

KOFFEL ASSOCIATES, INC.

Fire Resistance Rating = Fire Wall...Right?

Prepared by:
William E. Koffel, P.E., FSFPE


 *Expertly Engineering Safety From Fire*

Fire Resistance Rating = Fire Wall...WRONG!



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 Chapter 7 of the IBC – 2015 Edition



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



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, prescribed in Section 703.
 - ASTM E119



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 prescribed in Section 715. Ratings are stated in hours or minutes.
 - NFPA 252, NFPA 257

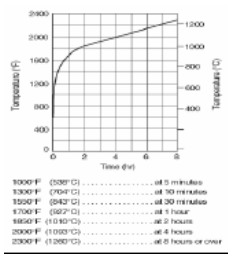


Fire Tests – Fire Resistance Rating

- ASTM E 119 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



Fire Tests



Fire Resistance Ratings



UL Fire Resistance – Volume I Numbering System for Fire Rated Assemblies

Description of Assembly	TYPE OF PROTECTION									
	Mechanical Protection					Other Applied Protection				
1. Type of Protection	000-000	100-100	200-200	300-300	400-400	500-500	600-600	700-700	800-800	900-900
2. Fire Resistance Rating	000	010	020	030	040	050	060	070	080	090
3. Assembly	000	010	020	030	040	050	060	070	080	090
4. Assembly	000	010	020	030	040	050	060	070	080	090
5. Assembly	000	010	020	030	040	050	060	070	080	090
6. Assembly	000	010	020	030	040	050	060	070	080	090
7. Assembly	000	010	020	030	040	050	060	070	080	090
8. Assembly	000	010	020	030	040	050	060	070	080	090
9. Assembly	000	010	020	030	040	050	060	070	080	090
10. Assembly	000	010	020	030	040	050	060	070	080	090
11. Assembly	000	010	020	030	040	050	060	070	080	090
12. Assembly	000	010	020	030	040	050	060	070	080	090
13. Assembly	000	010	020	030	040	050	060	070	080	090
14. Assembly	000	010	020	030	040	050	060	070	080	090
15. Assembly	000	010	020	030	040	050	060	070	080	090
16. Assembly	000	010	020	030	040	050	060	070	080	090
17. Assembly	000	010	020	030	040	050	060	070	080	090
18. Assembly	000	010	020	030	040	050	060	070	080	090
19. Assembly	000	010	020	030	040	050	060	070	080	090
20. Assembly	000	010	020	030	040	050	060	070	080	090

- ### Fire Tests – Fire Protection Rating
- NFPA 252/NFPA 257 Conditions of Acceptance
 - Remain in place
 - Minimal openings
 - Limits on flaming on unexposed surface
 - Pass the hose stream test on most assemblies



Fire Rated Glazing

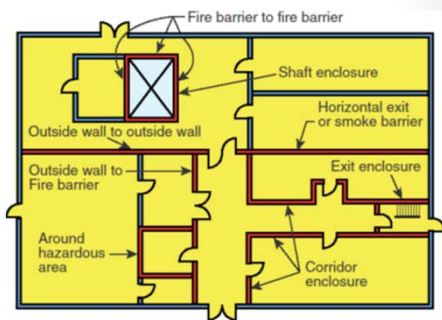


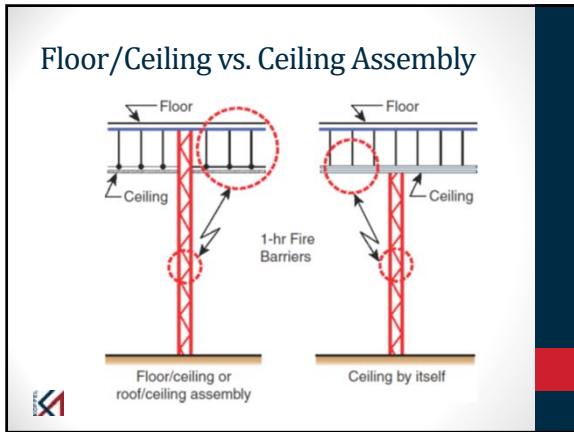
Performance Requirements

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



Compartmentation





- ### Other Performance Factors
- Structural support
 - Protection of openings
 - Projection of penetrations
 - Protection of joints

- ### Fire Walls
- Purpose
 - Create separate buildings
 - Establish fire compartment
 - Maximum foreseeable loss (MFL)

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
 - 156 sq. ft. or sprinkler protection
 - 25% of the length of the wall
- Penetrations and joints



Fire Barriers



Fire Barriers

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



Fire Barrier 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 except for non-rated building construction types
- Openings
- Penetrations
- Joints



Doors in Fire Barriers

- Tested in accordance with NFPA 252
- Installed in accordance with NFPA 80
- Automatic or self-closing
- Self-latching
- Varying ratings from 20 minute to 60 minute depending on application



Fire Door



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)



NFPA 80, Fire Doors and Windows

- Historical clearance (between doors and floor)
 - No sill – 3/4 in. (1.9 cm)
 - Non-combustible sill – 3/8 in. (0.95cm)
 - Tile – 5/8 in. (1.6 cm)
 - Class I or II carpeting – 1/2 in. (1.3 cm)
- Current requirement – 3/4 in. (1.9 cm)



Protective Plate



Window Assemblies in Fire Barriers

- Permitted in ≤ 1 hr fire barriers
- $\leq 25\%$ of fire barrier area
- Tested in accordance with NFPA 257
- Installed in accordance with NFPA 80



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



Penetrations in Fire Barriers



Penetrations in Fire Barriers



Fire Partitions

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



Fire Partitions



Fire Partition Performance Criteria

- Fire resistance rating
 - Generally range from 30 min to 1 hr
- 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



Shaft Enclosures



Shaft Enclosures

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



Smoke Barriers

- 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



Smoke Partitions

- 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



Horizontal Assemblies

- Fire resistance ratings
- Continuity
- Openings/penetrations



Horizontal Assemblies



Exterior Walls



Exterior Walls

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



