

Maintaining Protection: Fire-Resistance-Rated Fire Separation Assembly Requirements

**FCIA** Firestop Contractors International Association

FCIA Virtual Fire-Resistance in Existing Buildings 'DIIM' Symposium Canada

**KOFFEL ASSOCIATES** Fire Protection ENGINEERS

---

---

---

---

---

---

---

---

1

Fire-Resistance Rating = Fire Wall...WRONG!

**FCIA** Firestop Contractors International Association

**KOFFEL ASSOCIATES** Fire Protection ENGINEERS

---

---

---

---

---

---

---

---

2

Overview

- Fire-resistance-rated construction is used for:
  - Confine the fire
  - Contain the effects of the fire and the products of combustion
  - Protect people and property
  - Provide structural stability
  - Will follow Division B, Part 3 of the National Building Code of Canada – 2015 Edition

**FCIA** Firestop Contractors International Association

**KOFFEL ASSOCIATES** Fire Protection ENGINEERS

---

---

---

---

---

---

---

---

3

### Objectives

- Upon completion of the seminar the participant will be able to:
  - Distinguish the difference between fire-resistance and fire protection ratings
  - Identify the performance characteristics of different types of fire-rated construction



4

---

---

---

---

---

---

---

---

### Terminology

- Fire-resistance rating – The period of time a building element, component or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests (Appendix D)
  - CAN/ULC-S101



5

---

---

---

---

---

---

---

---

### Terminology

- Fire protection rating – The period of time that an opening protective assembly will maintain the ability to confine a fire as determined by tests. Ratings are stated in hours or minutes.
  - CAN/ULC-S104
  - CAN/ULC-S106
  - CAN/ULC-S112



6

---

---

---

---

---

---

---

---

### Fire Tests – Fire-Resistance Rating

- Conditions of Acceptance
  - Average temperature rise and maximum temperature rise on exposed surface or of the element
  - For barriers, flame and hot gases do not pass to ignite cotton waste
  - Maintain the structural load
  - Pass a hose stream test depending on the element and the fire-resistance rating



7

---

---

---

---

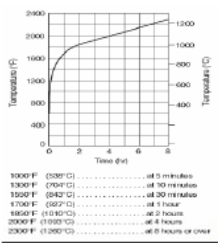
---

---

---

---

### Fire Tests



8

---

---

---

---

---

---

---

---

### Fire-Resistance Ratings



9

---

---

---

---

---

---

---

---



### Fire-Rated Glazing

**FCIA**  
Firestop Contractors International Association

**KOFFEL ASSOCIATES**  
FIRE PROTECTION ENGINEERS

---

---

---

---

---

---

---

---

13

### Performance Requirements

- Fire Walls
- Fire Separations
  - Fire Barriers
  - Fire Partitions
  - Shaft Enclosures
  - Horizontal Assemblies
- Exterior Walls

**FCIA**  
Firestop Contractors International Association

**KOFFEL ASSOCIATES**  
FIRE PROTECTION ENGINEERS

---

---

---

---

---

---

---

---

14

### Compartmentation

**FCIA**  
Firestop Contractors International Association

**KOFFEL ASSOCIATES**  
FIRE PROTECTION ENGINEERS

---

---

---

---

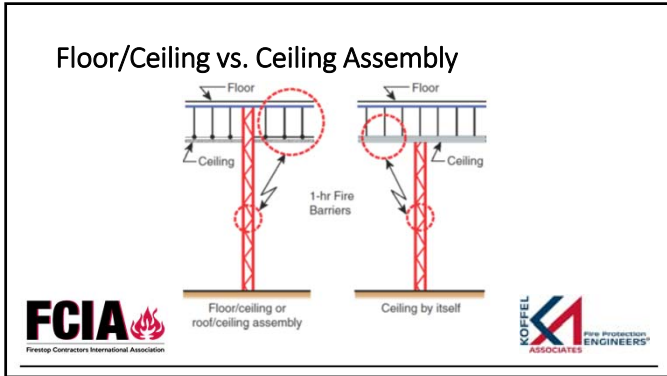
---

---

---

---

15



16

---

---

---

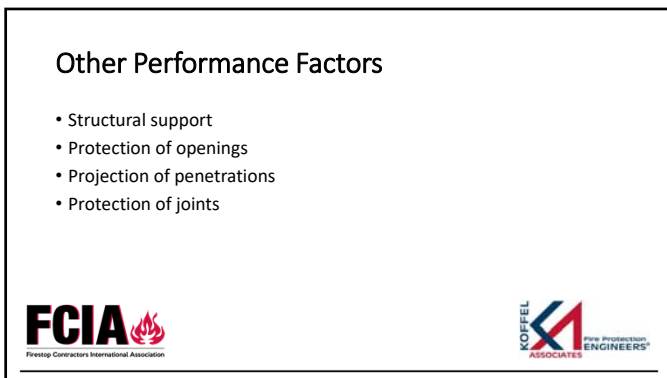
---

---

---

---

---



17

---

---

---

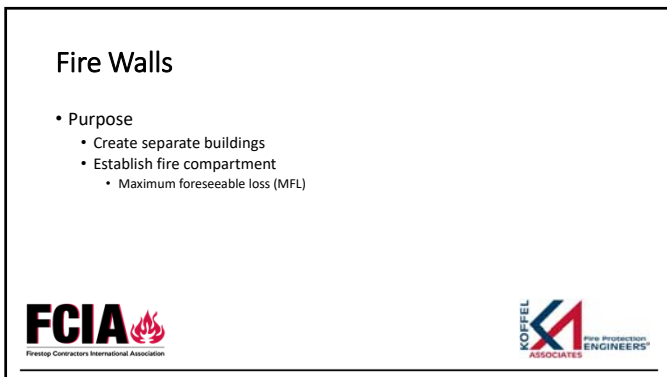
---

---

---

---

---



18

---

---

---

---

---

---

---

---

### Fire Wall Performance Criteria

- Allow collapse on either side without collapse of wall
- Noncombustible except Type V construction
- Fire-resistance ratings
  - Range from two hours to four hours
- Continuity
  - At least to the exterior wall or roof
  - Some instances require parapets or wing walls
- Limitations on openings (same as interior fire separations)
  - 11 m<sup>2</sup>. or 22 m<sup>2</sup> with sprinkler protection
  - 25% of the length of the wall
- Penetrations and joints



19

---

---

---

---

---

---

---

---

### Fire Separations



20

---

---

---

---

---

---

---

---

### Fire Separations

- Purpose (Uses)
  - Shaft enclosures
  - Exit enclosures
  - Horizontal exits
  - Atrium
  - Incidental use areas
  - Control areas
  - Occupancy separations



21

---

---

---

---

---

---

---

---

### Fire Separations Performance Criteria

- Fire-resistance ratings
  - Generally range from one hour to four hours
  - May allow one hour reduction for sprinklers
- Continuity
  - Outside wall to outside wall
  - Floor to floor/roof above
- Structural support
  - Required at least one floor below except for certain assemblies
- Openings
- Penetrations
- Joints



22

---

---

---

---

---

---

---

---

### Doors in Fire Separations

- Tested in accordance with ULC-S104
- Installed in accordance with NFPA 80
- Automatic or self-closing
- Self-latching
- Varying ratings from 20 minute to 180 minute depending on application



23

---

---

---

---

---

---

---

---

### Fire Door



24

---

---

---

---

---

---



---

---



**NFPA 80, Fire Doors and Windows**

- Frames
  - Labeled
  - Clearance (between doors and between door and frame)
    - Steel – 1/8 in. (0.32 cm), ±1/16 in. (0.16 cm)
    - Wood – 1/8 in. (0.32 cm)

25

---

---

---

---

---



---

---

---

**NFPA 80, Fire Doors and Windows**

- Historical clearance (between doors and floor)
  - No sill – ¾ in. (1.9 cm)
  - Non-combustible sill – 3/8 in. (0.95cm)
  - Tile – 5/8 in. (1.6 cm)
  - Class I or II carpeting – ½ in. (1.3 cm)
- Current requirement – ¾ in. (1.9 cm)

26

---

---

---

---

---

---

---

---

**Protective Plate**





27

---

---

---

---

---

---

---

---

### Window Assemblies in Fire Barriers

- Permitted in  $\leq$  1 hour fire barriers
- Maximum area typically 0.0645 m<sup>2</sup>
- Tested in accordance with ULC-S106
- Installed in accordance with NFPA 80



28

---

---

---

---

---

---

---

---

### Types of Fire-Rated Glazing Materials

- Wired glass
  - Typically limited in size
  - Caution if area subject to human impact
- Ceramic Glass
  - Typically limited to 45 minutes
  - Category II safety glazing material
- Special Tempered Glass
  - Typically limited to 20 minutes without hose stream (doors)
  - Category II safety glazing material



29

---

---

---

---

---

---

---

---

### Penetrations in Fire Barriers



30

---

---

---

---




---

---

---

---

### Penetrations in Fire Barriers



31

---

---

---

---

---



---

---

---

### Fire Partitions (not used in NBC or NFPA 101®)

- Purpose (Use)
  - Dwelling and sleeping room separation
  - Tenant separations
  - Corridors
  - Elevator lobbies



32

---

---

---

---

---

---

---

---

### Fire Partitions



33

---

---

---

---

---

---

---

---

### Fire Partition Performance Criteria

- Fire-resistance rating
  - Generally range from 30 min to 1 hour
- Continuity
  - Floor to floor/roof above or fire-resistance-rated assembly
- Structural support
  - Required except for certain fire partitions in non-rated building construction types
- Openings
- Penetrations



34

---

---

---

---

---

---

---

---

### Shaft Enclosures



35

---

---

---

---

---

---

---

---

### Shaft Enclosures

- Fire separations with modifications
- Openings
  - Limited for exit enclosures
- Penetrations
  - Limited for exit enclosures



36

---

---

---

---

---

---

---

---

### Smoke Barriers (not used in NBC)

- Building compartmentation typically found in health care and detention and correctional occupancies
- Typically one-hour fire-resistance rating
- Continuity
  - Floor to floor/roof above
- Structural support
  - Required except for non-rated building construction types
- Openings – L-rating requirements
- Penetrations – L-rating requirements



37

---

---

---

---

---

---

---

---

### Smoke Partitions (not used in NBC)

- Limited applications
  - Corridor walls in health care occupancies
- Typically non-rated walls
- Continuity
  - Floor to floor/roof above or ceiling capable of resisting the passage of smoke
- Structural support – no requirements
- Openings – approved material
- Penetrations – approved material



38

---

---

---

---

---

---

---

---

### Horizontal Assemblies

- Fire-resistance ratings
- Continuity
- Openings/penetrations



39

---

---

---

---

---

---

---

---

Horizontal Assemblies



**FCIA**  
Firestop Contractors International Association

**KOFFEL**  
ASSOCIATES  
FIRE PROTECTION  
ENGINEERS®

40

---

---

---

---


---

---

---

---

Exterior Walls



**FCIA**  
Firestop Contractors International Association

**KOFFEL**  
ASSOCIATES  
FIRE PROTECTION  
ENGINEERS®

41

---

---

---

---

---

---

---

---

Exterior Walls

- Fire-resistance rating
  - Type of construction if load bearing
  - Fire separation distance
  - Special situations
- Continuity
- Openings
- Penetrations

**FCIA**  
Firestop Contractors International Association

**KOFFEL**  
ASSOCIATES  
FIRE PROTECTION  
ENGINEERS®

42

---

---

---

---

---

---

---

---

**Inventory**

Blue dashed line clearly indicates extent of zones

**FCIA**  
Firestop Contractors International Association

**KOFFEL ASSOCIATES**  
FIRE PROTECTION ENGINEERS

43

---

---

---

---

---

---

---

---

**Objectives**

- Upon completion of this seminar the participant will be able to:
  - Distinguish the difference between fire resistance and fire protection ratings
  - Identify the performance characteristics of different types of fire-rated construction

**FCIA**  
Firestop Contractors International Association

**KOFFEL ASSOCIATES**  
FIRE PROTECTION ENGINEERS

44

---

---

---

---

---

---

---

---

**Questions?**

**William E. Koffel, P.E., FSPPE**  
(Registered in DC, MD, NY, OH, PA, VA, WA)  
[wkoffel@koffel.com](mailto:wkoffel@koffel.com)

**Koffel Associates, Inc.**  
8815 Centre Park Drive, Suite 200  
Columbia, MD 21045-2107  
410-750-2246  
[www.koffel.com](http://www.koffel.com)

Follow us on LinkedIn

**FCIA**  
Firestop Contractors International Association

**KOFFEL ASSOCIATES**  
FIRE PROTECTION ENGINEERS

45

---

---

---

---

---

---

---

---