

The Five Walls of the IBC

• *David Dodge, CSI, CDT*

Definitions

- **Fire Walls – Section 706**
- **Fire Barriers – Section 707**
- **Fire Partitions – Section 708**
- **Smoke Barriers – Section 709**
- **Smoke Partitions – Section 710**

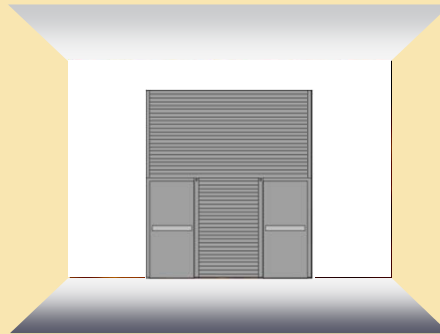
DEFINITIONS

Fire Walls

Section 706

A fire-resistance-rated wall having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall. (202)

- **Fire Ratings** (Table 706.4)
 - 2-hour
 - 3-hour
 - 4-hour
- **Opening Protection** (706.8)
- **Design Notes**
- **Applications**



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BUILDING CODE REQUIREMENTS

Opening Protectives

Section 715 (2009)

Table 715.4: Fire Door and Fire Shutter Fire Protection Ratings

Type of Assembly	Required Assembly Rating (Hours)	Minimum Fire Door & Fire Assembly Rating (Hours)
Fire Walls and Fire Barriers having a required fire-resistance rating greater than 1 hour.	4	3
	3	3 ^a
	2	1 1/2
	1 1/2	1 1/2
Fire Barriers having a required fire-resistance rating of 1 hour.	Shaft, exit enclosure and exit passageway walls	1
	Other fire barriers	3/4
Fire Partitions	Corridor walls	1/3 ^b
		0.5
	Other fire partitions	3/4
		0.5
Exterior Walls	3	1 1/2
	2	1 1/2
	1	3/4
Smoke Barriers	1	1/3 ^b

a. Two doors, each with a fire protection rating of 1 1/2 hours, installed on opposite side of the same opening in a fire wall, shall be deemed equivalent in fire protection rating to one 3-hour door.
 b. For testing requirements, see Section 715.4.3.

Opening Protectives

Section 716 (2015)

Table 716.5: Opening Fire Protection Assemblies, Ratings and Markings

Type of Assembly	Required Wall Assembly Rating (Hours)	Minimum Fire Door Shutter Assembly Rating (Hours)	Door Vision Panel Size	Fire Rated Glazing Marking Door Vision Panel	Minimum Sidelight/Transom Assembly Rating (Hours)		Fire-Rated Glazing Marking Sidelight/Transom Panel	
					Fire Protection	Fire Resistance	Fire Protection	Fire Resistance
Fire Walls and Fire Barriers having a required fire-resistance rating greater than 1 hour.	4	3	Not Permitted	Not Permitted	Not Permitted	4	Not Permitted	W-240
	3	3	Not Permitted	Not Permitted	Not Permitted	3	Not Permitted	W-180
	2	1 1/2	100 sq. in.	≤100 sq.in. = D-H-90 >100 sq.in. = D-H-W-90	Not Permitted	2	Not Permitted	W-120
	1 1/2	1 1/2	100 sq. in.	≤100 sq.in. = D-H-90 >100 sq.in. = D-H-W-90	Not Permitted	1 1/2	Not Permitted	W-90
Shaft, exit enclosures and exit passageways	2	1 1/2	100 sq. in.	≤100 sq.in. = D-H-90 >100 sq.in. = D-H-T- or D-H-T-W-90	Not Permitted	2	Not Permitted	W-120
Fire Barriers having a required fire-resistance rating of 1 hour:	1	1	100 sq. in.	≤100 sq.in. = D-H-60 >100 sq.in. = D-H-T- or D-H-T-W-60	Not Permitted	1	Not Permitted	W-60
Fire Protection								
Other fire barriers	1	3/4	Maximum size tested	D-H-NT-45	3/4		D-H-NT-45	
Fire partitions: Corridor walls	1 0.5	1/3	Maximum size tested	D-20	3/4 1/3		D-H-NT-45 D-H-NT-20	
Other fire partitions	1 0.5	3/4 1/3	Maximum size tested	D-H-45 D-H-20	3/4 1/3		D-H-45 D-H-20	

Opening Protectives

Section 715 (2009) or 716 (2012, 2015)

Table 715.4 / 716.5: Fire Door and Fire Shutter Fire Protection Ratings

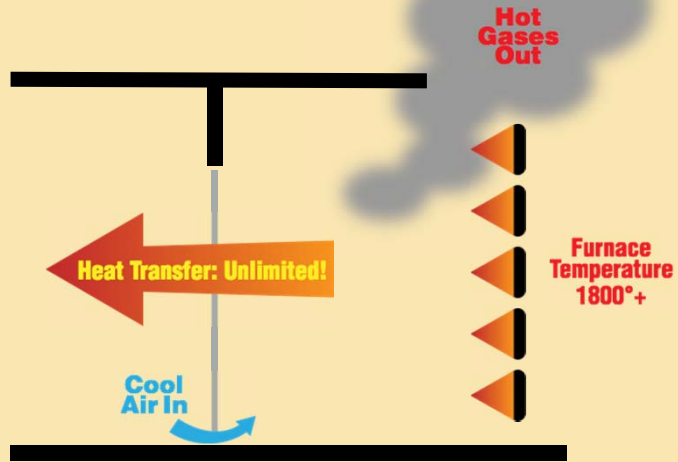
Type of Assembly	Required Assembly Rating (Hours)	Minimum Fire Door & Fire Assembly Rating (Hours)
Fire Walls and Fire Barriers having a required fire-resistance rating greater than 1 hour.	4	3
	3	3 ^a
	2	1 1/2
	1 1/2	1 1/2
Fire Barriers having a required fire-resistance rating of 1 hour.	Shaft, exit enclosure and exit passageway walls	1
	Other fire barriers	3/4
Fire Partitions	Corridor walls	1/3 ^b 1/3 ^b
	Other fire partitions	3/4 1/3
	Exterior Walls	3 2 1
Smoke Barriers	1	1/3 ^b

a. Two doors, each with a fire protection rating of 1 1/2 hours, installed on opposite side of the same opening in a fire wall, shall be deemed equivalent in fire protection rating to one 3-hour door.
 b. For testing requirements, see Section 715.4.3.

TEST CRITERIA

NFPA 252

UL 10B (Fire Protection Rating)



TEST CRITERIA

Hose Stream

UL 10B (Fire Protection Rating)



TEST CRITERIA

Hose Stream

UL 10B (Fire Protection Rating)



TEST CRITERIA

Hose Stream

UL 10B (Fire Protection Rating)

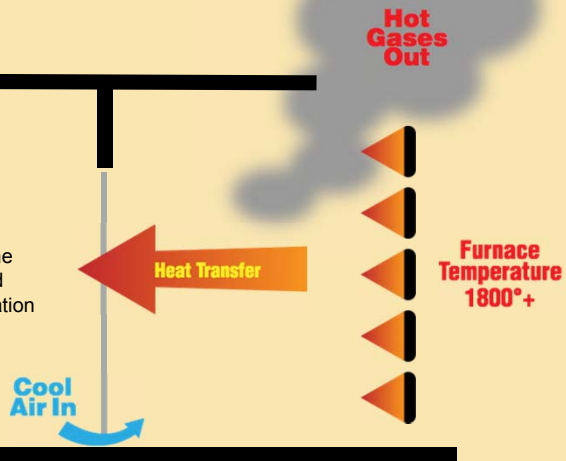


TEST CRITERIA

NFPA 252 (Fire Protection)

Temperature Rise (Fire Protection Rating)

Heat Transfer:
After the first 30 minutes the unexposed side of the assembly cannot exceed 450 degrees for the duration of the test.

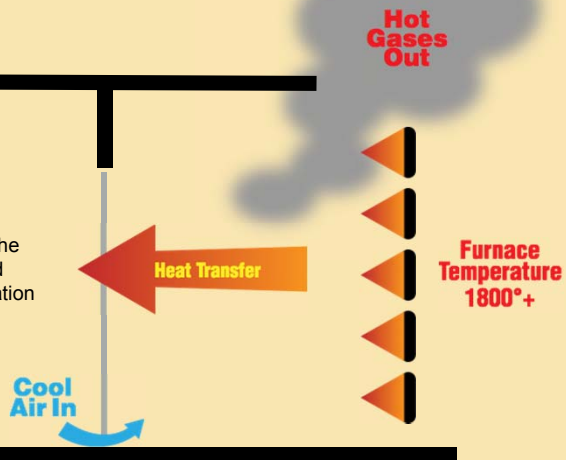


TEST CRITERIA

ASTM E-119

UL 263 (Fire Resistance Rating)

Heat Transfer:
The unexposed side of the assembly cannot exceed 250 degrees for the duration of the test.

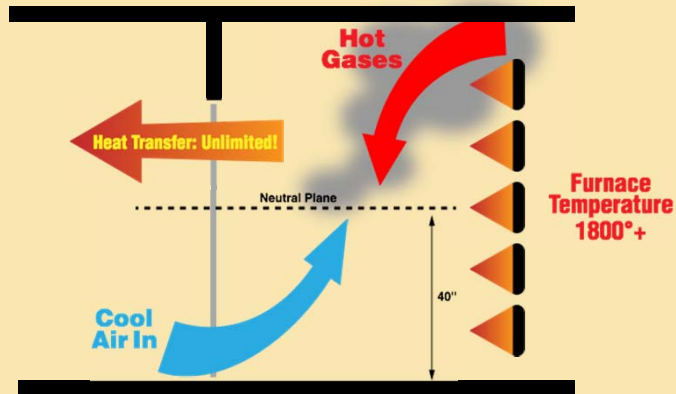


TEST CRITERIA

Positive Pressure Test

40" Neutral Plane (Fire Protection Rating)

UL 10C



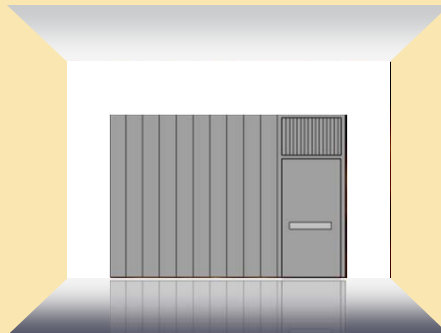
DEFINITIONS

Fire Barriers

Section 707

A fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained. (202)

- **Fire Ratings** (Table 707.3)
 - 1-hour
 - 2-hour
 - 3-hour
 - 4-hour
- **Opening Protection** (707.6)
- **Design Notes**
- **Applications**

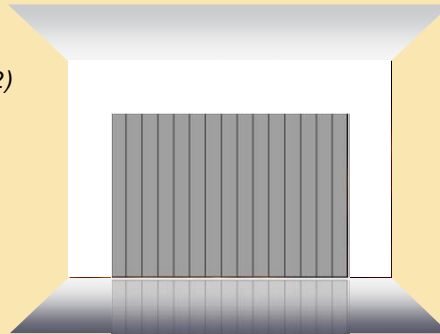


Fire Partitions

Section 708

A vertical assembly of materials designed to restrict the spread of fire in which openings are protected. (202)

- **Fire Ratings** (Table 708.3)
 - 1-hour
 - 1/2-hour (708.3, Exceptions #1 & #2)
- **Opening Protection**
- **Design Notes**
- **Applications**



Opening Protectives

Section 715 (2009) or 716 (2012, 2015)

Table 715.4 / 716.5: Fire Door and Fire Shutter Fire Protection Ratings

Type of Assembly	Required Assembly Rating (Hours)	Minimum Fire Door & Fire Assembly Fire Rating (Hours)
Fire Walls and Fire Barriers having a required fire-resistance rating greater than 1 hour.	4	3
	3	3 ^a
	2	1 1/2
	1 1/2	1 1/2
Fire Barriers having a required fire-resistance rating of 1 hour.	Shaft, exit enclosure and exit passageway walls	1
	Other fire barriers	3/4
Fire Partitions	Corridor walls	1/3 ^b
		0.5
	Other fire partitions	3/4
		0.5
Exterior Walls	3	1 1/2
	2	1 1/2
	1	3/4
Smoke Barriers	1	1/3 ^b

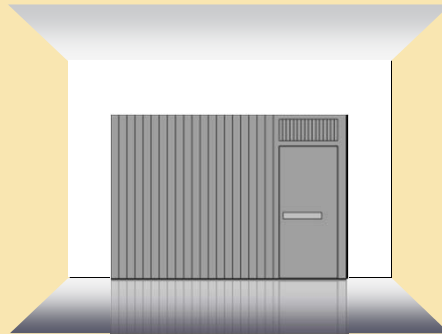
a. Two doors, each with a fire protection rating of 1 1/2 hours, installed on opposite side of the same opening in a fire wall, shall be deemed equivalent in fire protection rating to one 3-hour door.
 b. For testing requirements, see Section 715.4.3.

Smoke Barriers

Section 709

A continuous membrane, either vertical or horizontal, such as a wall, floor, or ceiling assembly that is designed and constructed to restrict the movement of smoke. (202)

- **Fire Ratings** (709.3)
1-hour
- **Opening Protection**
- **Design Notes**
- **Applications**



Smoke Partitions

Section 710

A partition constructed to limit the transfer or passage of smoke. (710.4)

- **Fire Ratings** (Table 710.3)
Non-rated
- **Opening Protection**
- **Design Notes**
- **Applications**



Types of Construction

Chapter 6

	Level of Protection		
	Construction Type	Most Elements Protected	Most Elements Unprotected
Non-combustible Exterior, interior (bearing or non-bearing) walls, floors, roofs and structural elements to be of non-combustible materials	I	A	B
	II	A	B
Combustible Exterior walls to be of non-combustible materials	III	A	B
	IV	HT (Heavy Timber)	
	V	A	B

Vertical Opening Separation

- Fundamental Guidelines
- Exit Access Stairs
- Vertical Openings – Escalator
- Interior Exit Stairs
- Atriums
- Vertical Compartmentation



Fundamental Guidelines (2009)

Sections 708, 1016 & 1022

Vertical openings between floors – in various shapes, heights and uses – are a frequently-used design element in multi-story buildings. For the purposes of code enforcement the following general categories are described in the building code:

1. Shaft Enclosures (708)

- a. Escalators (708.2, Exception #2)
- b. Mezzanines (708.2, Exception #9)
- c. Stairs or ramps (708, 1020)
- d. Elevators & dumbwaiters (708.14)

2. Atriums (404)

3. Vertical Exit Enclosures (Section 1022)

4. Non-egress and/or communicating stairs (708.2, Exception #11 & 1016.1, Exception #3 & #4)

Non-Egress Stairs (2009)

Sections 708.2; 1016.1; 1021.1; 1022.1

Exception #7

7. In other than Groups I-2 and I-3, a shaft enclosure is not required for a floor opening or an air transfer opening that complies with the following:

- 7.1. Does not connect more than two stories.
- 7.2. Is not part of the required means of egress system.
- 7.3. Is not concealed within the construction of a wall or a floor/ceiling assembly.
- 7.4. Is not open to a corridor in Group I and R occupancies.
- 7.5. Is not open to a corridor on nonsprinklered floors in any occupancy.
- 7.6. Is separated from floor openings ...
- 7.7. Is limited to the same smoke compartment.

Non-Egress Stairs (2009)

Sections 708.2; 1016.1; 1021.1; 1022.1

Exception #11

11. A shaft enclosure shall not be required for floor openings created by unenclosed stairs or ramps in accordance with Exception 3 or 4 in Section 1016.1

Non-Egress Stairs (2009)

Sections 708.2; 1016.1; 1021.1; 1022.1

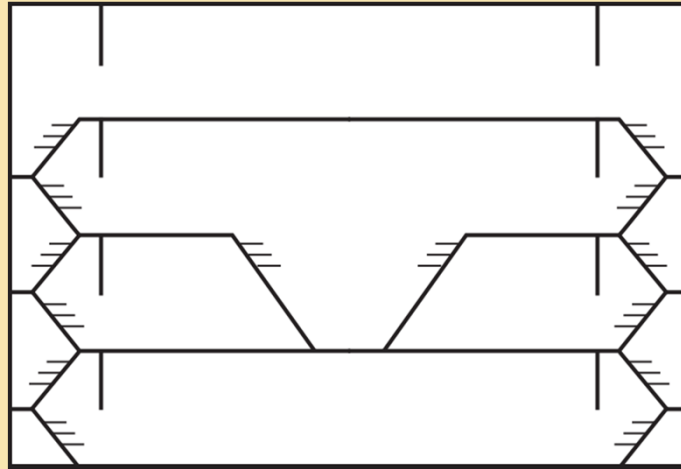
1016.1 Travel distance limitations.

Exceptions:

3. In other than Groups H and I, the exit access travel distance to a maximum of 50 percent of the exits is permitted to be measured from the most remote point within a building to an exit using unenclosed exit access stairways or ramps when connecting a maximum of two stories. The two connected stories shall be provided with at least two means of egress. Such interconnected stories shall not be open to other stories.

Non-Egress Stairs (2009)

Sections 708.2; 1016.1; 1021.1; 1022.1



Non-Egress Stairs (2009)

Sections 708.2; 1016.1; 1021.1; 1022.1

1016.1 Travel distance limitations.

Exceptions:

4. In other than Groups H and I, the exit access travel distance to a maximum of 50 percent of the exits is permitted to be measured from the most remote point within a building to an exit using unenclosed exit access stairways or ramps **in the first and second stories above grade plane in building equipped throughout with an automatic sprinkler system ...** **The first and second stories above grade plane** shall be provided with at least two means of egress. Such interconnected stories shall not be open to other stories.

Non-Egress Stairs (2009)

Sections 708.2; 1016.1; 1021.1; 1022.1

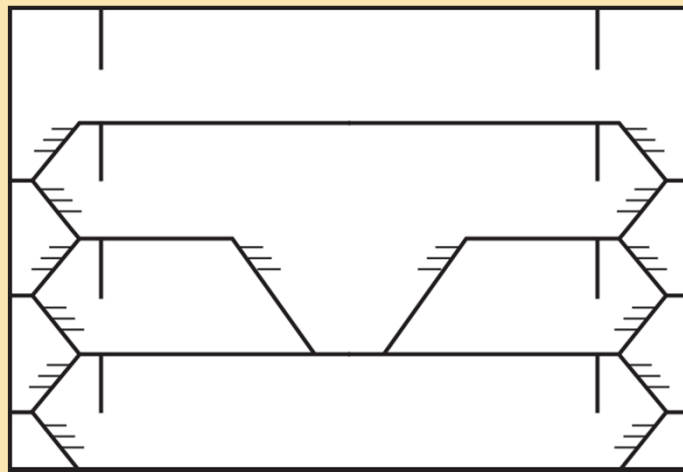
1021.1 Exits from stories.

Exceptions:

3. Exit access stairways and ramps that comply with Exception 3 or 4 of Section 1016.1 shall be permitted to provide the minimum number of approved exits required by Table 1021.1 on each story.

Non-Egress Stairs (2009)

Sections 708.2; 1016.1; 1021.1; 1022.1



2009	2012
701 General	701 General
702 Definitions	702 Definitions
703 Fire-resistance Ratings and Fire Tests	703 Fire-resistance Ratings and Fire Tests
704 Fire-resistance Rating of Structural Members	704 Fire-resistance Rating of Structural Members
705 Exterior Walls	705 Exterior Walls
706 Fire Walls	706 Fire Walls
707 Fire Barriers	707 Fire Barriers
708 Shaft Enclosures	713 Shaft Enclosures
709 Fire Partitions	708 Fire Partitions
710 Smoke Barriers	709 Smoke Barriers
711 Smoke Partitions	710 Smoke Partitions
712 Horizontal Assemblies	712 Vertical Openings
713 Penetrations	714 Penetrations
714 Fire-resistant Joint Systems	715 Fire-resistant Joint Systems
715 Opening Protectives	716 Opening Protectives
716 Ducts and Air Transfer Openings	717 Ducts and Air Transfer Openings
717 Concealed Spaces	718 Concealed Spaces
718 Fire-resistance Requirements for Plaster	719 Fire-resistance Requirements for Plaster
719 Thermal- and Sound-insulating Materials	720 Thermal- and Sound-insulating Materials
720 Prescriptive Fire Resistance	721 Prescriptive Fire Resistance
721 Calculated Fire Resistance	722 Calculated Fire Resistance

BUILDING CODE REQUIREMENTS

Shaft Enclosures

Section 708.2 (2009) Exceptions Shuffle

Section 708 has been divided into two separate sections:

1. Section 713 Shaft Enclosures - this section addresses the basic provisions of shaft construction and elevator lobby.
2. Section 712 Vertical Openings - this section addresses the previous 16 exceptions located in Section 708.2.

Vertical Openings

Section 712

Section 712.1.12 Unenclosed stairs and ramps. Vertical floor openings created by unenclosed stairs or ramps in accordance with Sections 1009.2 and 1009.3 shall be permitted.

Section 1009.2 Interior exit stairways.

Section 1009.2.2 Enclosure. All interior exit stairways shall be enclosed in accordance with the provisions of Section 1022.

Section 1009.3 Exit access stairways. Floor openings between stories created by exit access stairways shall be enclosed.

Exceptions:

1. In other than I-2 and I-3 occupancies, exit access stairways that serve, or atmospherically communicate between, only two stories are not required to be enclosed.

Vertical Openings

Section 712

2012 Edition

Section 712.1.12 Unenclosed stairs and ramps. Vertical floor openings created by unenclosed stairs or ramps in accordance with Sections 1009.2 and 1009.3 shall be permitted.

2015 Edition

Section 712.1.12 Exit access stairways and ramps. Vertical openings containing exit access stairways or ramps in accordance with Section 1019 shall be permitted.

Section 202 - Exit Access Stairway (not defined in the 2009 edition but used as a new term in Sections 1007, 1016 & 1021)

2012 Edition

An interior stairway that is not a required interior exit stairway.

2015 Edition

A stairway with(in) the exit access portion of the means of egress system.

Number of Exits & Exit Configuration

Section 1021

2012 Edition

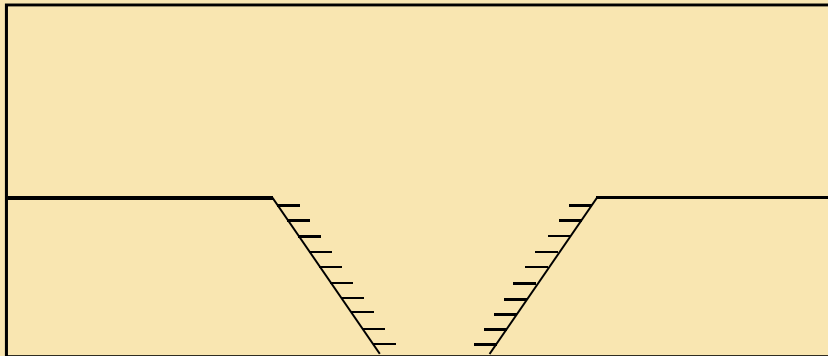
Section 1021.1 General. Each story and occupied roof shall have the minimum number of exits, or access to exits as specified in this section. The required number of exits, or exit access stairways or ramps providing access to exits, from any story shall be maintained until arrival at grade or a public way ... Each story above the second story of a building shall have a minimum of one interior or exterior exit stairway ... at each story above the second story that requires a minimum of three or more exits, or access to exits, a minimum of 50 percent of the required exits shall be interior exit stairways ...

2015 Edition

Section 1006.3 Egress from stories or occupied roofs ... Each story above the second story of a building shall have not less than one interior or exterior exit stairway ...

Number of Exits & Exit Configuration

Section 1021



Number of Exits & Exit Configuration

Section 1006

Table 1021.2(2): Stories with One Exit or Access to One Exit for Other Occupancies

Story	Occupancy	Maximum Occupants Per Story	Maximum Common Path of Egress Travel Distance (feet)
First story above or below grade plane	A, B ^a , E, F, M, U, S	49	75
	H-2, H-3	3	25
	H-4, H-5, I, R-1, R-2, R-4	10	75
	S	29	75
Second story above grade plane	B, F, M, S	29	75
Third story above grade plane and higher	NP	NA	NA