Barrier Fundamentals: Code Requirements for Barriers

Prepared by:
William E. Koffel, P.E., FSFPE, SASHE
Fire Resistance Rating = Fire Wall...Right?
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

![Graph showing temperature changes over time (°F and °C).](image)

- 1000°F (538°C) ........ all 5 minutes
- 1300°F (704°C) .......... all 10 minutes
- 1550°F (843°C) .......... all 30 minutes
- 1700°F (922°C) .......... all 1 hour
- 1850°F (1010°C) ........ all 2 hours
- 2000°F (1093°C) ........ all 4 hours
- 2300°F (1260°C) ........ all 8 hours or over
Fire Resistance Ratings
# UL Fire Resistance – Volume I
## Numbering System for Fire Rated Assemblies

<table>
<thead>
<tr>
<th>Groups of Construction</th>
<th>000-099</th>
<th>100-199</th>
<th>200-299</th>
<th>300-399</th>
<th>400-499</th>
<th>500-599</th>
<th>600-699</th>
<th>700-899</th>
<th>900-999</th>
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<tbody>
<tr>
<td><strong>Types of Protection</strong></td>
<td>Membrane Protection</td>
<td>Direct Applied Protection</td>
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<td><strong>Floors-Ceilings:</strong></td>
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<tr>
<td>A or B* Concrete and Cellular Steel Floor C - Glazing Systems</td>
<td>Concealed Grid Sys.</td>
<td>Exposed Grid System</td>
<td>(Reserved)</td>
<td>Metal Lath</td>
<td>Gypsum Board</td>
<td>Misc.</td>
<td>SFRM+</td>
<td>Unprotected</td>
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<td>D, E* or F* Concrete and Steel Floor Units</td>
<td>Concealed Grid Sys.</td>
<td>Exposed Grid System</td>
<td>Mineral and Fiber Boards</td>
<td>Metal Lath</td>
<td>Gypsum Board</td>
<td>Mastic and Intumescent Coatings</td>
<td>SFRM+</td>
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<td>G or H* Concrete and Steel Joists</td>
<td>Concealed Grid Sys.</td>
<td>Exposed Grid System</td>
<td>Mineral and Fiber Boards</td>
<td>Metal Lath</td>
<td>Gypsum Board</td>
<td>Misc.</td>
<td>SFRM+</td>
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<tr>
<td>I Non-load-bearing Horizontal Barrier</td>
<td>(Reserved)</td>
<td>(Reserved)</td>
<td>(Reserved)</td>
<td>(Reserved)</td>
<td>Gypsum Board</td>
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<td>J or K Concrete</td>
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<td>L or M Wood Joist or Combination Wood and Steel Assemblies</td>
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<td>Exposed Grid System</td>
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<td>Gypsum Board</td>
<td>Misc.</td>
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<td>Exposed Grid System</td>
<td>Batts and Blankets or Mineral and Fiber Boards</td>
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<td>Gypsum Board</td>
<td>Mastic and Intumescent Coatings</td>
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<td>Exposed Grid System</td>
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<td>Metal Lath</td>
<td>Gypsum Board</td>
<td>Misc.</td>
<td>SFRM+</td>
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<td>S or T* for Roof-Ceiling</td>
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<td>Gypsum Board</td>
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<td><strong>Wall and Partition:</strong></td>
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<td>U, V or W</td>
<td>Building or Partition Panel Units</td>
<td>Insulating Concrete</td>
<td>Wood Stud, Gypsum Board, Lath &amp;/or Plaster</td>
<td>Metal Stud, Gypsum Board, Lath &amp;/or Plaster</td>
<td>Misc.</td>
<td>Metal Panels, Gypsum Board, Lath &amp;/or Plaster</td>
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<td>Masonry</td>
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<td>X, Y or Z*</td>
<td>Building Units</td>
<td>Prefabricated Mat Materials</td>
<td>Batts and Blankets or Mineral and Fiber Boards</td>
<td>Metal Lath &amp; Plaster</td>
<td>Gypsum Board</td>
<td>Mastic and Intumescent Coatings</td>
<td>SFRM+</td>
<td>Masonry</td>
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</table>
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 Protection Ratings
Fire Rated Glazing
Performance Requirements

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

- Fire barrier to fire barrier
- Shaft enclosure
- Horizontal exit or smoke barrier
- Outside wall to outside wall
- Exit enclosure
- Outside wall to Fire barrier
- Around hazardous area
- Corridor enclosure
Floor/Ceiling vs. Ceiling Assembly

- **Floor/Ceiling or roof/ceiling assembly**
- **Ceiling by itself**

1-hr Fire Barriers
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 – 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)
Protective Plate
Window Assemblies in Fire Barriers

- Permitted in ≤ 1 hr fire barriers
- ≤ 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 msoke
- 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
Inventory

Blue dashed line clearly indicates extent of zones
Objectives

• Upon completion of this seminar the participant will be able to:
  • Distinguish the difference between fire resistance and fire protection ratings
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Questions?

William E. Koffel, P.E., FSFPE  
(Registered in DC, MD, NY,  
OH, PA, VA, WA)  
wkoffel@koffel.com

Koffel Associates, Inc.  
8815 Centre Park Drive,  
Suite 200  
Columbia, MD 21045-2107  
410-750-2246  
www.koffel.com

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