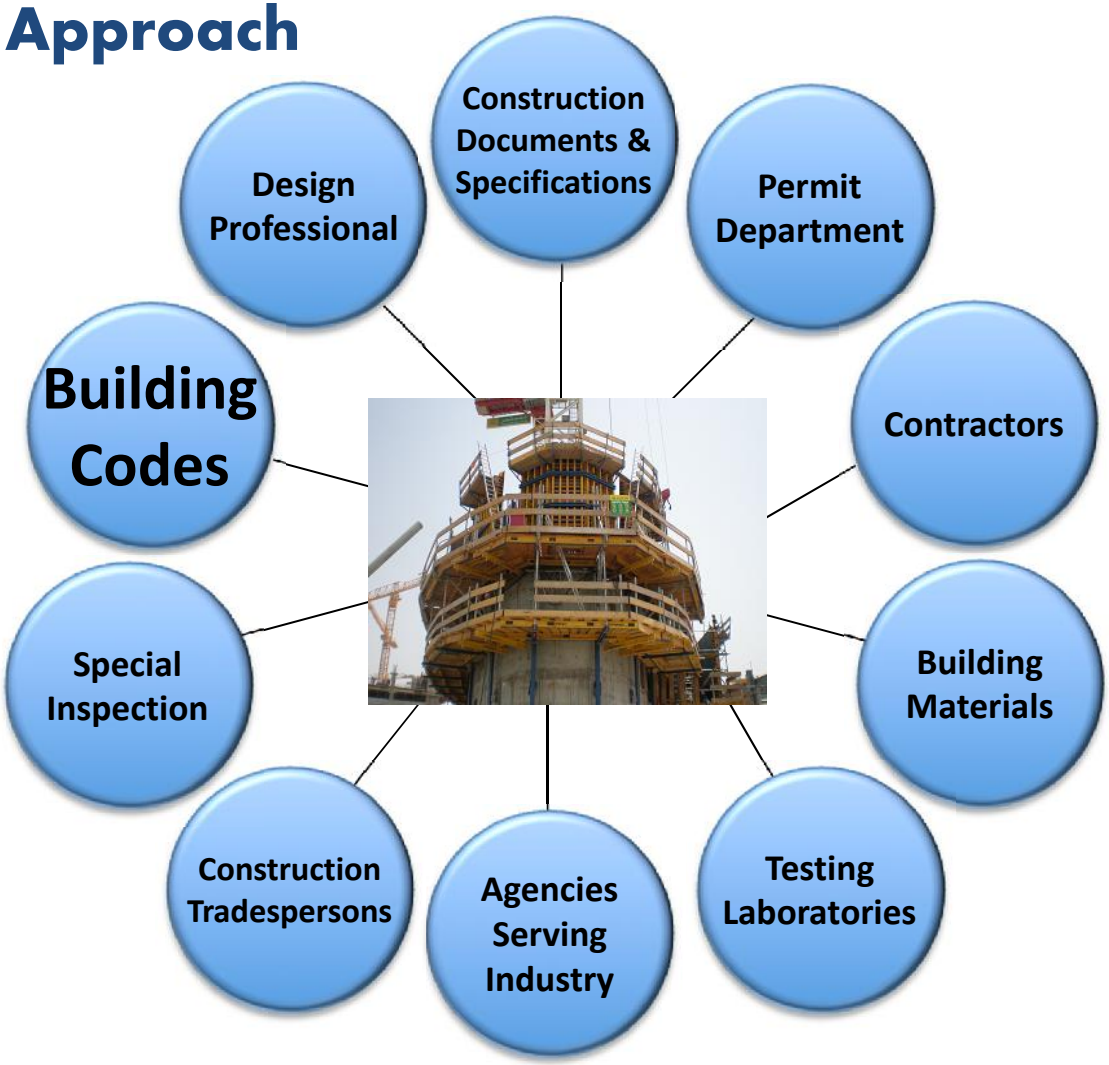


The Case for a New Building Code

Are current codes adequate?

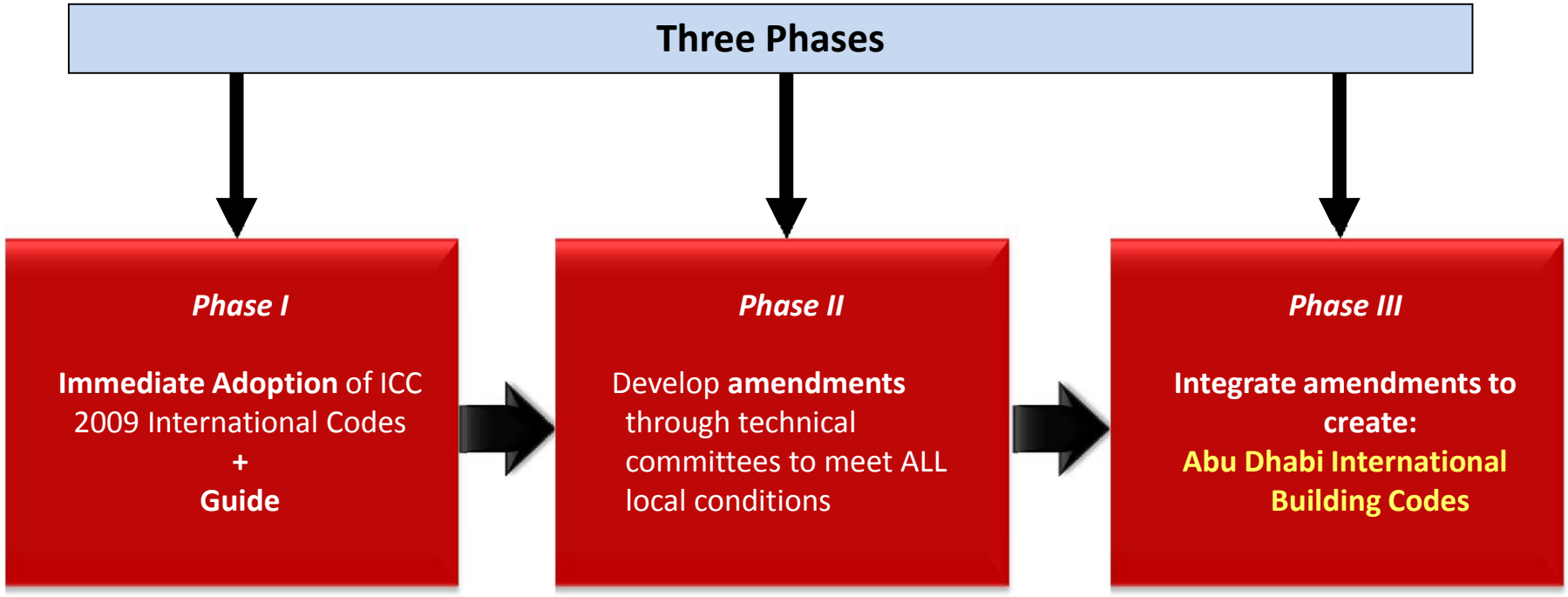
How can we Improve Construction Practices in Abu Dhabi?

Holistic Approach



The Abu Dhabi Building Code Program

Development Process



The Abu Dhabi Building Code Development Methodology

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Customize

Abu Dhabi International Building Codes

BUILDING CODE REGULATES:

Use and Occupancy

Chapter 3

Use and Occupancy Classification

Occupancy	Section	Occupancy Sub-Groups
A = Assembly	303	A-1, A-2, A-3, A-4 and A-5
B = Business	304	B
E = Educational	305	E
F = Factory and Industrial	306	F-1 and F-2
H = High hazard	307	H-1, H-2, H-3, H-4 and h-5
I = Institutional	308	I-1, I-2, I-3 and I-4
M = Mercantile	309	M
R = Residential	310	R-1, R-2 and R-3
S = Storage	311	S-1 and S-2
U = Utility and Miscellaneous	312	U

Use and Occupancy:

Examples:

- **Hotels: R-1**
- **Apartment Buildings: R-2**
- **Villas: R-3**
- **Schools to Grade 12: E**
- **Colleges and Universities: B**
- **Theaters: A-1**
- **Restaurants: A-2**
- **Office Buildings: B**
- **Hospitals: I-2**

Building Code Regulates:

Height and Area Limitations

Chapter 5

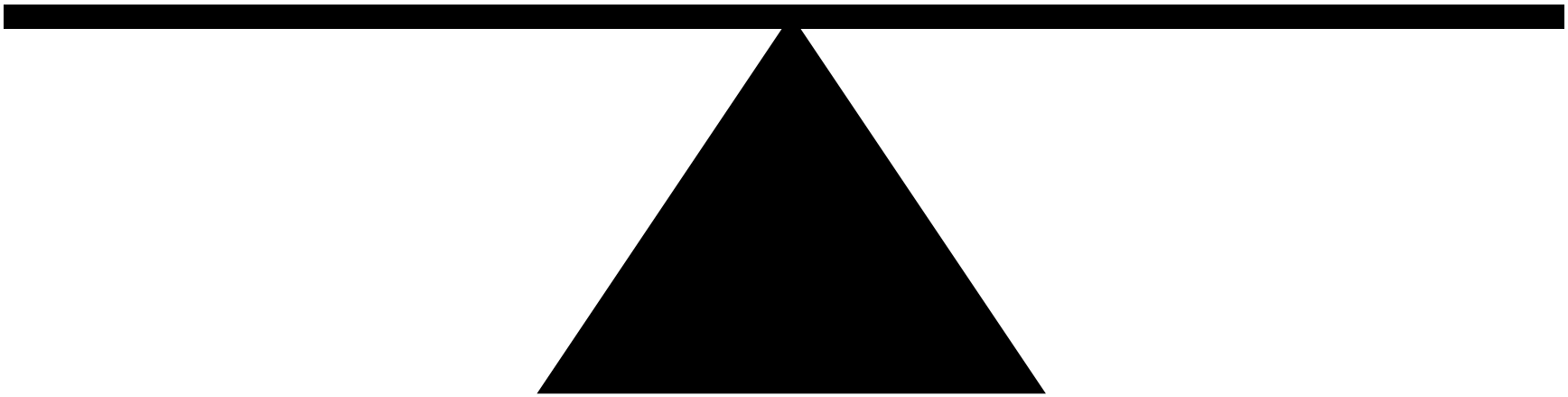
Height and Area Limitations

RISKS

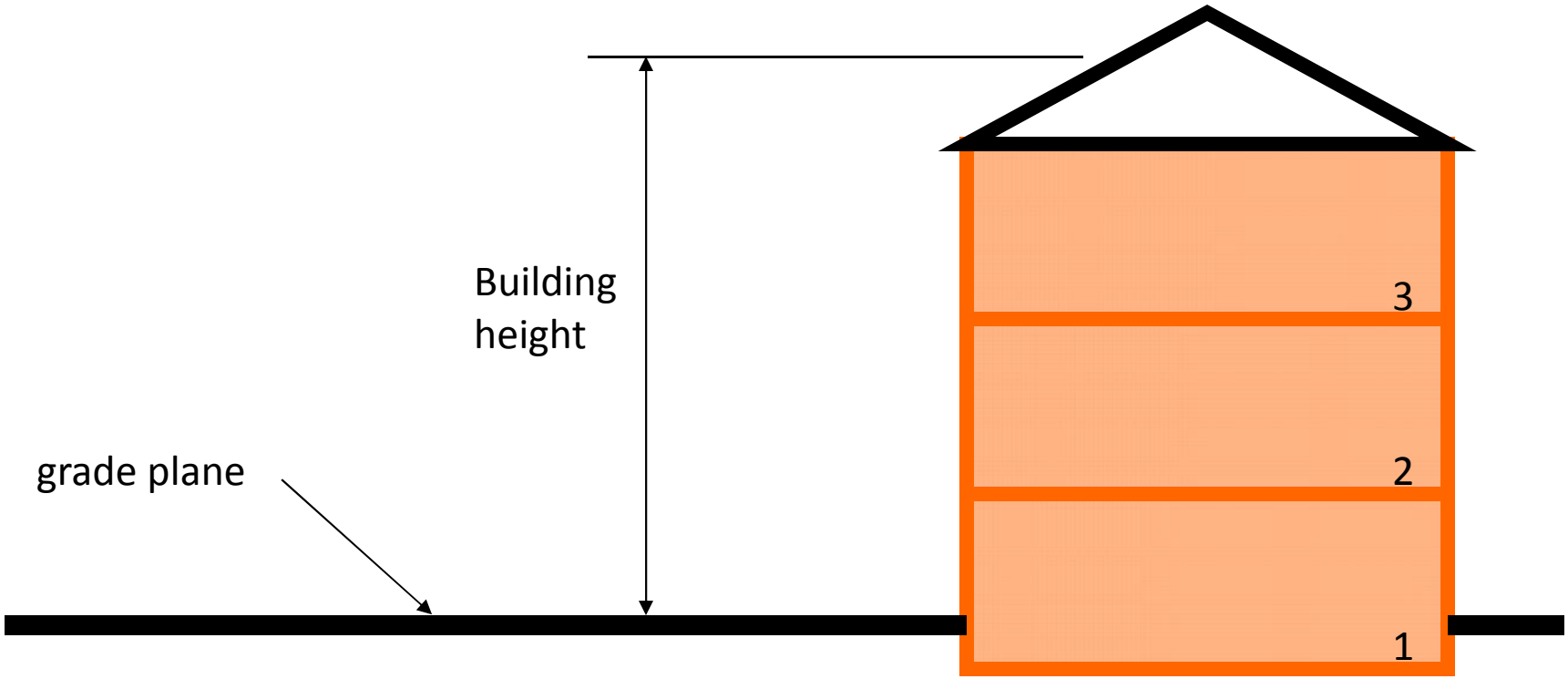
- Occupancy Group
- Height
- Area
- No. of stories

SAFETY

- Construction Type
- Open Space
- Sprinkler Protection



Height, Area, and Number of Stories



A 3-story building

= total allowable area of the building

Height and Area Limitations

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS[a]
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building," per floor.

		TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
GROUP	Hgt(feet) Hgt(S)	UL	160[e]	65	55	65	55	65	50	40
A-1	S A	UL UL	UL UL	6 17,500	3 10,500	6 14,700	3 5,600	6 15,000	3 8,400	2 5,500
A-2	S A	UL UL	UL UL	6 17,500	3 9,500	6 14,000	3 5,600	6 15,000	3 8,400	2 5,500
A-3	S A	UL UL	UL UL	6 17,500	3 9,500	6 14,000	3 5,600	6 15,000	3 8,400	2 5,500
A-4	S A	UL UL	UL UL	6 17,500	3 9,500	6 14,000	3 5,600	6 15,000	3 8,400	2 5,500
A-5	S A	UL UL	UL UL	UL UL	UL UL	UL UL	UL UL	6 UL	UL UL	UL UL
B	S A	UL UL	UL UL	6 37,500	3 10,500	6 28,000	3 5,600	6 36,000	3 8,400	2 5,500
E	S A	UL UL	UL UL	4 26,000	3 10,500	4 23,000	3 5,600	6 25,500	3 8,400	2 5,500
F-1	S A	UL UL	UL UL	5 12,500	3 7,500	5 7,500	2 3,000	5 10,000	3 3,000	2 1,000
F-2	S A	UL UL	UL UL	6 37,500	3 10,500	6 28,000	3 5,600	6 30,000	3 8,400	2 5,500

Chapter 5, Modifying Tabular Area

Section 506 Area Modifications

Equation 5-1:

$$A_a = \left\{ A_t + \left[A_t \times I_f \right] + \left[A_t \times I_s \right] \right\}$$

Allowable Area (SF) Per Story = **Tabular Area per Table 503** + **Area increase through Frontage (Section 506.2)** + **Area increase through Sprinkler Protection (Section 506.3)**

A_a= Allowable area per story (SF)

A_t= Tabular area per story in accordance with Table 503 (SF)

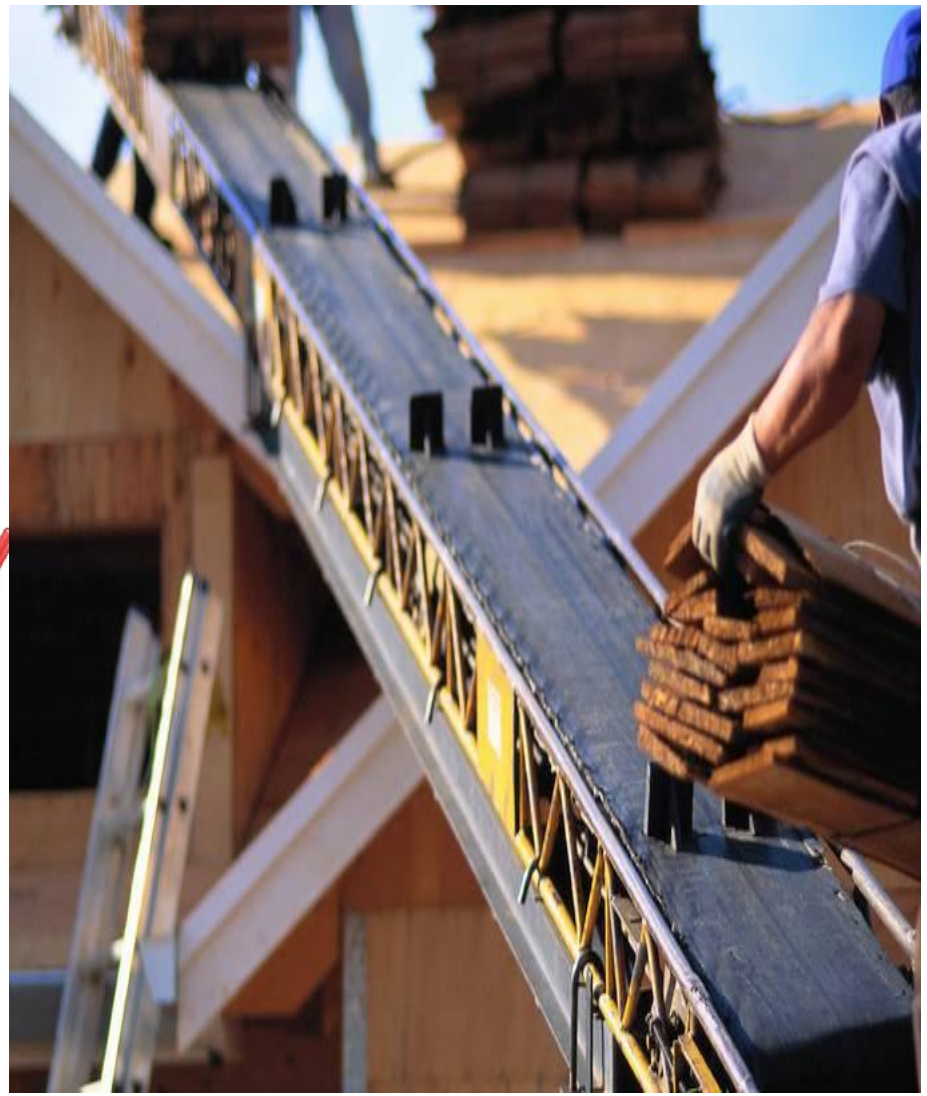
I_f= Area increase factor due to frontage as calculated in accordance with Section 506.2

I_s= Area increase factor due to sprinkler protection as calculated in accordance with Section 506.3

BUILDING CODE REGULATES:

Type of Construction based on Occupancy and Associated Hazard

Chapter 6



Concepts:

- **NONCOMBUSTIBLE MATERIALS (Construction Types I and II)**
- Materials required to be noncombustible shall be tested in accordance with ASTM E136

- **COMBUSTIBLE MATERIALS (Construction Types III, IV, and V)**
- Those that are permitted by the code but do not comply with ASTM E136

- **FIRE-RESISTANCE RATING**
- The period of time a building element, component or assembly maintains the ability to withstand fire exposure, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests, prescribed by Code.

- **FIRE SEPARATION DISTANCE.** The distance measured from the building face to the closest interior tax lot line, to the centerline of a street or other public space, or to an imaginary line between two buildings on the same tax lot. The distance shall be measured at right angles from the face of the wall.

Types of Construction

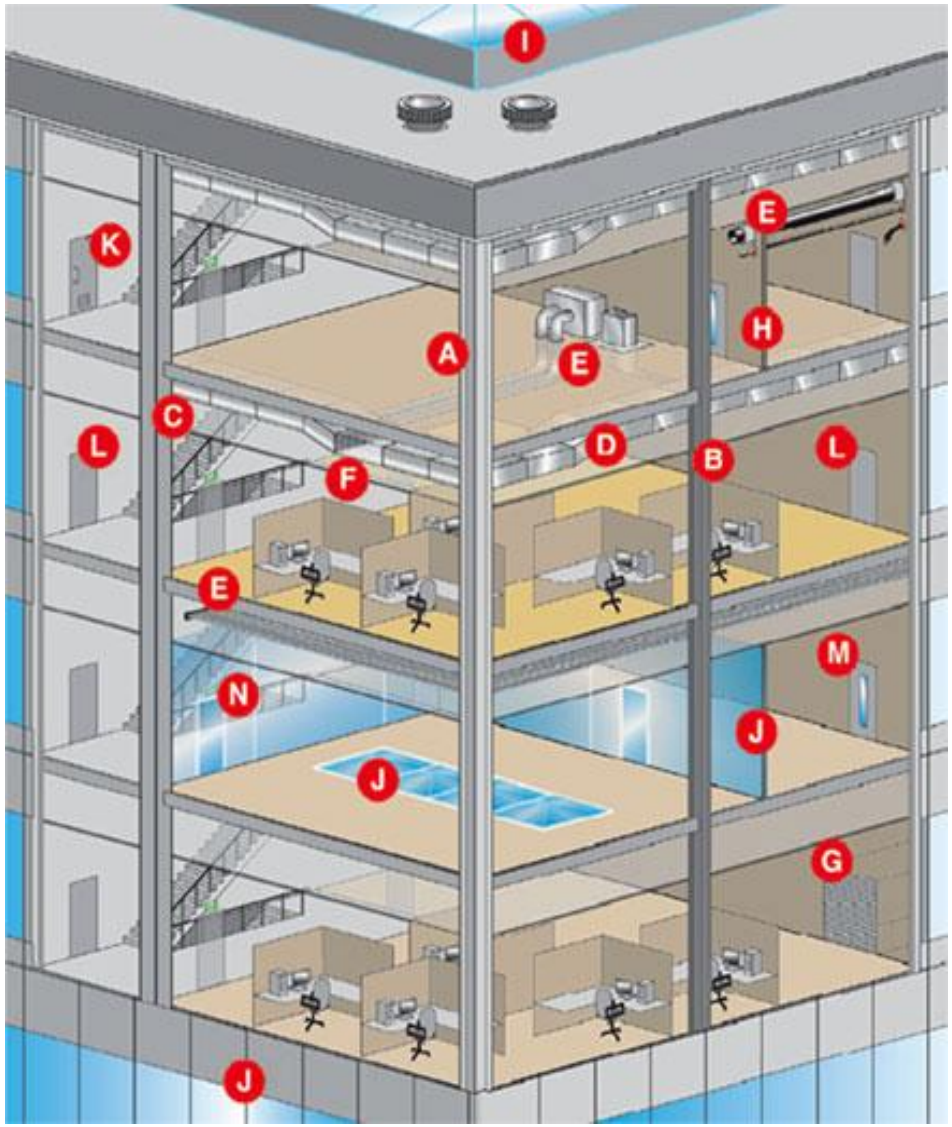
Buildings must be classified in 1 of 9 construction types

	Classification	Subclassification	Description of building elements
noncombustible	TYPE I	TYPE IA	Noncombustible building elements
		TYPE IB	
	TYPE II	TYPE IIA	
		TYPE IIB	
combustible	TYPE III	TYPE IIIA	Noncombustible exterior walls Combustible or noncombustible interior elements
		TYPE IIIB	
	TYPE IV	TYPE IV	Noncombustible exterior walls Heavy timber interior elements
	TYPE V	TYPE VA	Combustible building elements permitted by the code
		TYPE VB	

BUILDING CODE REGULATES:

Passive Fire and Smoke Protection Elements

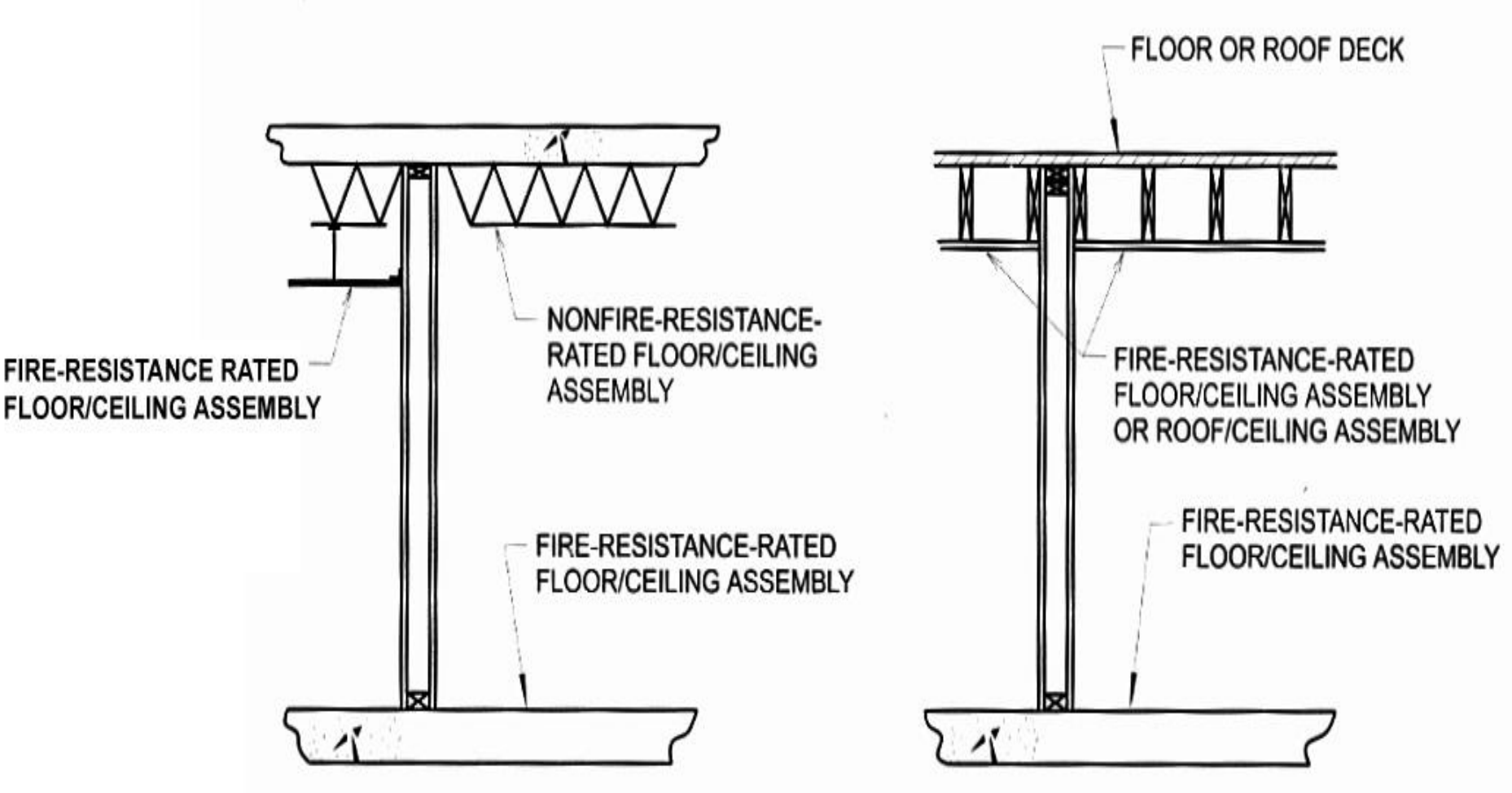
Chapter 7




Elements of Fire and Smoke Separation
Fire Separation of *Occupied Spaces*
FIRE WALL
FIRE BARRIER
FIRE PARTITION
Fire dampers
Fire Separation of *Concealed Spaces*
FIRESTOPPING
FIREBLOCKING
DRAFT STOP
Smoke Separation of Spaces
SMOKE BARRIER
SMOKE PARTITION
Smoke Dampers

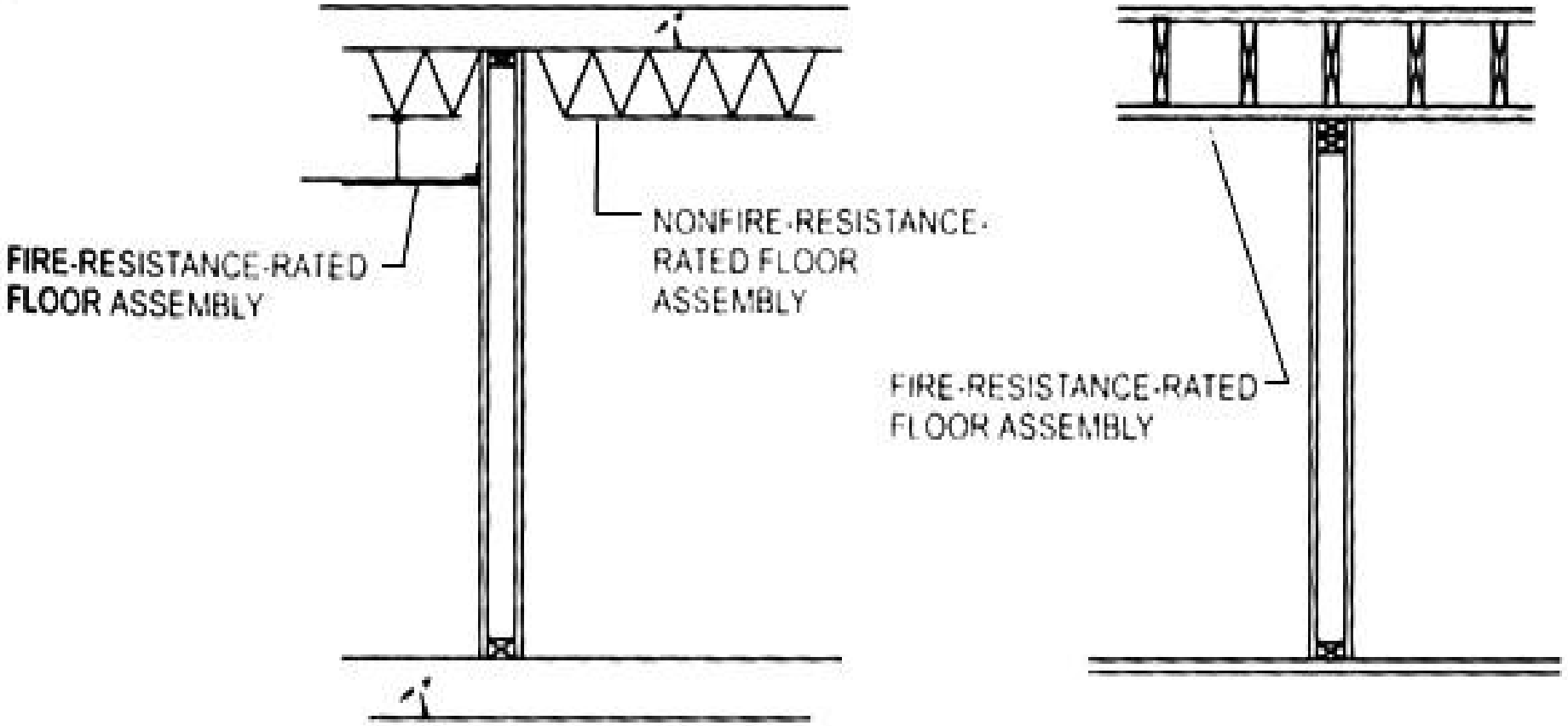
Fire Barrier (Section 706)

A fire-resistance-rated horizontal or vertical assembly with protected openings. A fire barrier wall must extend from the floor below, through any concealed spaces, to the underside of the floor or roof slab above.

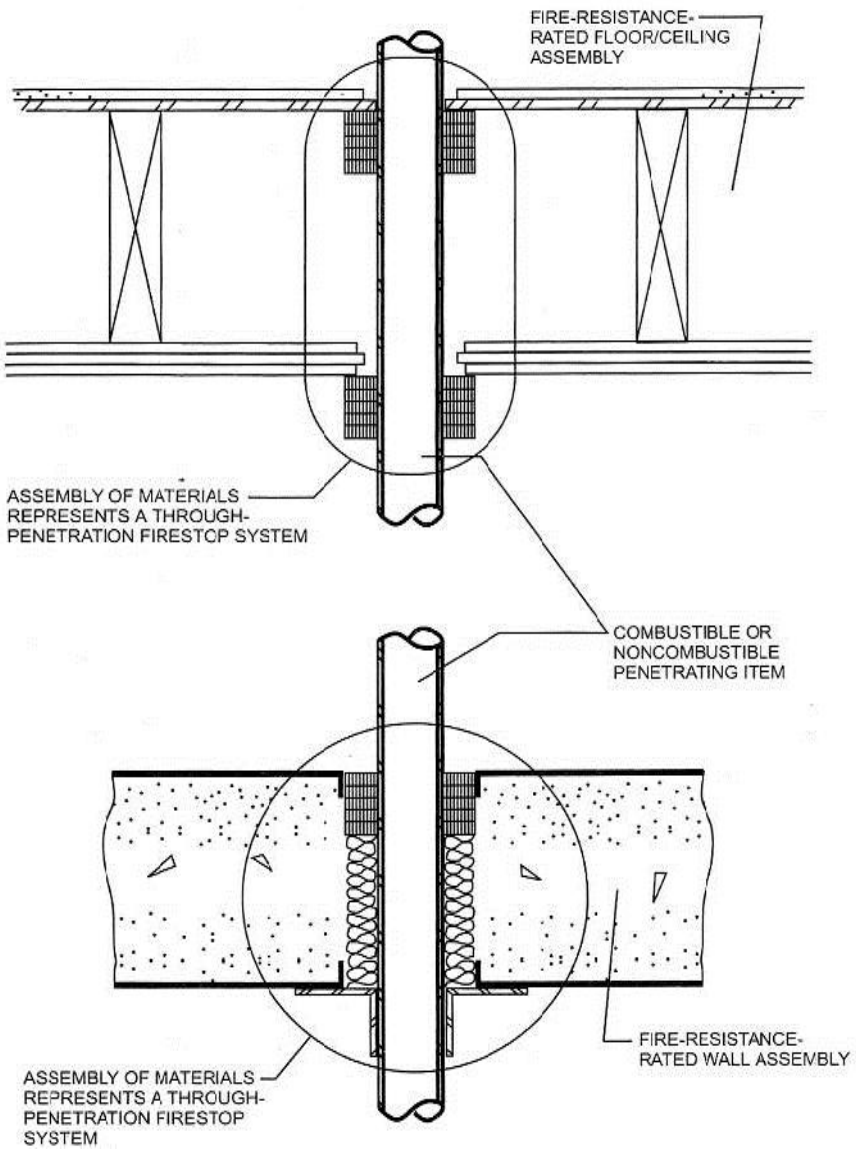


Fire Partition (Section 708)

A 1 hour fire-resistance-rated vertical assembly with protected openings. A fire partition need not extend through any concealed spaces provided that the partition intersects a fire-rated ceiling assembly and the concealed space is fire blocked or draft stopped at the partition line



Separation of concealed spaces (Section 717)



Firestopping

- Fire-rated materials installed to resist the free passage of flame or hot gases
- Applied to penetrations of fire-rated construction (Section 712)

Fireblocking

- Installed to resist the free passage of flame or hot gases
- Not required to be fire-rated

Draft stop

- Installed to resist the free passage of air in concealed spaces
- Not required to be fire-rated

BUILDING CODE REGULATES:

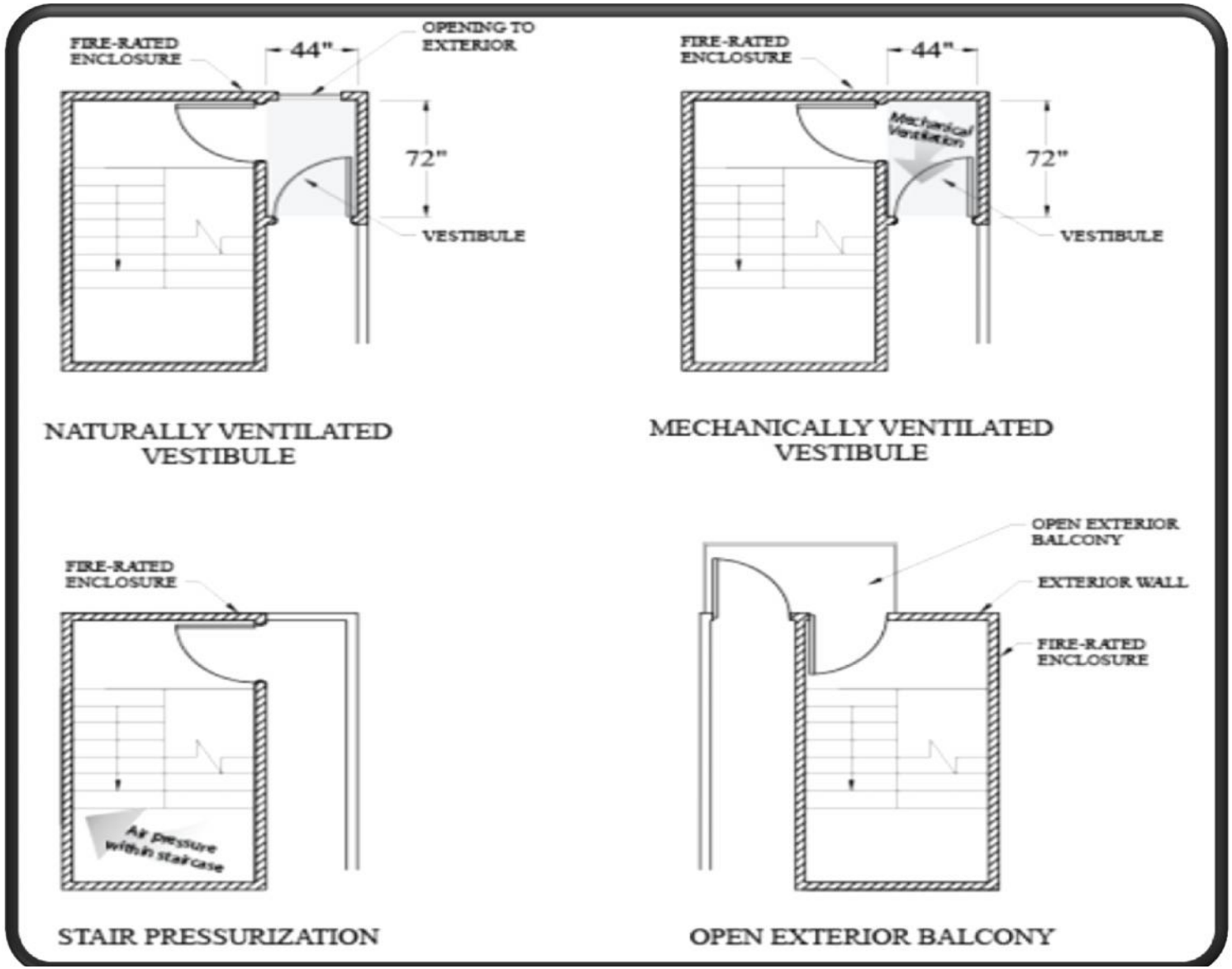
Active Fire Protection Systems

Chapter 9

Fire Protection Systems

Sprinkler Systems 903	• Occupancy, Fire area, Height, Occupant Load • RS NFPA 13
Standpipe Systems 905	• Height, Occupancy, Occupant Load • RS NFPA 14
Fire Alarm and Detection Systems 907	• Occupancy, Occupant Load, CH 4 buildings • RS NFPA 72
Smoke Control Systems 909	• As required by CH 4 • Smoke-proof enclosure 909.20

Smokeproof Enclosures



BUILDING CODE REGULATES:

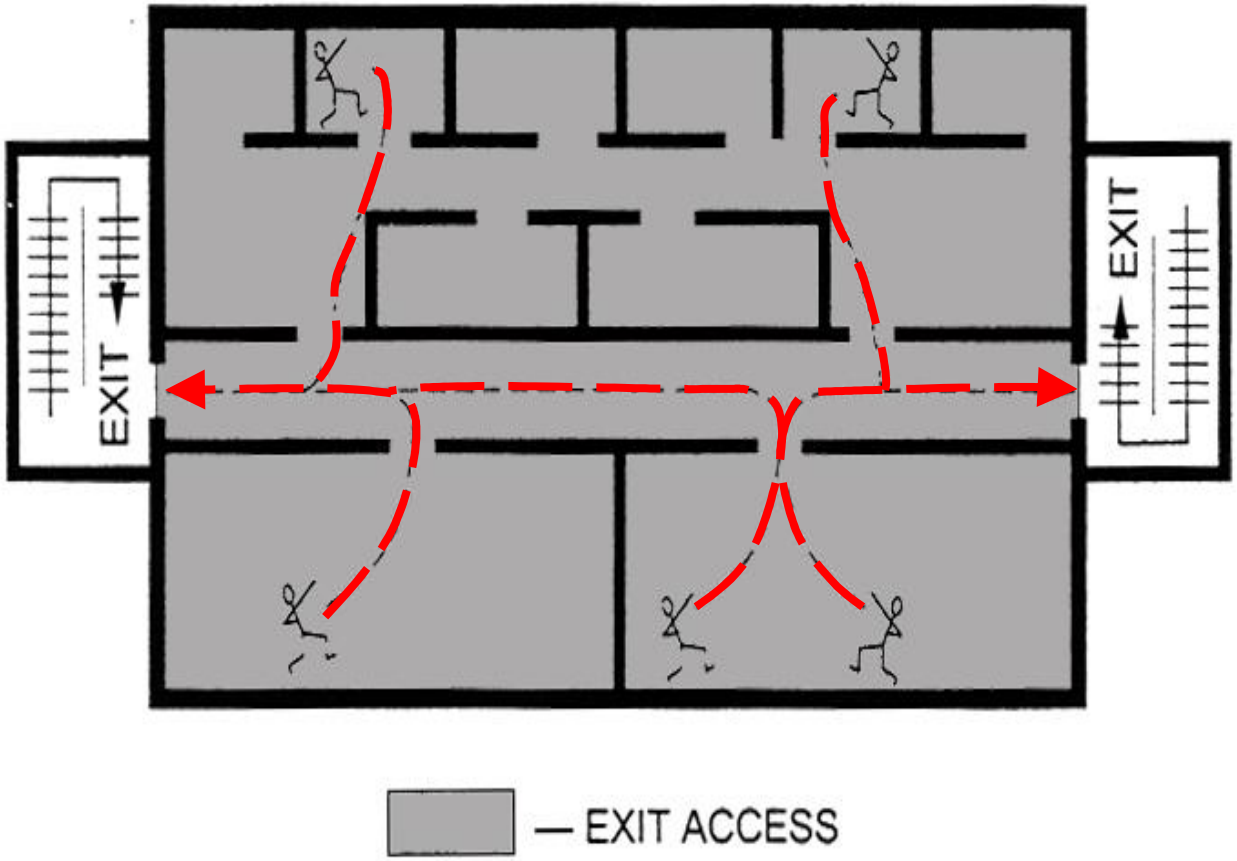
Means of Egress and Safe Evacuation from buildings

Chapter 10

- ***Means of Egress***: A continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a public way. A means of egress consists of three separate and distinct parts: the exit access, the exit and the exit discharge.

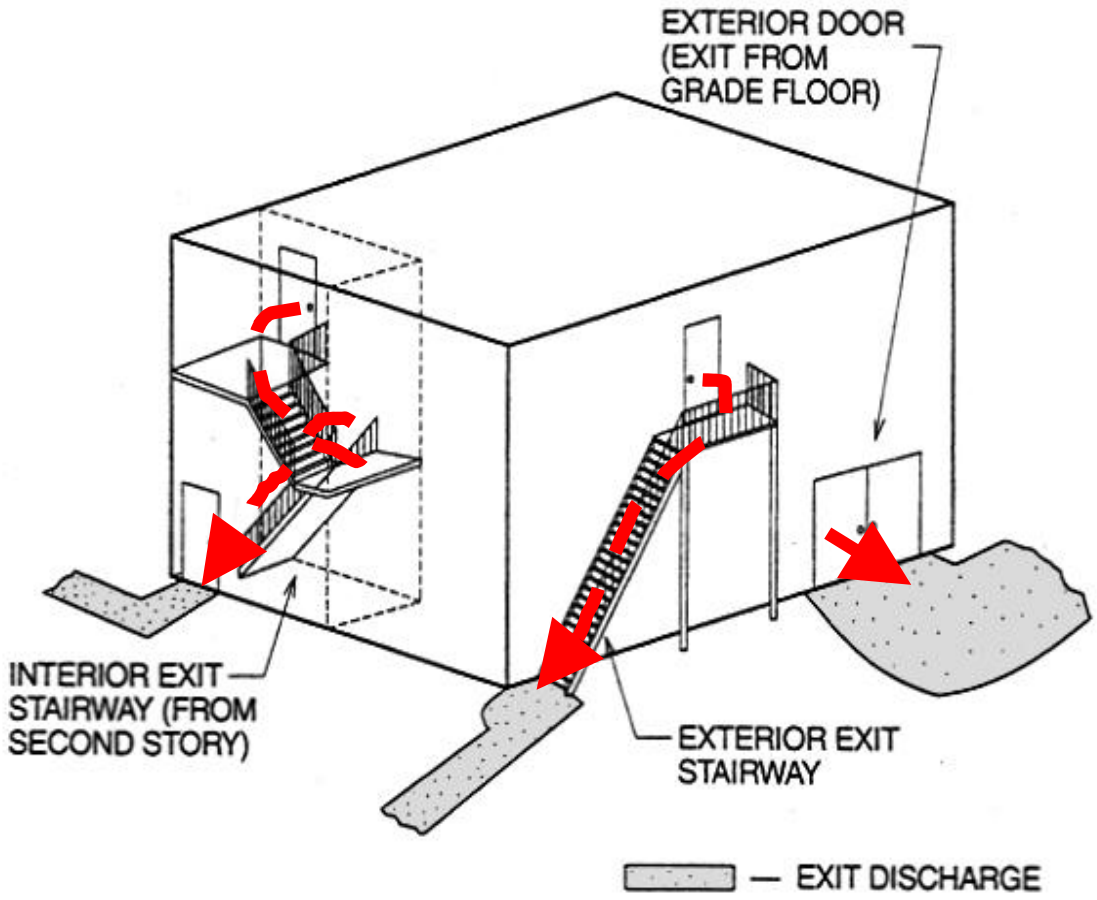
Exit access

- Begins at the furthest occupied point in a room and ends at the entrance to an *exit*
- The travel distance is regulated



Exit

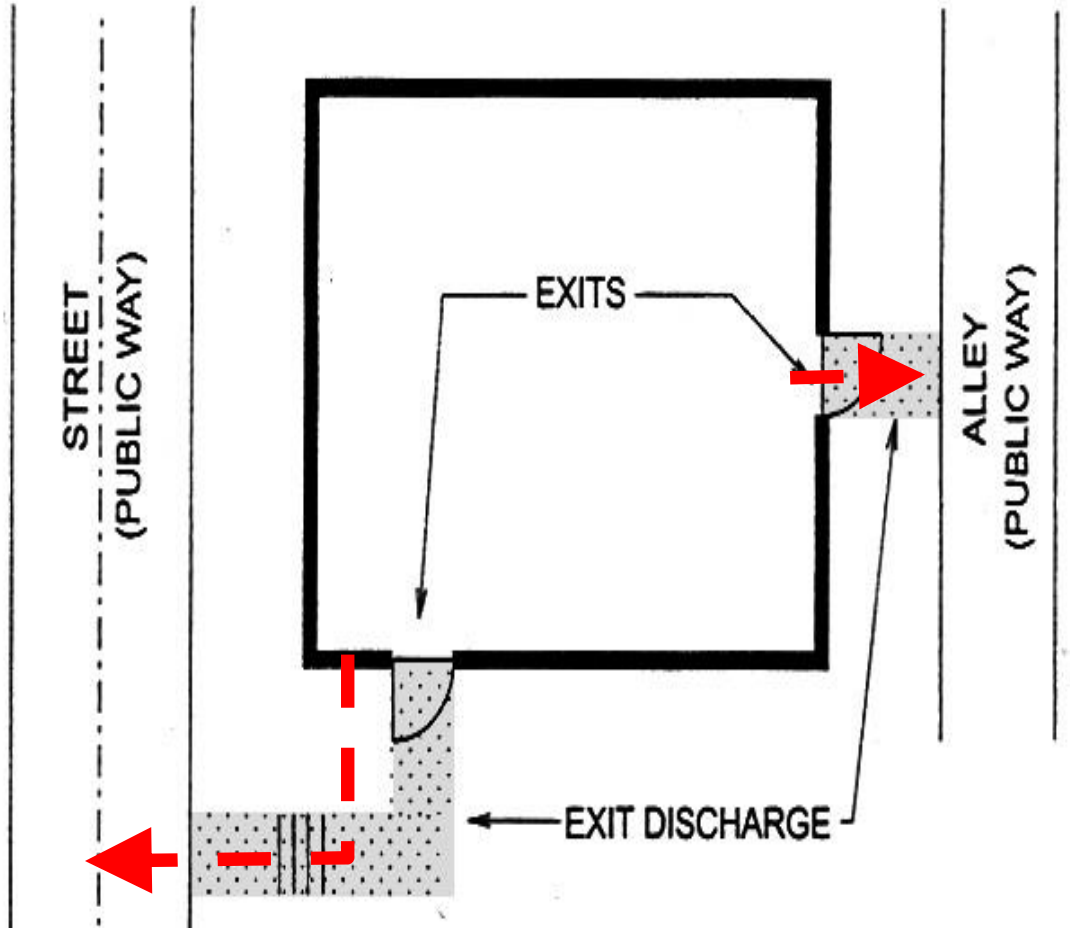
- Provides a protected path of egress travel between the *exit access* and *exit discharge*
- Travel distance is generally not an issue within an *exit*



Courtesy of ICC

Exit discharge

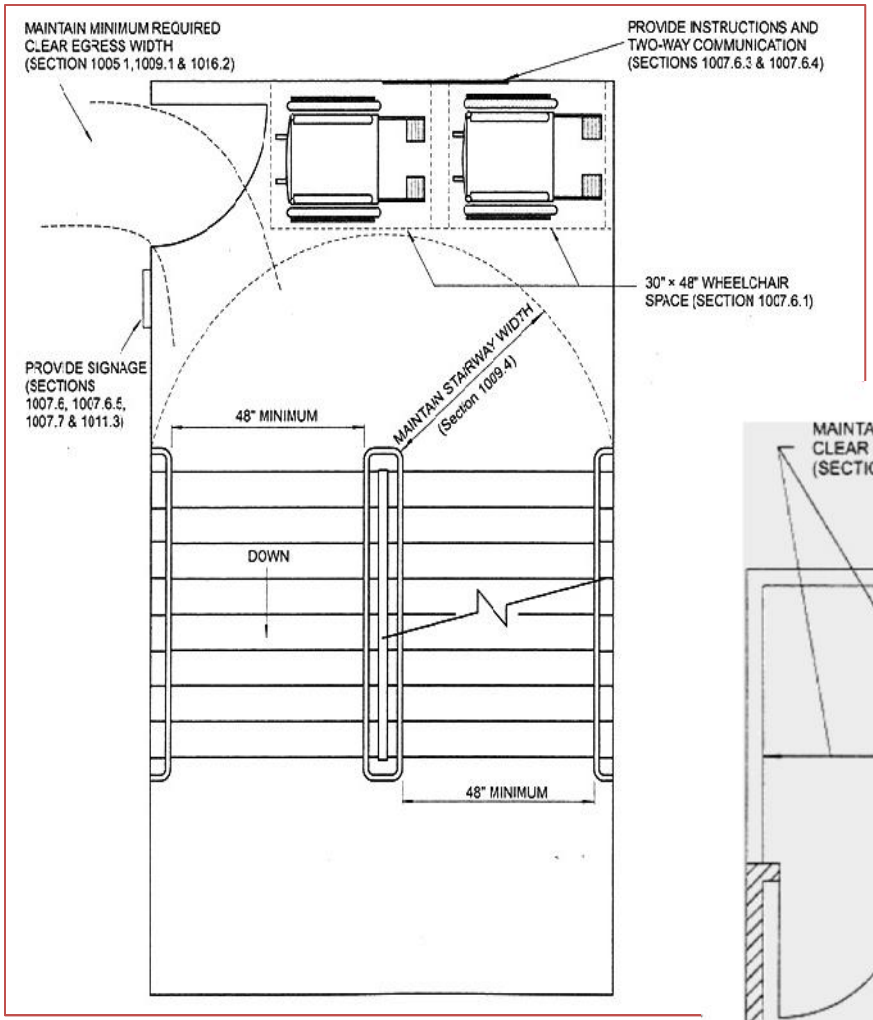
- The portion between the *exit* termination and a public way
- Travel distance is not limited at and beyond the *exit discharge*

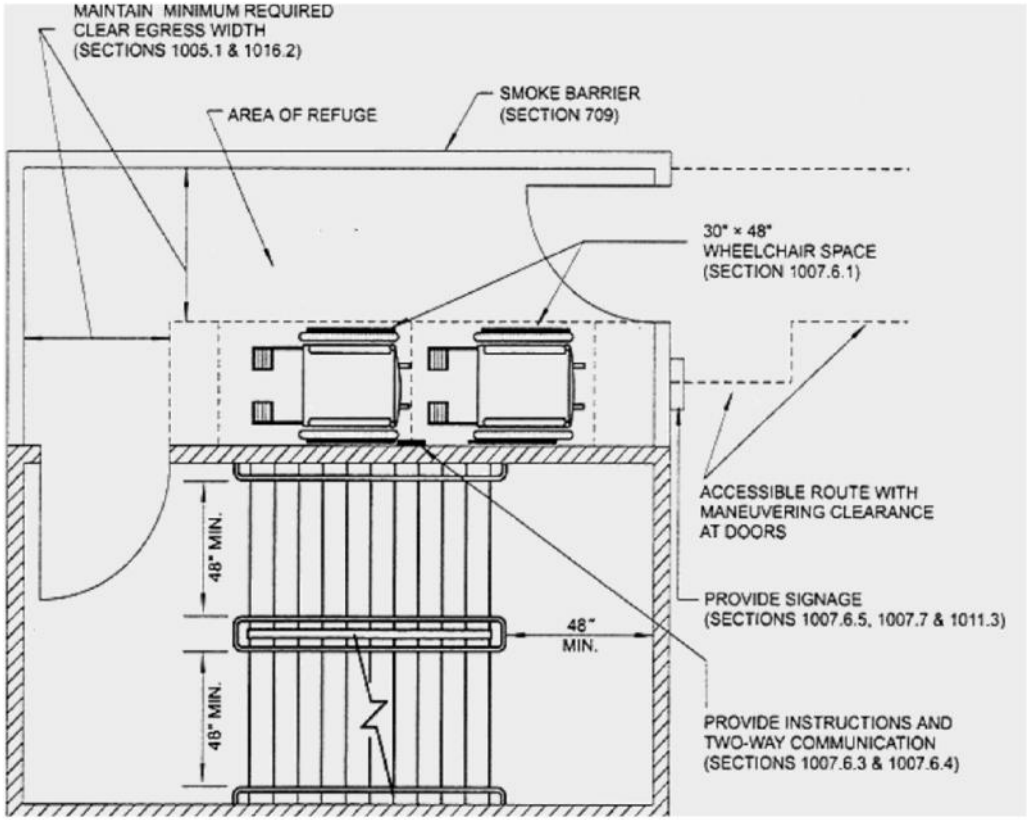


Courtesy of ICC


Accessible Means of Egress
At least 1 required in accessible spaces
At least 2 required where there are 2 or more means of egress

Areas of refuge within/adjacent to an Exit Enclosure





Additional Requirements for Assembly Use/Occupancies

Building Code Regulates:

Additional Requirements based on Use and Occupancy

Chapter 4

Occupancies Covered in Chapter 4

- Covered mall buildings
- **High-rise buildings**
- Atriums
- Underground buildings
- Parking
- Hospitals
- Prisons
- Movie theatres
- Stages
- Special amusements
- Aircraft-related occupancies
- Hazardous materials
- Group H occupancies

Safety measures in High-rise Buildings

- **Fire Suppression systems**

  - Buildings shall be fully sprinklered in accordance with **NFPA 13**
  - Each sprinkler system zone in buildings that are more than 420 feet (128 m) in building height shall be supplied by a minimum of two risers. Each riser shall supply sprinklers on alternate floors
  - Required fire pumps shall be supplied by connections to a minimum of two water mains located in different streets.

Safety measures in High-rise Buildings

- **Emergency systems.**
  - Smoke detection.
  - Fire alarms systems.
  - Emergency voice/alarm communication system.
  - Emergency responder radio coverage.
  - Fire command.
  - Smoke removal.

- **Emergency and Standby Power Systems**

Safety measures in High-rise Buildings

- **Means of egress and evacuation.**
  - Stair enclosure shall be constructed of Impact Resistance walls
  - Remoteness of exit stairway enclosures.
  - Additional exit stairway.
  - Stairway door operation.
  - Smokeproof exit enclosures.
  - Luminous egress path markings.

- **Fire service access elevator.**

BUILDING CODE REGULATES:

Aluminum Composite Panels

Chapter 14

Exterior Walls Coverings

Exterior wall coverings as regulated by the New Abu Dhabi Building Code

- **METAL COMPOSITE MATERIAL (MCM).** A factory-manufactured panel consisting of metal skins bonded to bot 1407.1.1 Plastic core.
- The plastic core of the MCM **shall not contain foam plastic insulation** as defined in Section 2602.1.
- **FOAM PLASTIC INSULATION**. A plastic that is intentionally expanded by the use of a foaming agent to produce a reduced-density plastic containing voids consisting of open or closed cells distributed throughout the plastic for thermal insulating or acoustical purposes and that has **a density less than 20 pounds per cubic foot (pcf) (320 kg/m3).**

METAL COMPOSITE MATERIAL (MCM) as Cladding

- **1407.10.1 Surface-burning characteristics.**

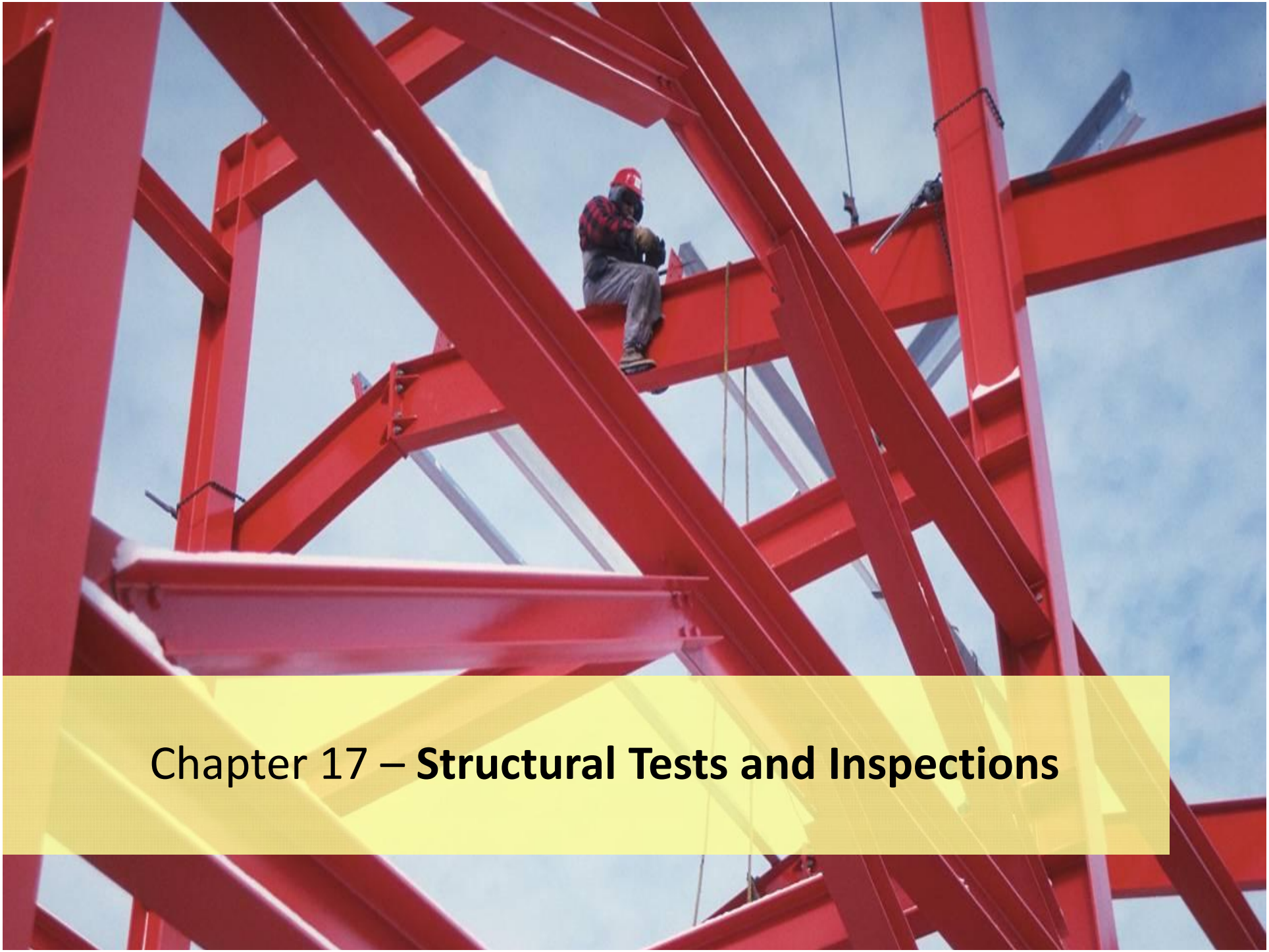
  MCM shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 when tested as an assembly in the maximum thickness intended for use in accordance with ASTM E 84 or UL 723.

- **1407.10.2 Thermal barriers.**

  MCM shall be separated from the interior of a building by an approved thermal barrier consisting of 1/2-inch (12.7 mm) gypsum wallboard or equivalent thermal barrier material that will limit the average temperature rise of the unexposed surface to not more than 250°F (121°C) after 15 minutes of fire exposure

- **1407.10.4 Full-scale tests.**

  The MCM system shall be tested in accordance with, and comply with, the acceptance criteria of NFPA 285. Such testing shall be performed on the MCM system with the MCM in the maximum thickness intended for use.



Chapter 17 – **Structural Tests and Inspections**

New Concepts

- Approved Agency: Inspection, research or Testing
- Special Inspections
  - Design Professional In Responsible Charge
  - Special Inspector
  - Approved Fabricator
  - Certificate of Compliance
- Labeling of Materials

Thank you

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