

Is That A Fire Barrier?

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**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 – 2018 Edition
 - NFPA 101 references will be to both the 2012 Edition and the 2021 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

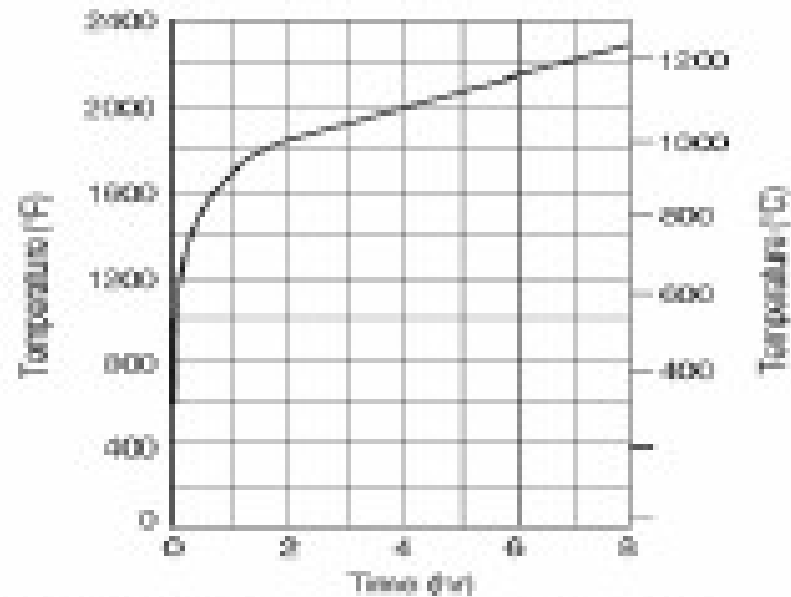
Terminology

- 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



1000° F (538° C)	.....	at 5 minutes
1300° F (704° C)	.....	at 10 minutes
1500° F (817° C)	.....	at 30 minutes
1700° F (932° C)	.....	at 1 hour
1900° F (1044° C)	.....	at 2 hours
2000° F (1093° C)	.....	at 4 hours
2300° F (1260° C)	.....	at 8 hours or over

Fire Resistance Ratings



UL Numbering System for Fire Rated Assemblies

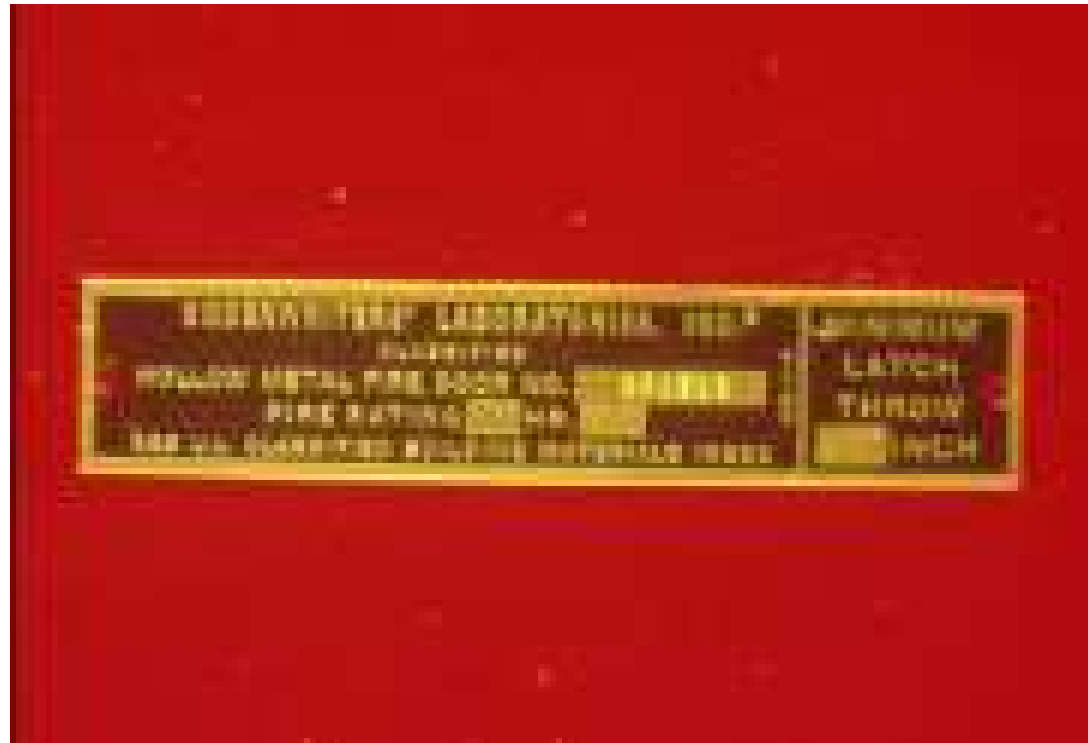
Groups of Construction	TYPES OF PROTECTION								
	Membrane Protection						Direct Applied Protection		Unprotected
	000-099	100-199	200-299	300-399	400-499	500-599	600-699	700-899	900-999
Floors-Ceilings: A or B* Concrete and Cellular Steel Floor C - Glazing Systems	Concealed Grid Sys.	(Reserved)	Exposed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



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



Fire Rated Glazing

TABLE 716.1(1)
MARKING FIRE-RATED GLAZING ASSEMBLIES

FIRE TEST STANDARD	MARKING	DEFINITION OF MARKING
ASTM E119 or UL 263	W	Meets wall assembly criteria.
ASTM E119 or UL 263	FC	Meets floor/ceiling criteria ^a
NFPA 257 or UL 9	OH	Meets fire window assembly criteria including the hose stream test.
NFPA 252 or UL 10B or UL 10C	D	Meets fire door assembly criteria.
	H	Meets fire door assembly hose stream test.
	T	Meets 450°F temperature rise criteria for 30 minutes
—	XXX	The time in minutes of the fire resistance or fire protection rating of the glazing assembly.

For SI: °C = [(°F) – 32]/1.8.

a. See Section 2409.1

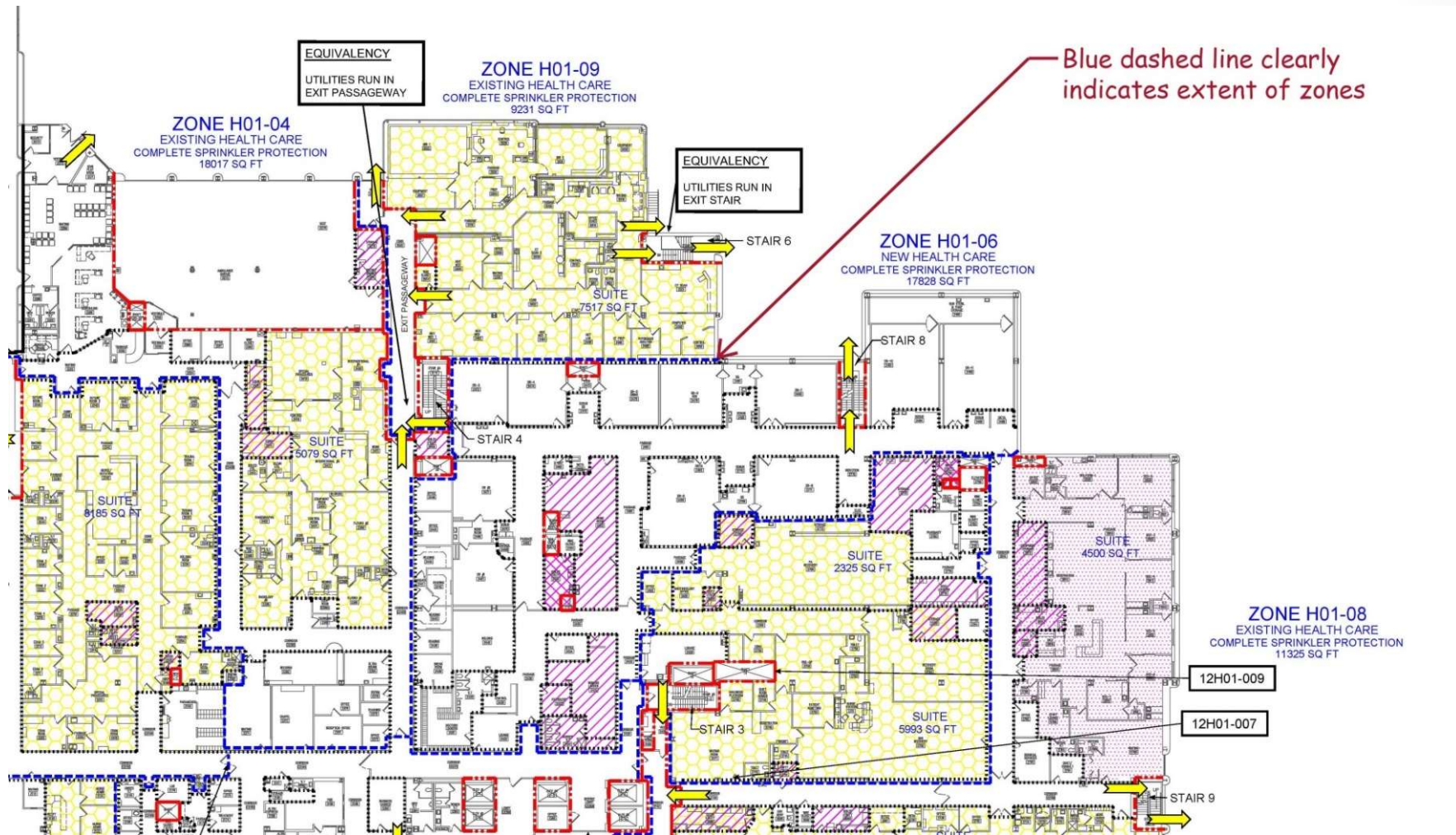
Fire Rated Glazing



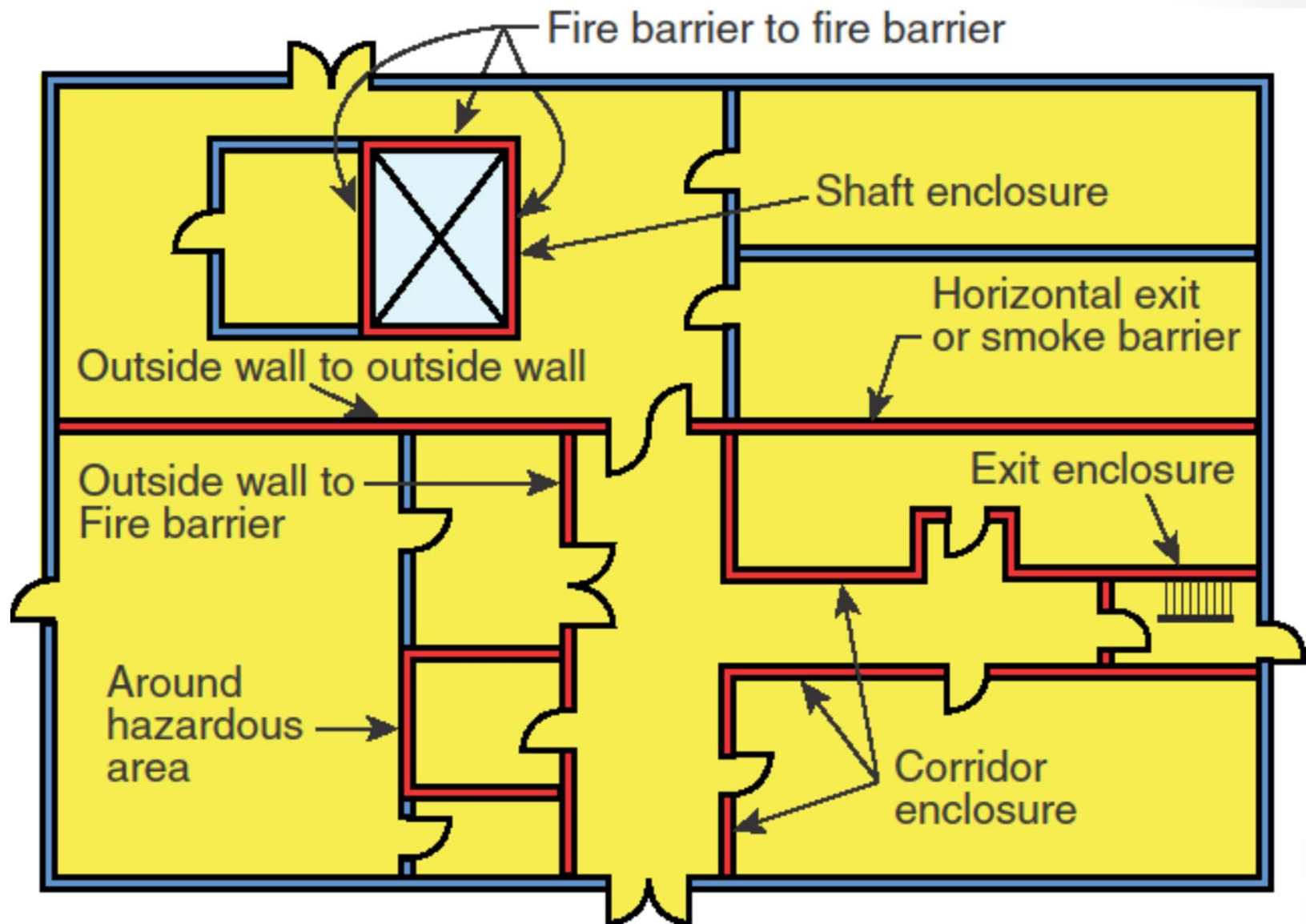
Performance Requirements

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

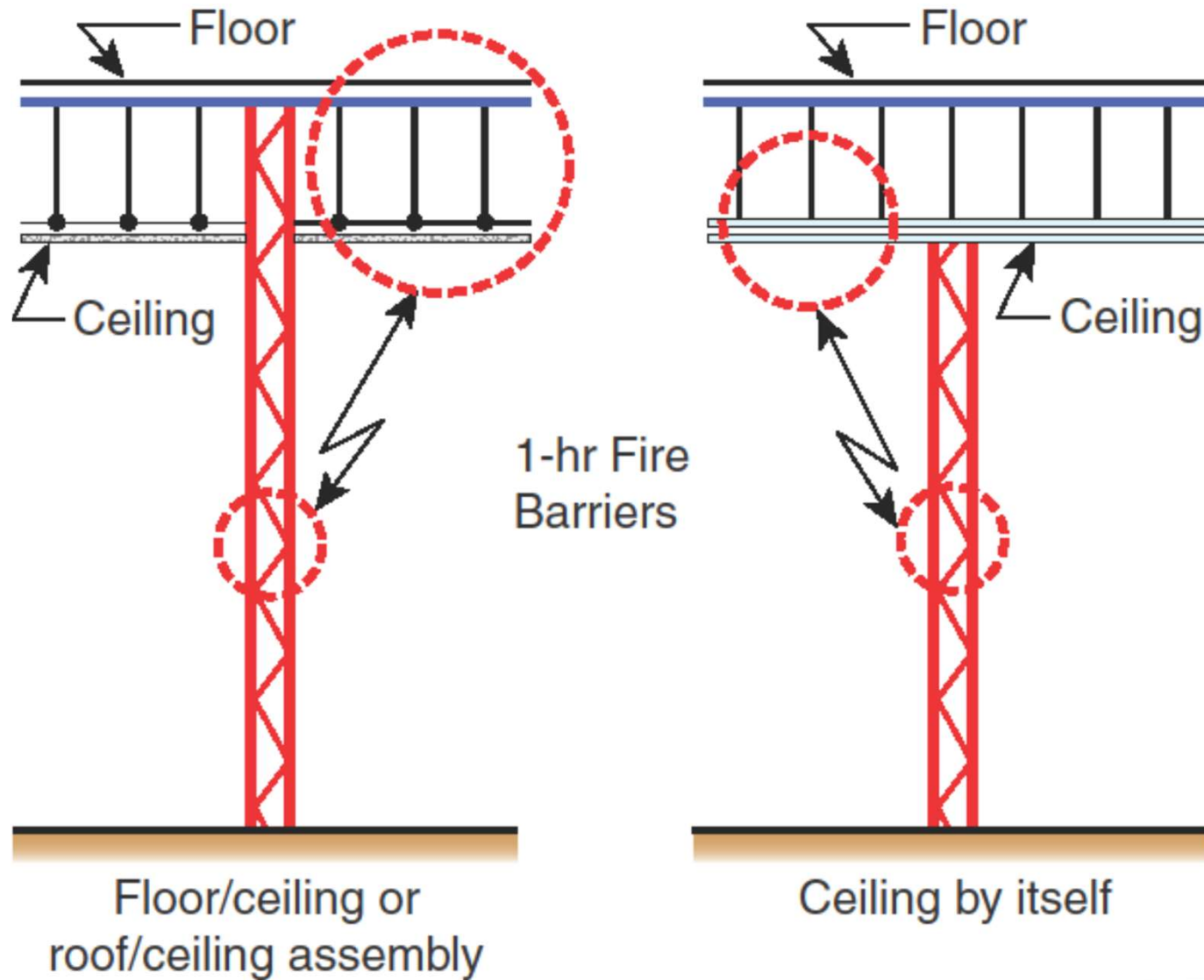
Where Is The Rated Construction?



Compartmentation



Floor/Ceiling vs. Ceiling Assembly



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 180 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), $\pm 1/16$ 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 – $\frac{3}{4}$ in. (1.9 cm)
 - Non-combustible sill – $\frac{3}{8}$ in. (0.95cm)
 - Tile – $\frac{5}{8}$ in. (1.6 cm)
 - Class I or II carpeting – $\frac{1}{2}$ in. (1.3 cm)
- Current requirement – $\frac{3}{4}$ 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

Wetted Glass Alternative

703.4 Automatic sprinklers.

Under the prescriptive fire-resistance requirements of this code, the *fire-resistance rating* of a building element, component or assembly shall be established without the use of *automatic sprinklers* or any other fire suppression system being incorporated as part of the assembly tested in accordance with the fire exposure, procedures and acceptance criteria specified in ASTM E119 or UL 263. However, this section shall not prohibit or limit the duties and powers of the *building official* allowed by [Sections 104.10](#) and [104.1](#).

- **This does not apply to atrium separation walls**

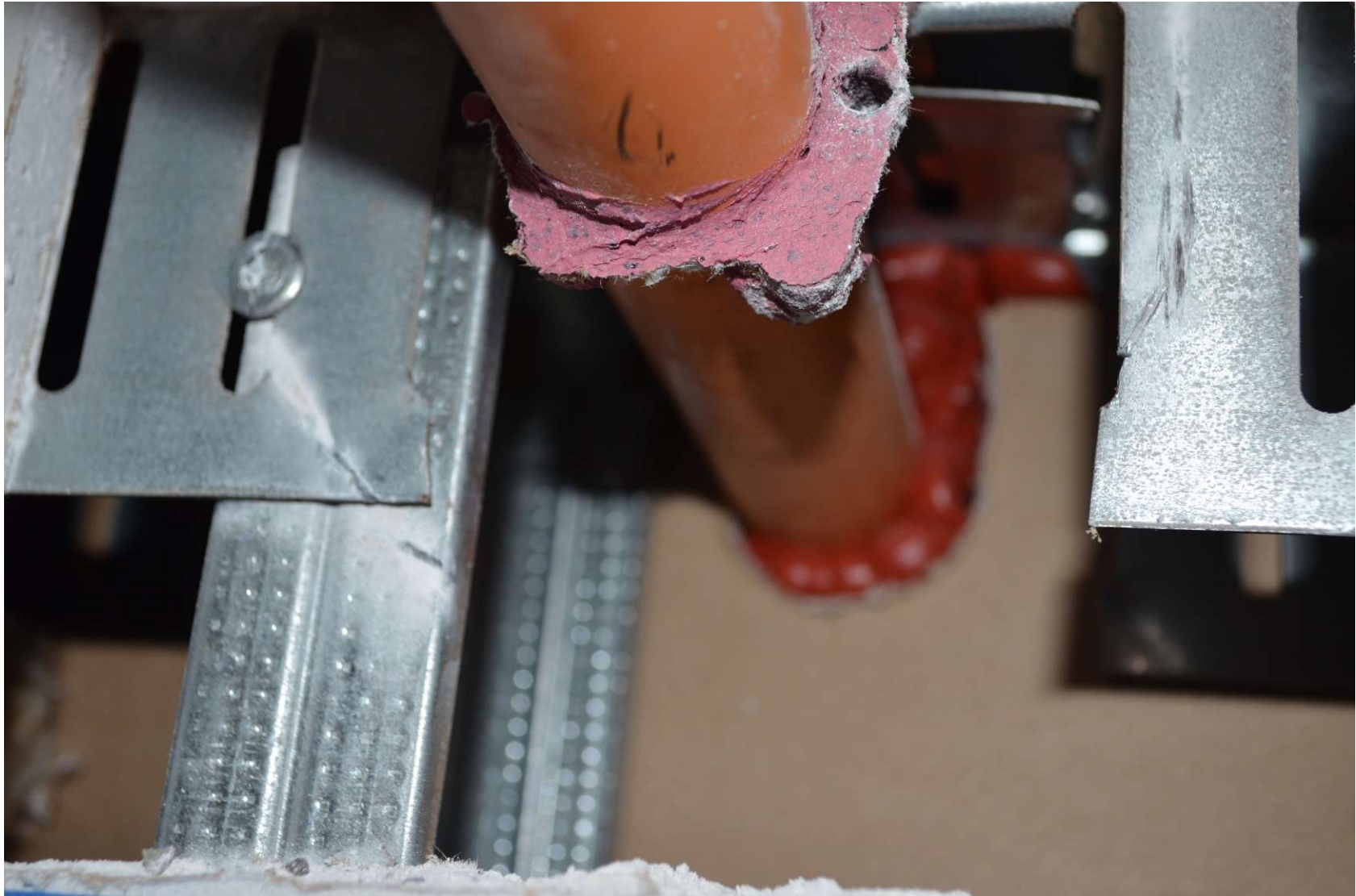
Penetrations in Fire Barriers



Penetrations in Fire Barriers



Is There Anything Wrong With This?



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Fire Partitions

- Purpose (Use)
 - Dwelling and sleeping room separation
 - Tenant separations
 - Corridors
 - Elevator lobbies
- Term “fire partition” is not used in NFPA 101

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

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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

Structural Load Bearing Walls

- Nothing in the IBC sends one to the fire barrier provisions
 - Opening protectives?
 - Penetrations?
 - Joint systems?

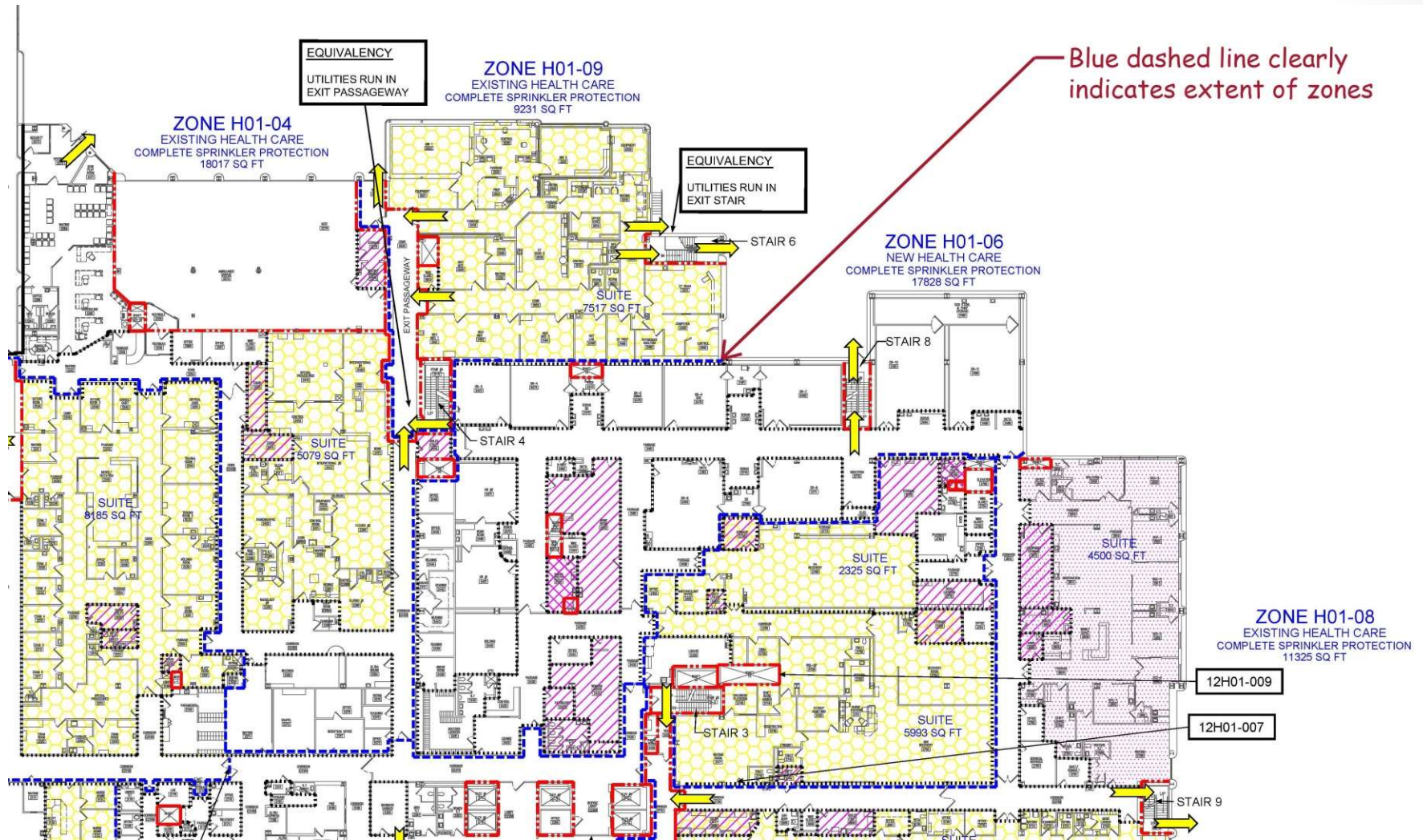
Structural Load Bearing Walls

- Nothing in the IBC sends one to the fire barrier provisions
 - Opening protectives?
 - Penetrations?
 - Joint systems?
- Often used for other purposes – Becomes a fire barrier

Structural Load Bearing Walls

- Nothing in the IBC sends one to the fire barrier provisions
 - Opening protectives?
 - Penetrations?
 - Joint systems?
- Often used for other purposes – Becomes a fire barrier
- Must maintain the integrity of the fire resistance rating
 - Temperature rise
 - 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

Inventory



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Objectives

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Questions?

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