



1

KEY CONCEPT



Fire Safety Requirements

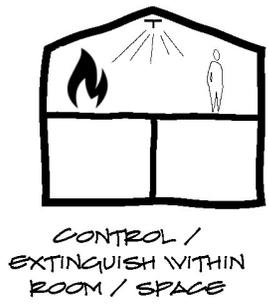
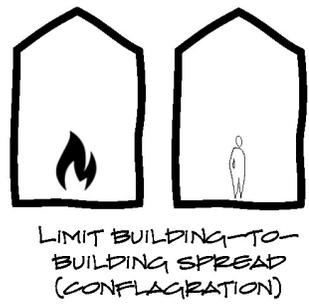
- Code includes interrelated strategies to protect people and property from fire and other hazards
 - Fire-resistance-rated and smoke resistant construction
 - Interior finishes
 - Fire protection and life safety systems
 - Means of egress
- Chapter 7 deals with “passive” fire resistance



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Fire Safety Requirements (continued)

- Structural fire endurance
- Limit spread of fire from building to building
- Limit spread of fire and smoke from space to space



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Fire Resistant Construction

For more information, see **Module 4** in the *Chicago Plan Review Manual*

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KEY CONCEPT



Fire-resistance Rated Construction

Chapter 7 provides requirements for:

- Structural members
- Walls and partitions
- Floors
- Roofs
- Opening protectives
- Penetrations

Note: marking fire-resistance rated walls in accessible concealed spaces and equipment rooms required by Sec. 703.7.



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KEY CONCEPT



Ratings

- **Fire-resistance rating** – Relative duration a building, element, component, or assembly is expected to maintain the ability to confine a fire, perform a given structural function, or both, as determined by testing data or calculations derived from testing data.
- **Fire protection rating** – Relative duration that an opening protective (window, door, fire shutter, etc.) is expected to maintain the ability to confine a fire, as determined by testing data.



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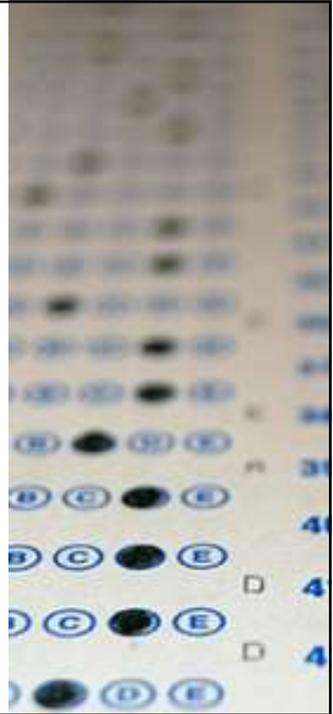
KEY CONCEPT



Multiple Use Fire Assemblies

Assemblies that serve multiple purposes must comply with all fire-resistive requirements that are applicable for each purpose. For example:

- A wall may be a load-bearing wall (required to have a fire-resistance rating based on construction type) and must comply with Section 704.1.
- An incidental use separation (required to have a fire-resistance rating by Section 509) must be a fire barrier and comply with Section 707.
- A corridor wall (required to have a fire-resistance rating by Section 1020) must be a fire partition and comply with Section 708.



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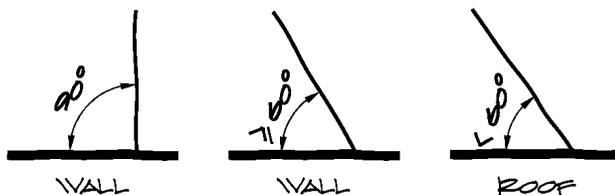
Exterior Walls

For more information, see **Module 4** in the *Chicago Plan Review Manual*

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Exterior Walls

- Exterior walls are required to be fire-resistance rated based on both construction type (if load bearing) and fire-separation distance.
- Exterior surfaces with a slope less than 60° from horizontal, such as windowsills and the top surface of parapets, must meet requirements for roofs.



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KEY CONCEPT



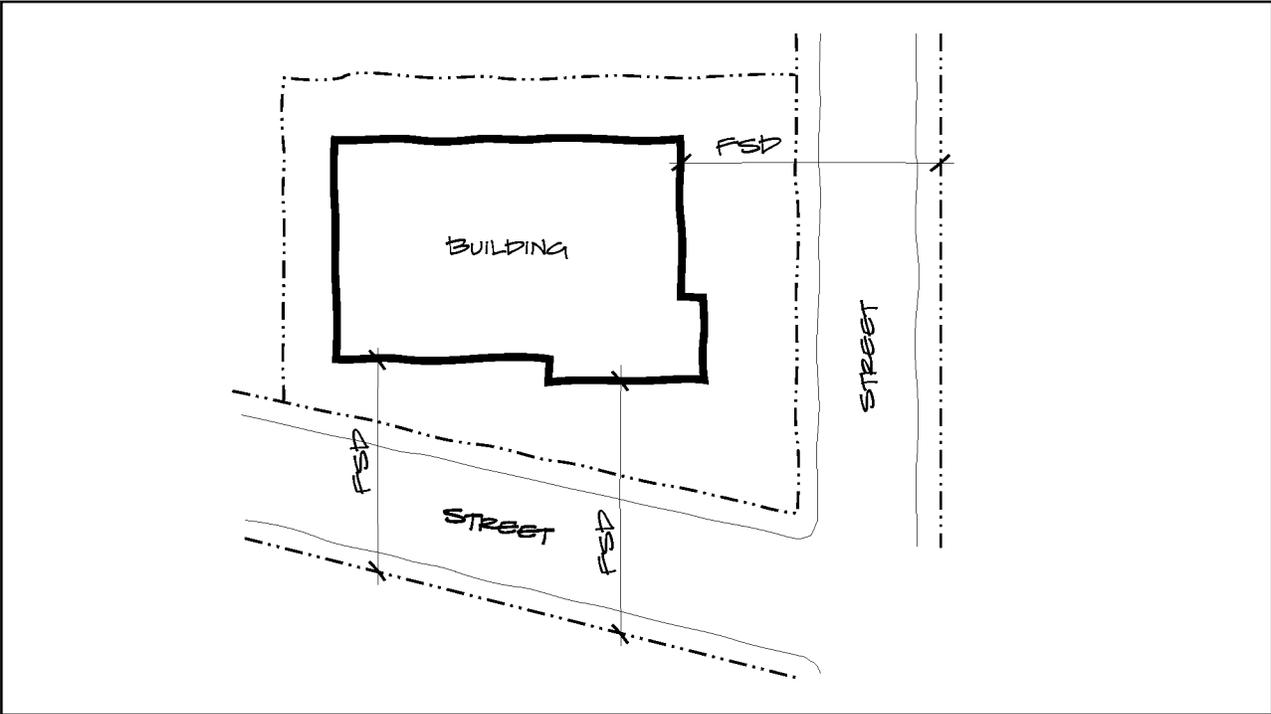
Fire Separation Distance

- The horizontal distance measured from the building face or element to one of the following:
 1. The closest *abutting property line*.
 2. The far boundary of a *public way* adjoining the lot.
 3. An imaginary line between two *buildings* on the same lot.

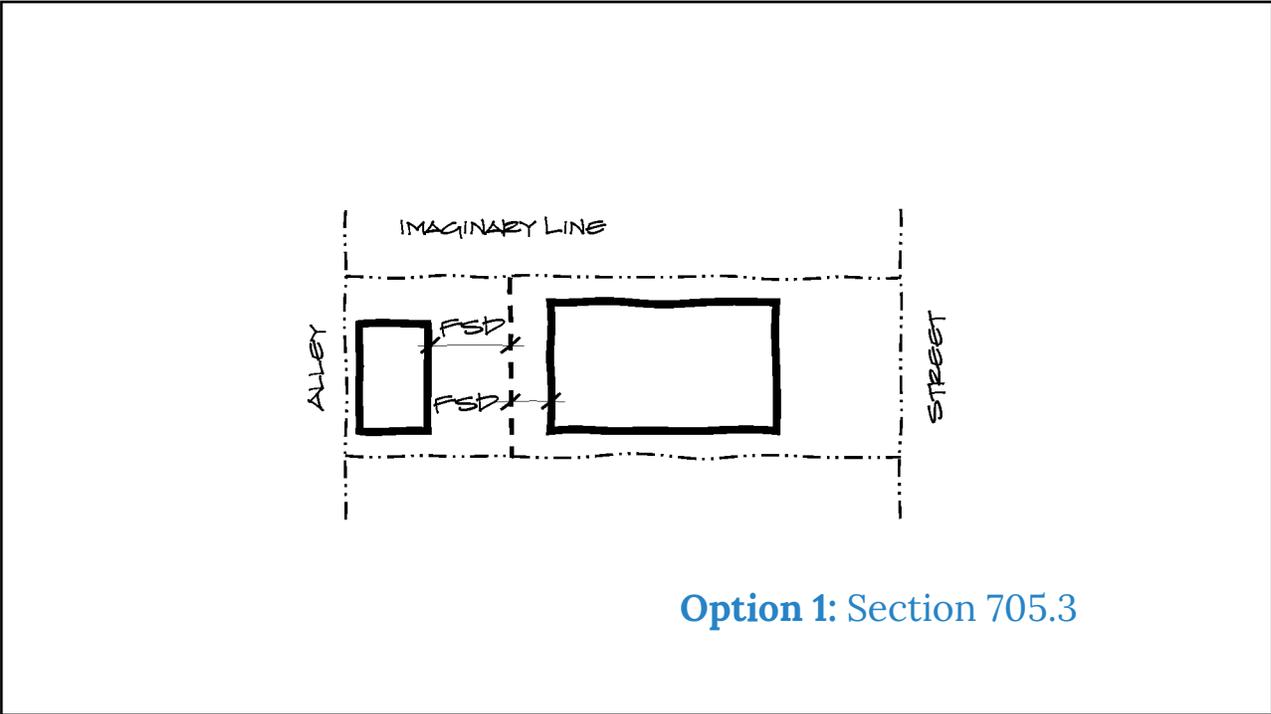
The distance shall be measured at right angles from the face of a wall or edge of a building element.

- FSD is used to determine the required characteristics of exterior walls, openings in exterior walls, projections from exterior walls, and some features of occupiable rooftops.

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Option 1: Section 705.3

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Easements

- Legal right to use another's land for a specified purpose, either temporarily or permanently
- Easements may be used for fire separation distance or to establish yards for natural light and ventilation
- Easements must be permanent, shown on survey, and verified through ACAR process



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Exterior Wall Requirements

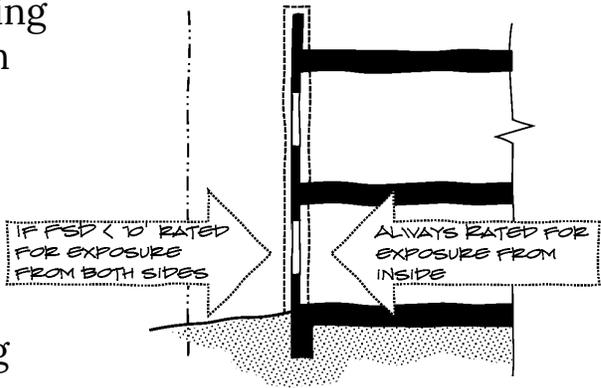
- Materials
- Fire-resistance Rating
- Opening Protectives
- Ducts and Air Transfer Openings
- Parapets
- Joints



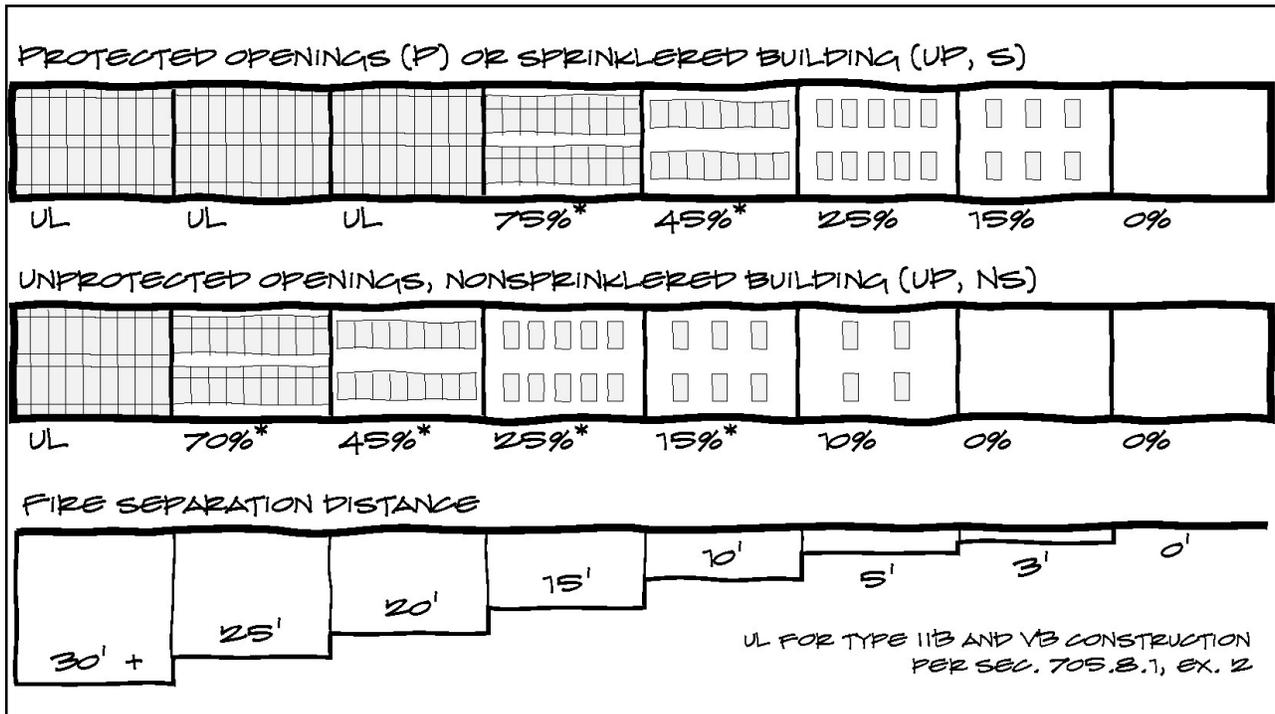
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Exterior Wall Requirements (continued)

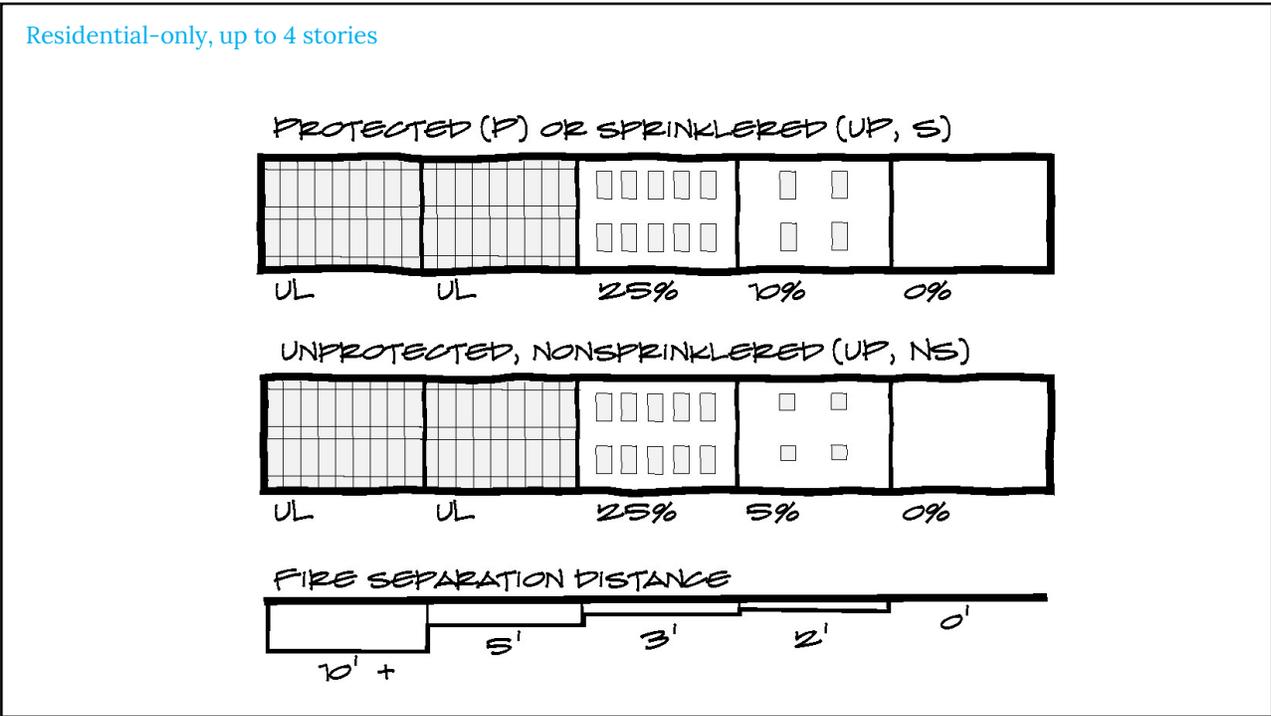
- Fire-resistance rating for nonbearing walls per Table 602 (fire separation distance)
- Fire-resistance rating for bearing walls—stricter of Table 601 (construction type) or 602 (fire separation distance)
- If FSD ≥ 10 ft, fire-resistance rating required from interior only



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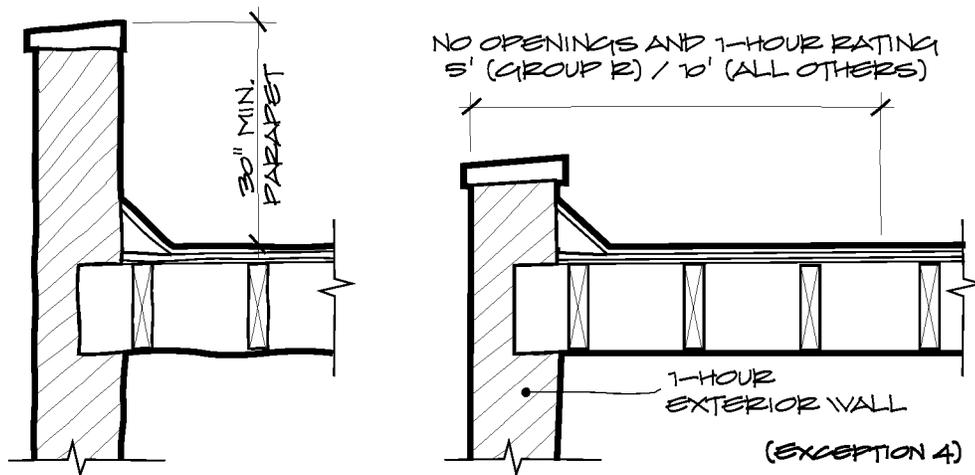
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Exterior Wall Requirements (continued)

- When ducts and air transfer openings penetrate an exterior wall, they must be protected, unless exception applies.
 - Exception for foundation vents, residential kitchen and clothes dryer exhaust.
- 30" parapets are required, unless exception applies.
 - 5 exceptions, including FSD, building type/area, and rated roof construction
- Materials used to protect joints (such as expansion joints) must have a fire-resistance rating, but area doesn't count toward area of openings.

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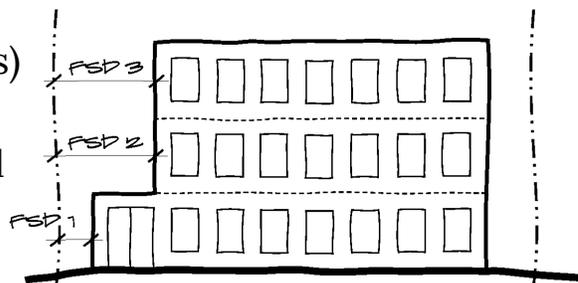
Exterior Wall Requirements (continued)



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Exterior Wall Requirements (continued)

- Area of protected and unprotected openings per Tables 705.8(2) (residential buildings up to 4 stories) and 705.8(1) (all other buildings)
- Requirement is applied to each wall and each story.
- Where both protected and unprotected openings are used, sum of ratios of actual to allowable area must not exceed 1.

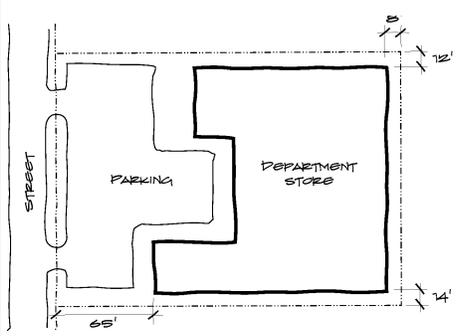


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Exterior Wall Activity (p. II-24)

- Determine the required fire-resistance rating for each wall of the fully-sprinklered single-story Type IIB department store shown:



	North	East	South	West
Fire separation distance				
Bearing wall				
Nonbearing wall				
Area of Openings				

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Exterior Wall Projections

For more information, see **Module 4** in the *Chicago Plan Review Manual*

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Exterior Wall Projections

- Chicago-specific definitions for “deck,” “porch,” and “exterior balcony”
- Also include: gutters/downspouts, bay windows, cornices
- Check separation distance (24” min.)
- Check materials
 - Table 705.2.1 for any construction type
 - Table 705.2.2 for Type III, IV or V construction
- Check % perimeter coverage



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FOR EXAMPLE



Exterior Wall Projections (continued)

TABLE 705.2.1
PROJECTIONS FROM WALLS OF ANY TYPE OF CONSTRUCTION*

Type of Projection	MATERIAL TYPE	Fire Separation Distance (feet) ^b			
		0 to less than 3	3 to less than 5	5 to less than 10	10 or greater
Cornices, eave overhangs, bay windows, oriel windows and similar decorative projections on <i>buildings</i> not exceeding 40 feet in <i>building height</i>	U	No	Yes	Yes	Yes
	P	Yes	Yes	Yes	Yes
Cornices, eave overhangs, bay windows, oriel windows and similar decorative projections on <i>buildings</i> greater than 40 feet in <i>building height</i>	U	No	No	No	No
	P	No	No	No	Yes
	PNC	Yes	Yes	Yes	Yes
Gutters and downspouts on buildings not exceeding 40 feet in <i>building height</i>	U	No	Yes	Yes	Yes
	UNC	Yes	Yes	Yes	Yes
Gutters and downspouts on buildings greater than 40 feet in <i>building height</i>	U	No	No	No	No
	UNC	Yes	Yes	Yes	Yes
Exterior balconies, each not exceeding 100 square feet in area, on <i>buildings</i> not exceeding 55 feet in <i>building height</i>	U	No	Yes	Yes	Yes
	UNC	Yes	Yes	Yes	Yes
Exterior balconies, each not exceeding 100 square feet in area, on <i>build-</i>	U	No	No	No	No

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FOR EXAMPLE



Exterior Wall Projections (continued)

**TABLE 705.2.1
PROJECTIONS FROM WALLS OF ANY TYPE OF CONSTRUCTION***

Type of Projection	MATERIAL TYPE	Fire Separation Distance (feet) ^b			
		0 to less than 3	3 to less than 5	5 to less than 10	10 or greater
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	P	Yes	Yes	Yes	Yes
Cornices, eave overhangs, bay windows, oriel windows and similar decorative projections on <i>buildings</i> greater than 40 feet in <i>building height</i>	U	No	No	No	No
	P	No	No	No	Yes
	PNC	Yes	Yes	Yes	Yes
Gutters and downspouts on buildings not exceeding 40 feet in <i>building height</i>	U	No	Yes	Yes	Yes
	UNC	Yes	Yes	Yes	Yes
Gutters and downspouts on buildings greater than 40 feet in <i>building height</i>	U	No	No	No	No
	UNC	Yes	Yes	Yes	Yes
Exterior balconies, each not exceeding 100 square feet in area, on <i>buildings</i> not exceeding 55 feet in <i>building height</i>	U	No	Yes	Yes	Yes
	UNC	Yes	Yes	Yes	Yes
Exterior balconies, each not exceeding 100 square feet in area, on <i>buildings</i> greater than 55 feet in <i>building height</i>	U	No	No	No	No

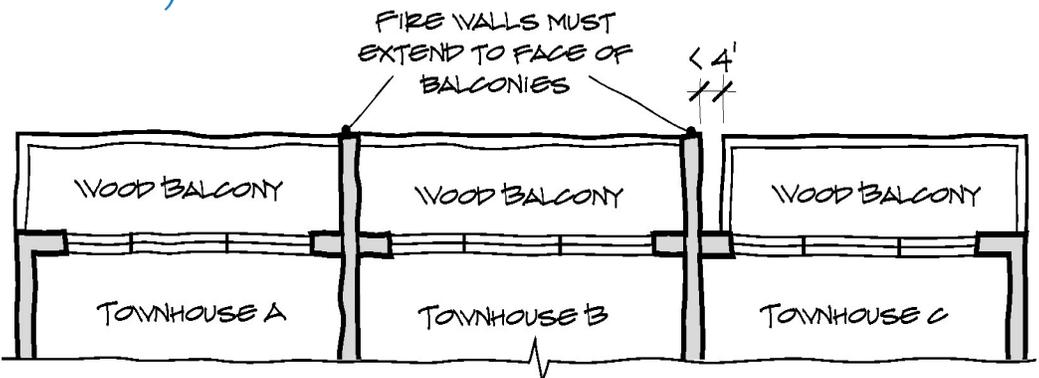
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Fire Walls

For more information, see **Module 4** in the *Chicago Plan Review Manual*

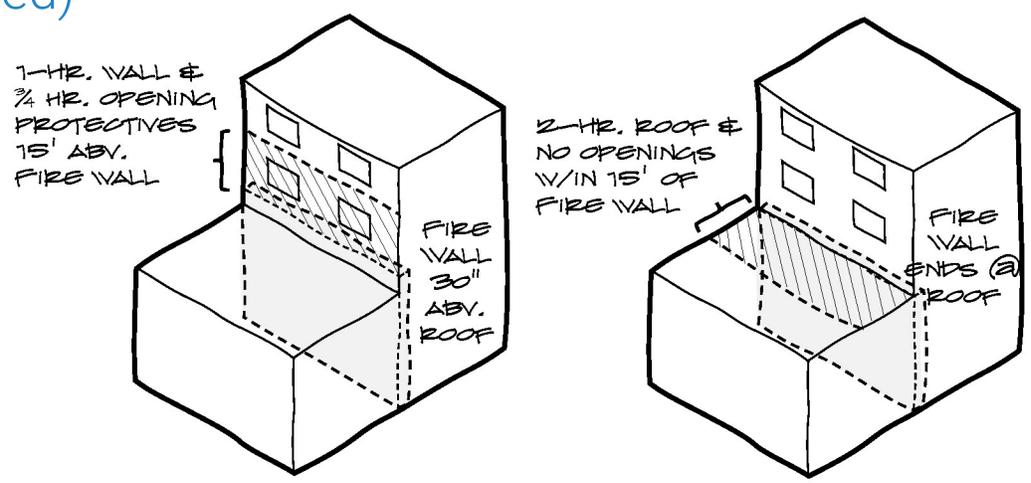
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Fire Walls (continued)

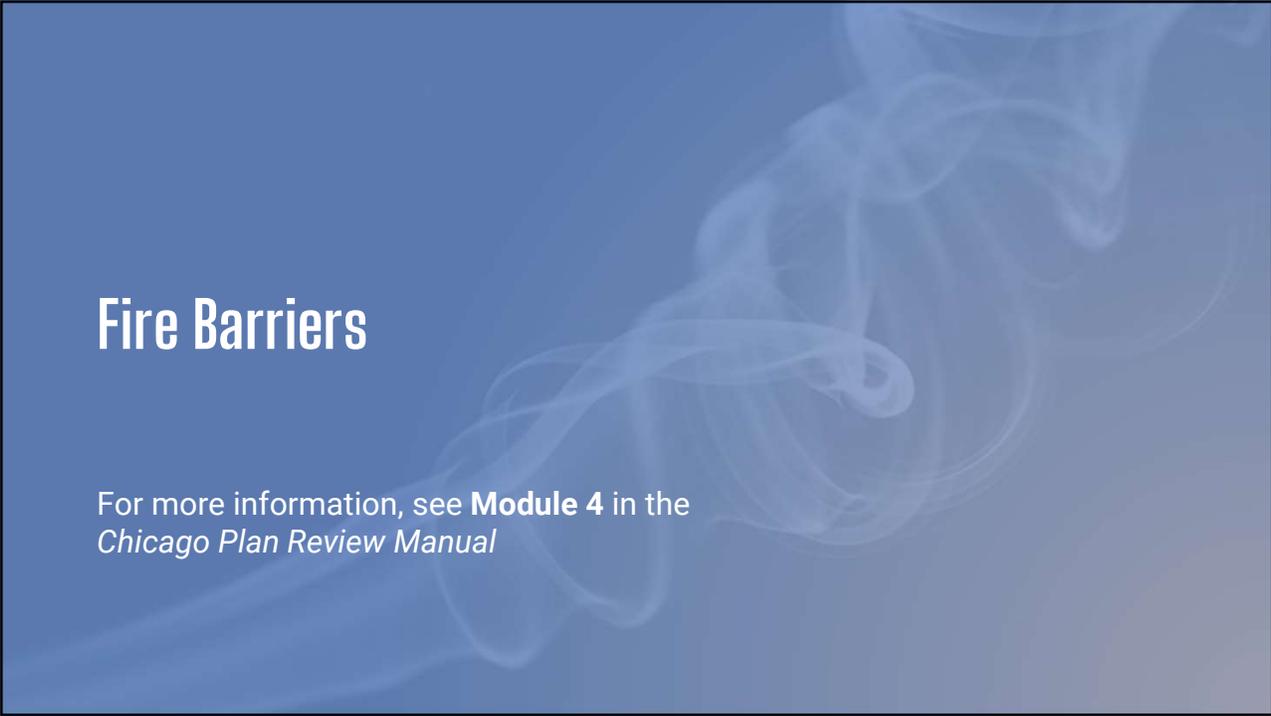


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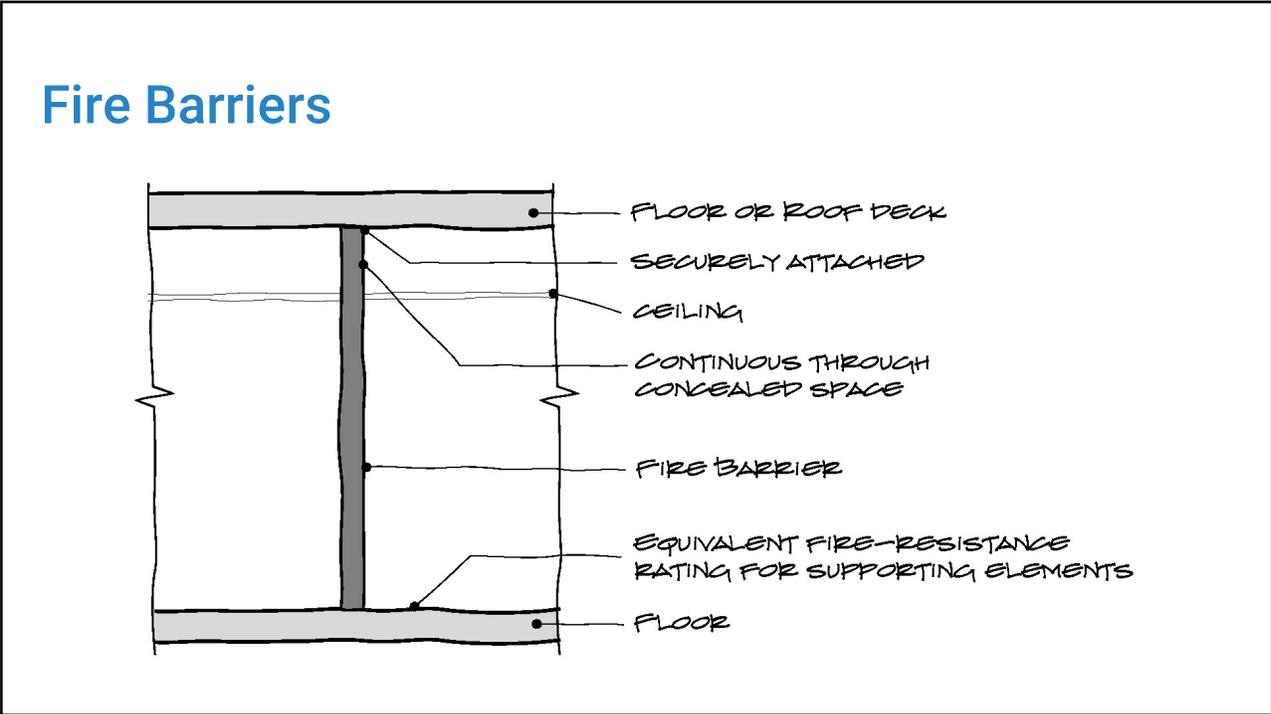
Fire Walls (continued)



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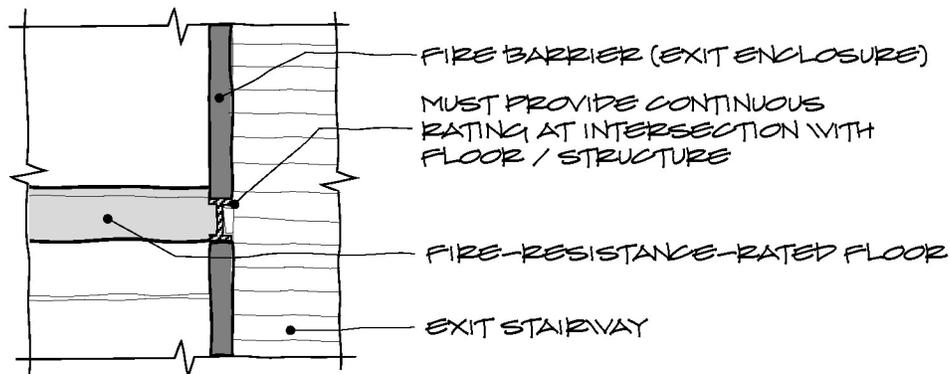
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Fire Barriers (continued)

- Most fire-resistance-rated walls are required to be fire barriers:
 - Mixed-occupancy separations (Sec. 508.4)
 - Incidental use separations (Sec. 509)
 - Fire area separations (Ch. 9; Table 707.3.10)
 - Exit enclosures (Sec. 707.3.3, 1023.2)
- Hourly rating based on purpose.
- If multi-purpose, highest requirement.

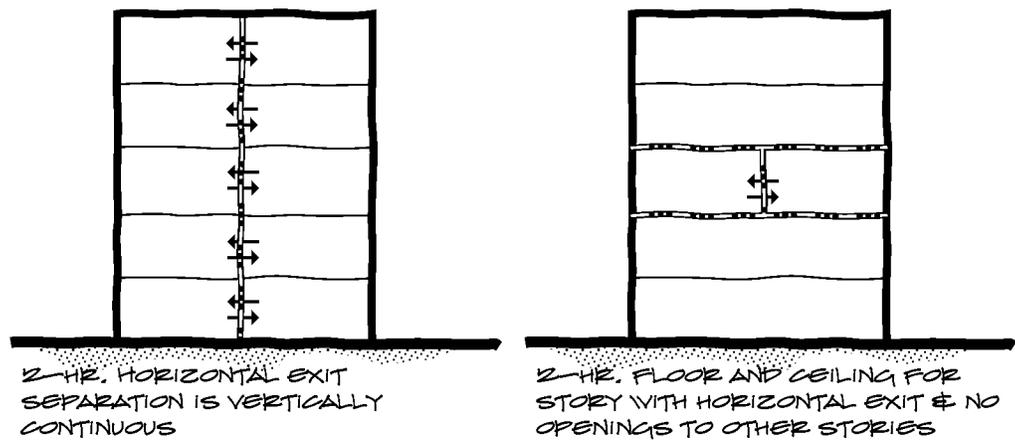
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Fire Barriers (continued)



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Fire Barriers (continued)



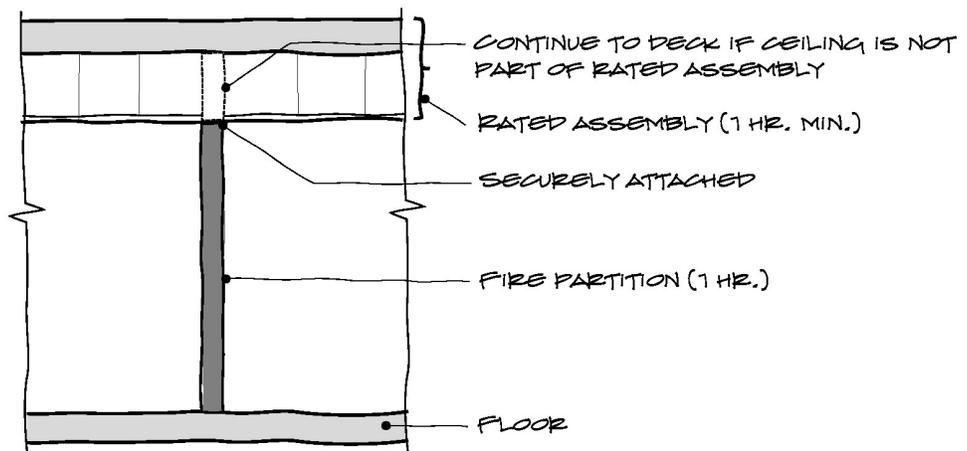
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Fire Partitions

For more information, see **Module 4** in the *Chicago Plan Review Manual*

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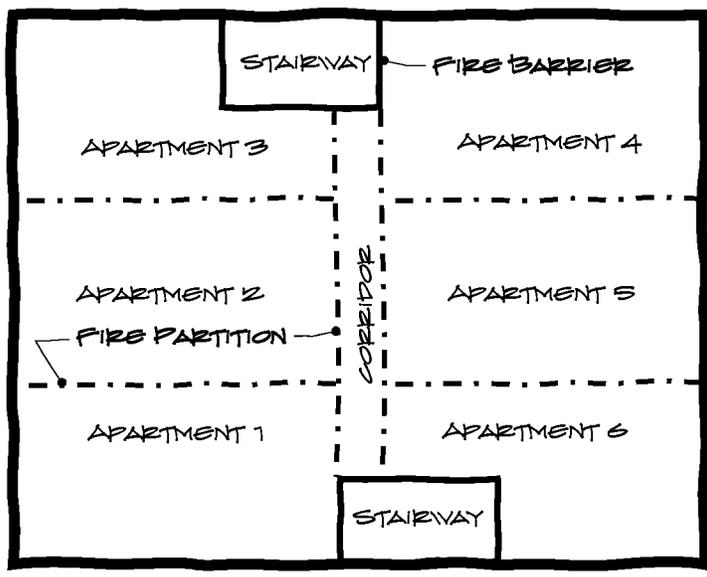
Fire Partitions



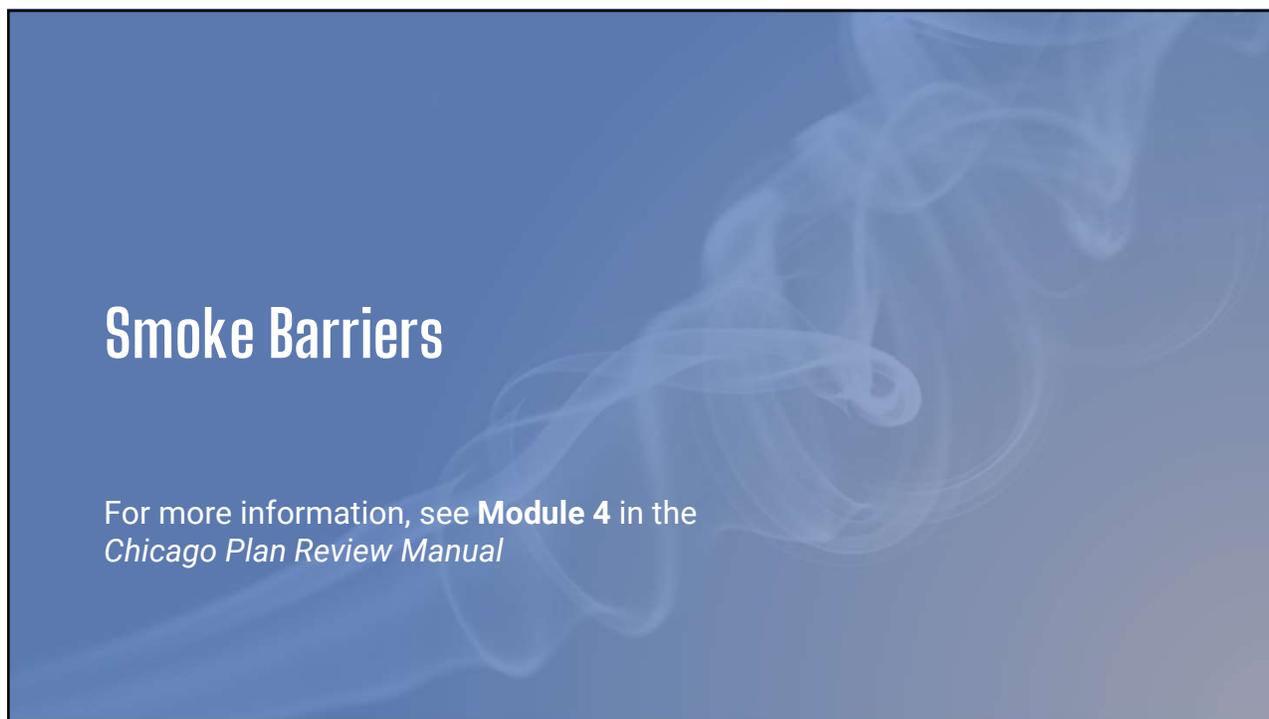
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Apartment Building



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Smoke Barriers

- Smoke barriers are occasionally required by the code to resist the passage of smoke from one area to another. Smoke barriers will almost always also be required to have a 1-hour rating.
- In most cases, a smoke barrier is an enhanced form of fire barrier.
- Smoke barriers are required for:
 - Underground buildings (Sec. 405)
 - Group I-1, Condition 2
 - Groups I-2 and I-3
 - Ambulatory care facilities
 - Areas of refuge for accessible means of egress

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Structural Members and Bearing Walls

For more information, see **Module 4** in the *Chicago Plan Review Manual*

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Structural Members and Bearing Walls

- Fire-resistance rating may be required for:
 - Primary structural frame
 - Bearing walls
 - Structural members supporting fire-resistance-rated horizontal assemblies
- Fire-resistance design for structural members and interior bearing walls (not required as part of another fire-resistance rated assembly) does not require opening, joint, or penetration protection.



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FOR EXAMPLE

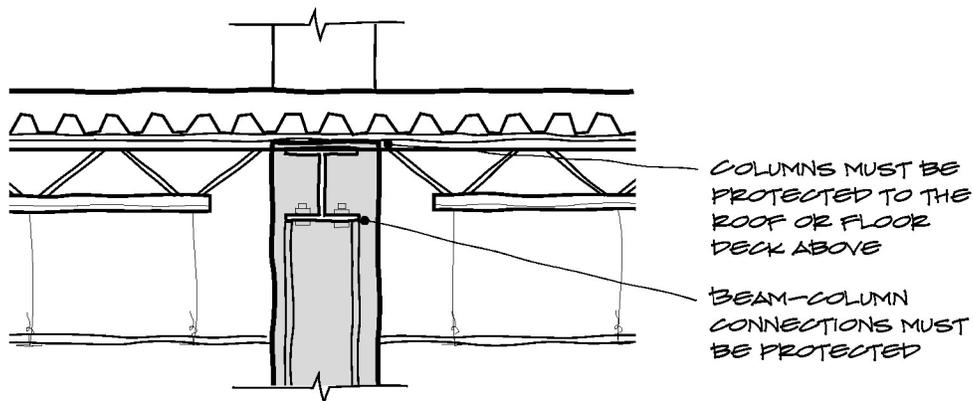


Structural Members and Bearing Walls— Example

- Type IIA construction requires 1-hour horizontal assemblies for floors and roofs as well as for the primary structural frame and bearing walls.
- If a two-story Type IIA building includes a horizontal exit on the second story, and the fire barrier does not extend to the first story, a 2-hour fire-resistance-rated floor is required by Section 1026.2.
- The primary structural frame and/or bearing wall structure supporting this floor must also have a 2-hour fire-resistance rating per Section 704.1.

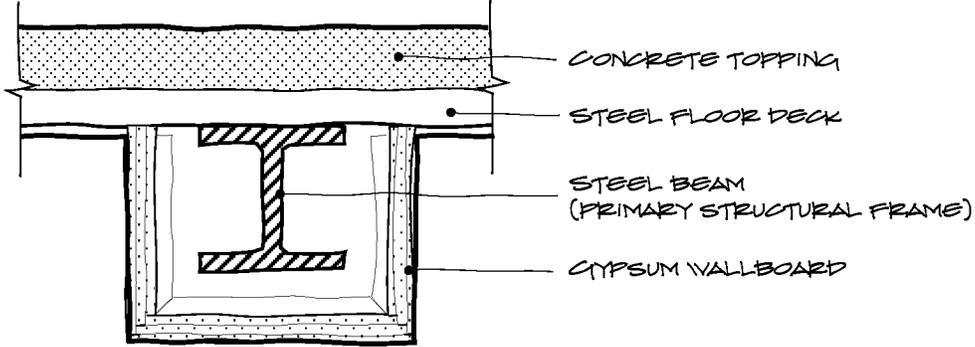
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Structural Members and Bearing Walls (continued)



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Structural Members and Bearing Walls (continued)



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Vertical Openings and Shaft Enclosures

For more information, see **Module 4** in the *Chicago Plan Review Manual*

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Vertical Openings and Shaft Enclosures

- Vertical openings connecting 2 or more stories must be enclosed with fire-resistance rated construction or comply with one of the special provisions in Sec. 712.
- Shaft enclosures must have a 1-hour rating, or 2-hour rating if connecting more than 3 stories.



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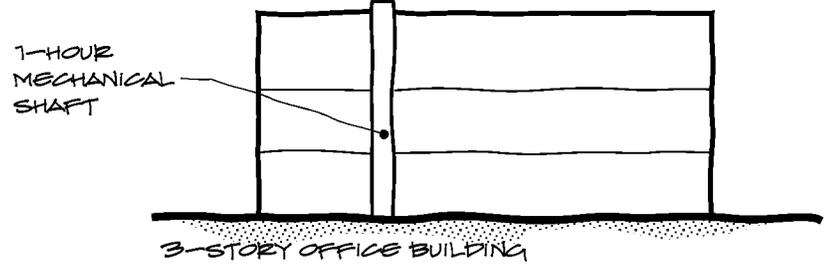


Vertical Openings and Shaft Enclosures

- Vertical openings connecting 2 or more stories must be enclosed with fire-resistance rated construction or comply with one of the special provisions in Sec. 712.
- Shaft enclosures must have a 1-hour rating, or 2-hour rating if connecting more than 3 stories.
- 1-hour shaft allowed to enclose noncombustible pipes, conduit, or iron, steel or aluminum ducts with floor penetration up to 9 ft²/story, any number of stories

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Vertical Openings and Shaft Enclosures (continued)



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Basement Construction

For more information, see **Module 4** in the *Chicago Plan Review Manual*

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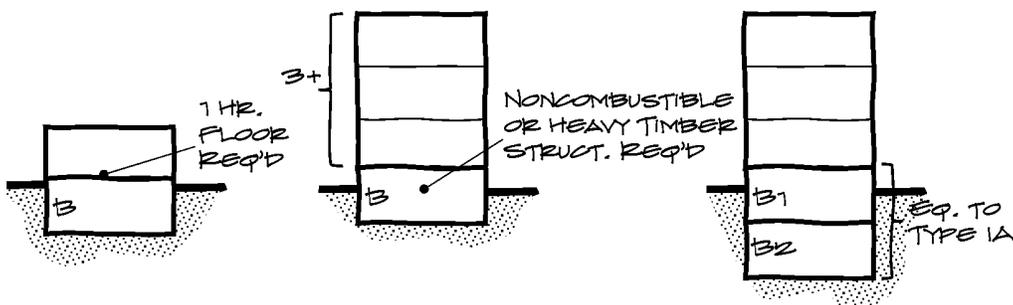
Basement Construction (continued)

- Basements that exceed maximum areas must be subdivided with fire barriers into 40,000 ft² (80,000 ft² in fully-sprinklered bldg.)
- Basements with a floor level more than 60' below the lowest level of exit discharge must be subdivided into smoke compartments.
- In Type III or V buildings with 3 or more stories above grade, basement columns and bearing walls must be NC or HT.
- Buildings with multiple basements require Type IA construction below first story above grade.
- Floor construction over basements must have a min. 1-hour fire resistance rating (exception for R-5). (605.4)

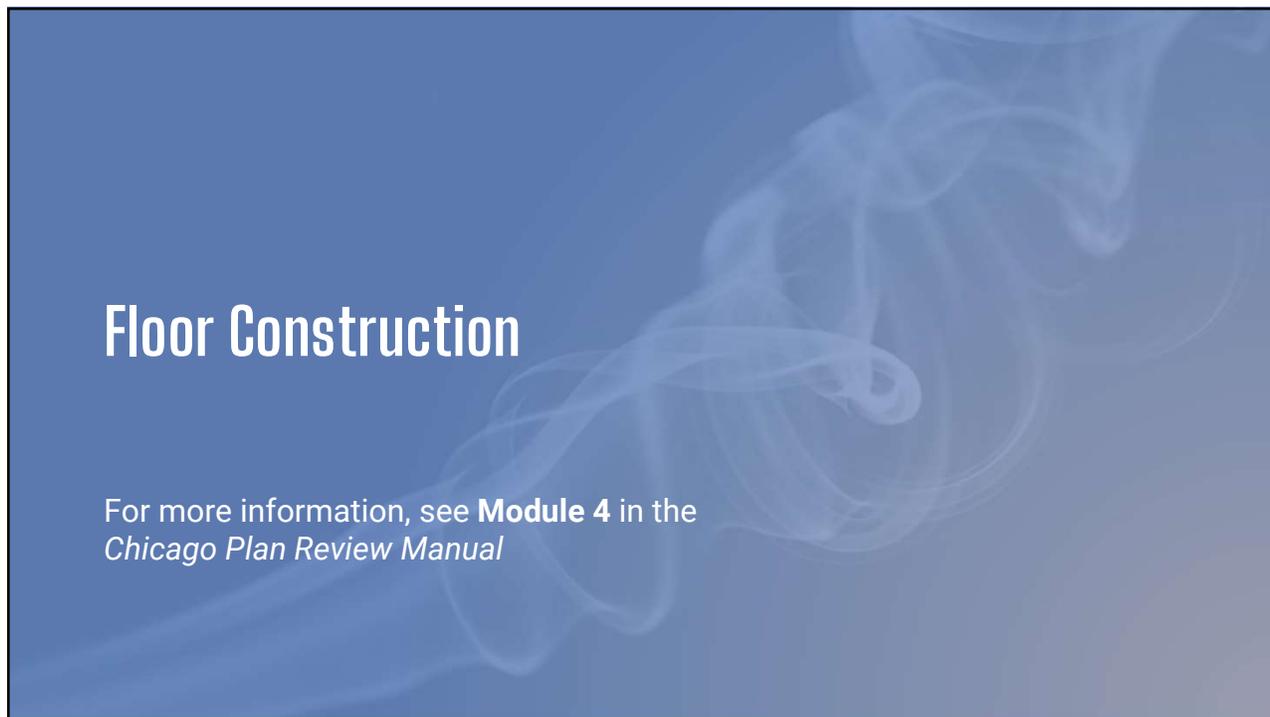
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Basement Construction



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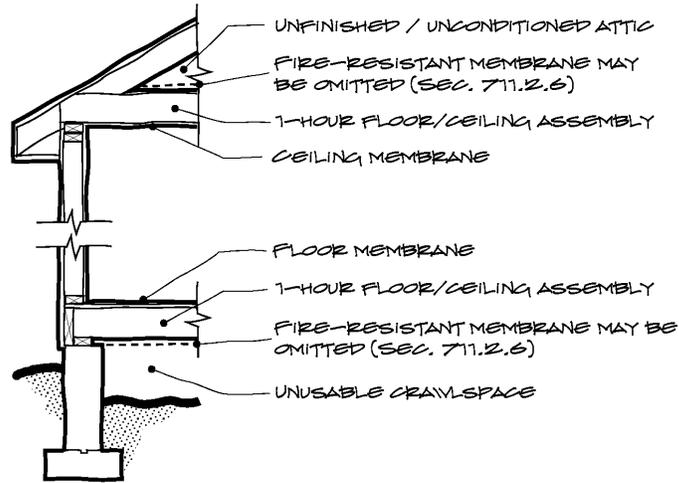
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Floor Construction

- Rated floor/ceiling assemblies must meet the strictest rating required by:
 - Construction type
 - Occupancy separation
 - Fire area separation
 - Incidental use separation
- Exception for bottom membrane of floor/ceiling assembly over unusable space.
- All construction supporting floor/ceiling assembly must have same minimum rating.

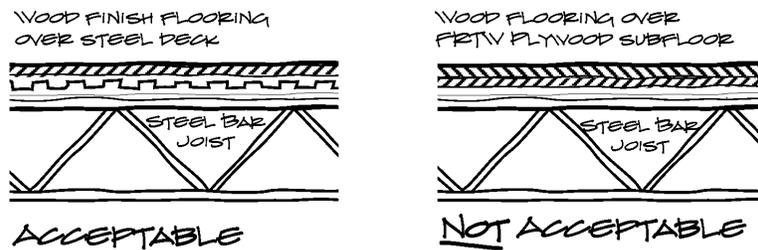
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Floor Construction (continued)

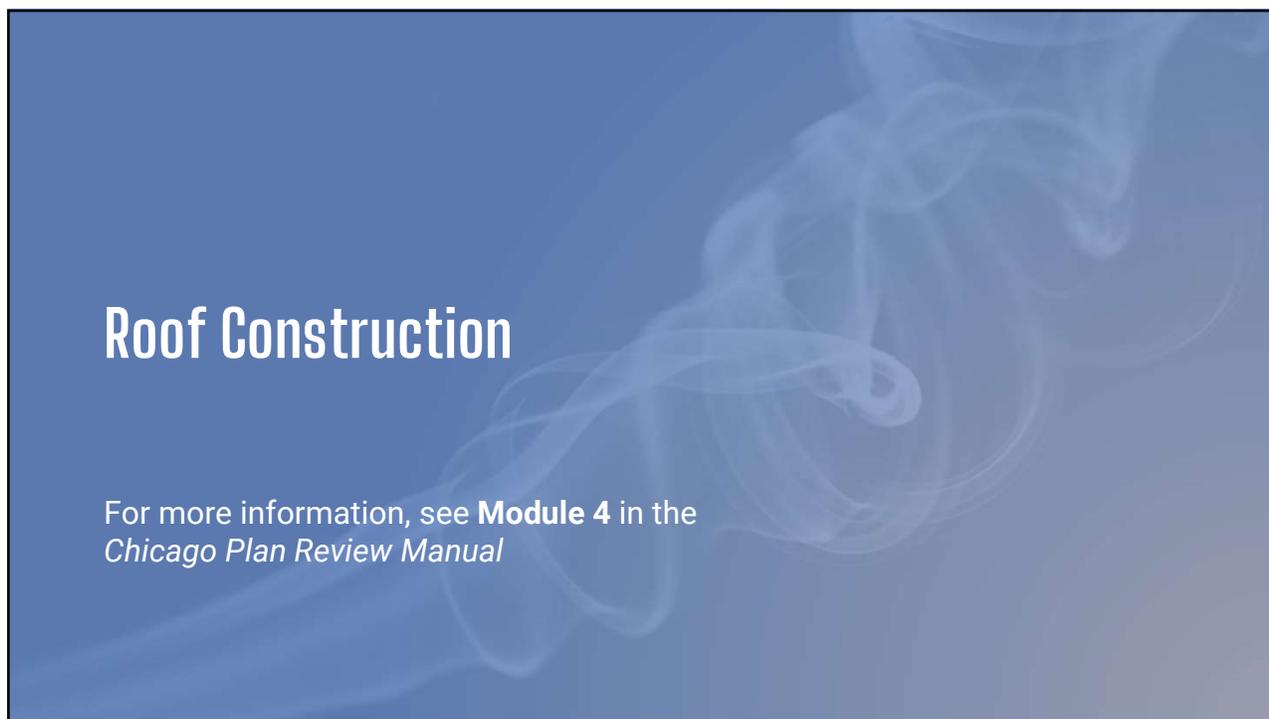


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Floor Construction (continued)



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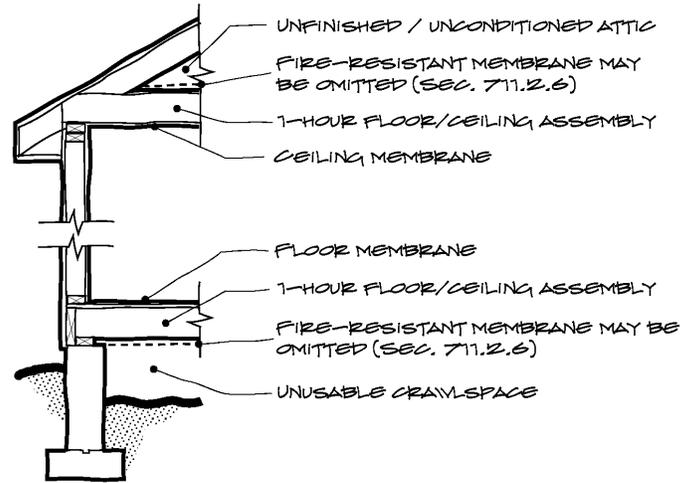
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Roof Construction

- Roofs must have required fire-resistance rating.
 - No rating required for Type IIB, IIIB, or VB construction
 - Residential buildings ≤ 4 stories may be 30 min. (Table 601, note h)
- Roofs must have required fire-resistance rating.
- Exception for top membrane of floor/ceiling assembly below unusable attic space.
- Roof assemblies must be continuous.
 - Skylights allowed. (711.3.2)

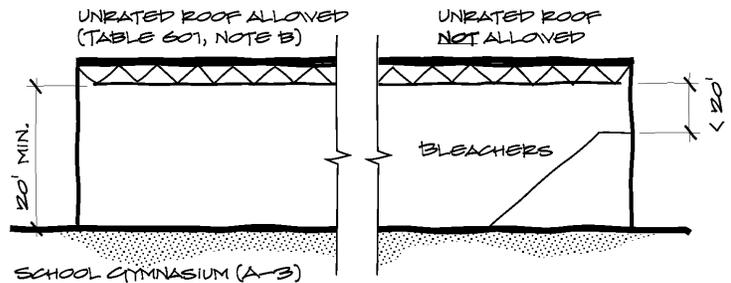
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Roof Construction

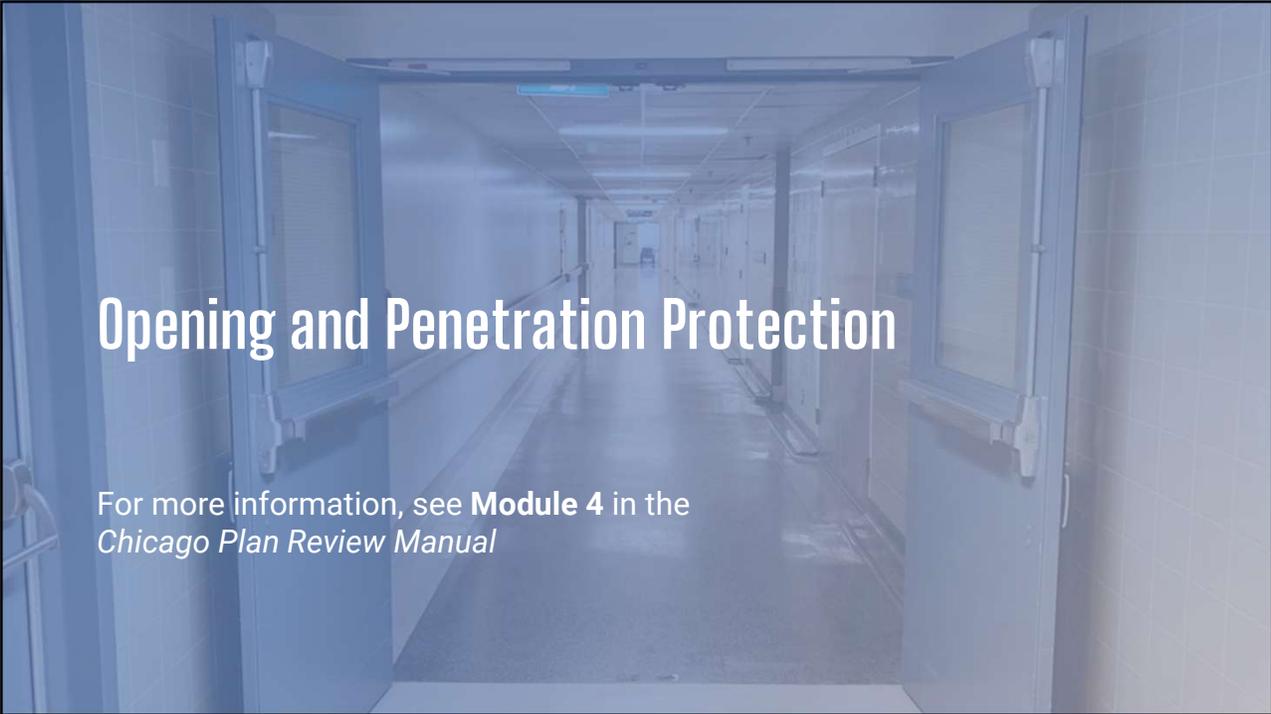


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Roof Construction



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Opening and Penetration Protection

For more information, see **Module 4** in the *Chicago Plan Review Manual*

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Opening Protectives

- Doors, windows, shutters, etc. in fire-resistance-rated wall/ partitions must have a fire protection rating based on type of element and required fire-resistance rating of element:

TABLE 716.1(2)
OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS

TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)	DOOR VISION PANEL SIZE ^b	FIRE-RATED GLAZING MARKING DOOR VISION PANEL ^{c,*}	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	See Note f.	Not Permitted	Not Permitted	Not Permitted	NP	Not Permitted	NP
	4 ^e	3 ^a	100 sq. in.	D-H-W-240	Not Permitted	4	Not Permitted	W-240
	3	3 ^a	100 sq. in.	D-H-W-180	Not Permitted	3	Not Permitted	W-180
	2	1 1/2	100 sq. in. ^b	< 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. ^b	< 100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90	Not Permitted	1 1/2	Not Permitted	W-90
Enclosures for								

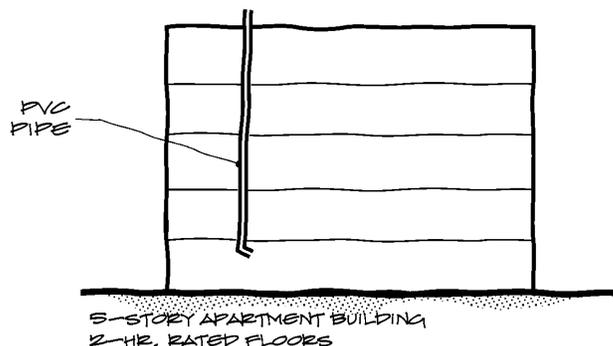
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Penetration Protection

- Protection required when pipes, conduit, ducts, etc. penetrate a fire-resistance rated assembly.
- Different rules for horizontal and vertical assemblies.
- Different rules for membrane penetrations and through penetrations.
- Different rules for air transfer openings.
- Helpful chart on p. II-84 of *Manual*.
- **Penetrations of exit enclosures limited to essential openings!**

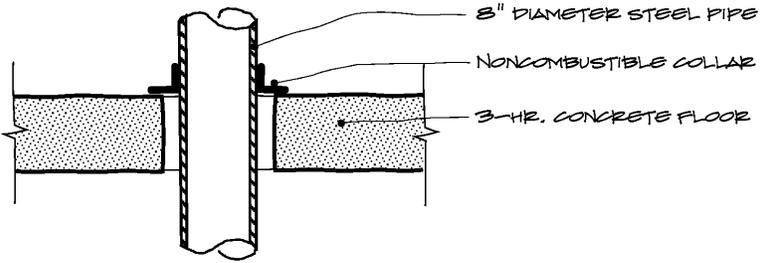
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Penetration Protection (continued)

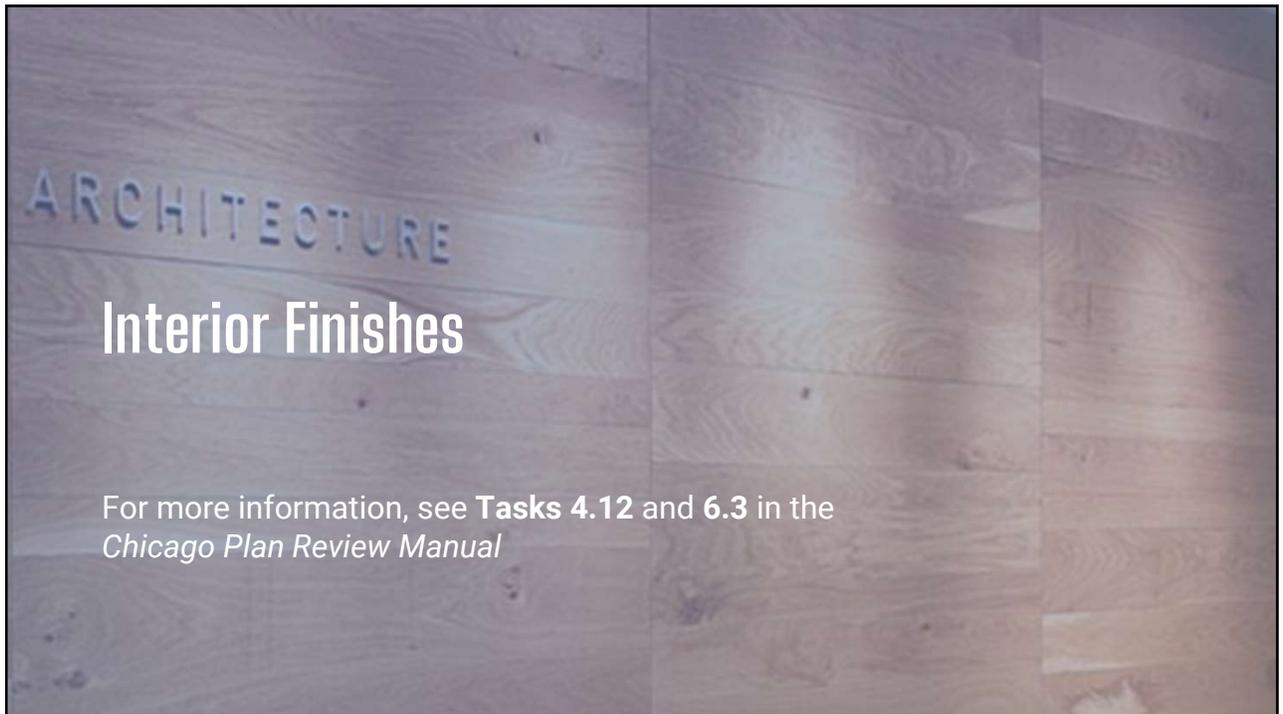


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Penetration Protection (continued)



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CODE BOOK



Definitions

- **INTERIOR FINISH.** Interior finish includes *interior wall and ceiling finish* and *interior floor finish*.
- **INTERIOR FLOOR FINISH.** The exposed floor surfaces of buildings including coverings applied over a finished floor or *stair*, including risers.
- **INTERIOR FLOOR-WALL BASE.** *Interior floor finish trim* used to provide a functional or decorative border at the intersection of walls and floors.



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CODE BOOK



Definitions (continued)

- **INTERIOR WALL AND CEILING FINISH.** The exposed *interior surfaces* of buildings, including but not limited to: fixed or movable walls and partitions; toilet room privacy partitions; columns; ceilings; and interior wainscoting, paneling or other finish applied structurally or for decoration, acoustical correction, surface insulation, structural fire resistance or similar purposes, but not including *trim*.
- **TRIM.** Picture molds, chair rails, baseboards, *handrails*, door and window frames and similar decorative or protective materials used in fixed applications.

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Interior Wall and Ceiling Finishes

- Most interior wall and ceiling finish materials must be classified (based on flame spread and smoke development) as either Class A, Class B, or Class C based on testing.
- The code also allows wall coverings to be tested to NFPA 286, which is deemed equivalent to a Class A rating.
- Interior finishes must be as specified in Table 803.13.
- (This requirement does not apply to material with a thickness less than 0.036 inches—excluding paint and wallpaper)

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**TABLE 803.13
INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY^a**

GROUP	SPRINKLERED ^d			NONSPRINKLERED		
	Interior exit stairways and ramps and exit passageways ^a	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces ^c	Interior exit stairways and ramps and exit passageways ^a	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces ^c
A-1 & A-2	A	B	C	A	A	B ^e
A-3, A-4, A-5	A	B	C	A	A	C
B, E, M, R-1	A	C ^m	C	A	B	C
R-4	B	C	C	A	B	B
F	A	C	C	A	C	C
H	A	B	C ^g	A	A	B
I-1	A	C	C	A	B	B
I-2	A	B	B ^{h,i}	A	A	A
I-3	A	A ^l	C	A	A	B
I-4	A	B	B ^{h,i}	A	A	B
R-2	A	C	C	A	B	C
R-3, R-5	C	C	C	C	C	C
S	A	C	C	A	B	C
U	No restrictions			No restrictions		

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**TABLE 803.13
INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY***

GROUP	SPRINKLERED ¹			NONSPRINKLERED		
	Interior exit stairways and ramps and exit passageways ^a	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces ^c	Interior exit stairways and ramps and exit passageways ^a	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces ^c
A-1 & A-2	A	B	C	A	B	C
A-3, A-4, A-5	A	B	C	A	A	C
B, E, M, R-1	A	C ^m	C	A	B	C
R-4	B	C	C	A	C	B
F	A	C	C	A	C	C
H	A	B	C ^g	A	A	B
I-1	A	C	C	A	B	B
I-2	A	B	B ^h	A	A	A
I-3	A	A ^j	C	A	A	B
I-4	A	B	B ^{h,i}	A	A	B
R-2	A	C	C	A	B	C
R-3, R-5	C	C	C	C	C	C
S	A	C	C	A	B	C
U	No restrictions			No restrictions		

Annotations:

- Blue arrow points to the "SPRINKLERED" header.
- Blue arrow points to the "NONSPRINKLERED" header.
- Blue arrow points to the "A" finish requirement for "Interior exit stairways and ramps and exit passageways" in the "SPRINKLERED" column.
- Blue arrow points to the "B" finish requirement for "Corridors and enclosure for exit access stairways and ramps" in the "SPRINKLERED" column.
- Blue arrow points to the "C" finish requirement for "Rooms and enclosed spaces" in the "SPRINKLERED" column.
- Blue arrow points to the "A" finish requirement for "Interior exit stairways and ramps and exit passageways" in the "NONSPRINKLERED" column.
- Blue arrow points to the "B" finish requirement for "Corridors and enclosure for exit access stairways and ramps" in the "NONSPRINKLERED" column.
- Blue arrow points to the "C" finish requirement for "Rooms and enclosed spaces" in the "NONSPRINKLERED" column.
- Text labels with arrows: "Sprinklered", "Library (Group A-3)", "Reading room", "Corridor", "Exit stairs".

79

Interior Wall and Ceiling Finishes (continued)

- Textile and expanded vinyl wall coverings and ceiling coverings have additional requirements
- High-density polyethylene (HDPE) and polypropylene (PP) wall coverings must be tested under special standard
- Additional testing requirements apply to:
 - Site-fabricated stretch systems
 - Laminated finishes over wood/combustible substrates
 - Site-applied wood facings and veneers
- Additional rules apply to finishes on fire-resistance rated assemblies.

80

Interior Floor Finishes

- Traditional floor finish and floor covering materials that are not comprised of fibers, such as wood, vinyl, linoleum or terrazzo, and resilient floor covering, are not subject to any special fire performance requirements.
- Fibrous floor finishes in exits and exit discharge vestibules/lobbies must be Class I.
- Floor finishes in other areas must be Class I, Class II or meet the CPSC “pill test” per Sec. 804.4.



81

Decorative Materials and Trim

- Combustible trim (including foam plastic) may not exceed 10 percent of the specific wall or ceiling area to which it is attached.
 - The surface area of combustible handrails and freestanding guardrails is not included in calculating the 10 percent limit.
- Material, other than foam plastic used as interior trim must have a minimum Class C flame rating when tested in accordance with ASTM E84 or UL 723.
- Foam plastic trim has limited dimensions and density, if met, no thermal barrier is required and smoke-developed index is not limited.

82

Decorative Materials and Trim (continued)

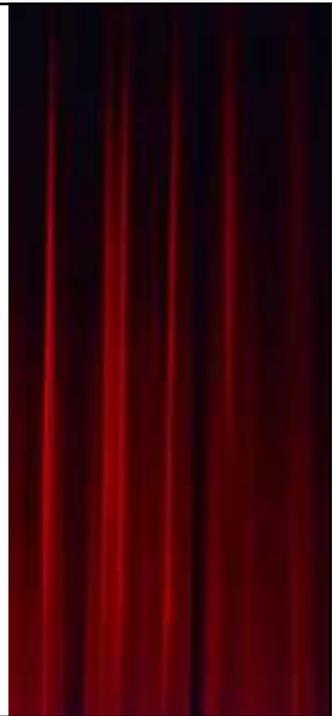
- Where interior floor-wall base does not comply with the requirements for wall trim:
- Interior floor-wall base that is 6 inches or less in height must be tested in accordance with requirements for floor finishes and must be at least Class II.
- Where a Class I floor finish is required, the floor-wall base must be Class I.
- For example, this might include a detail where the floor covering material is used as the floor-wall base.

83

Decorative Materials and Trim (continued)

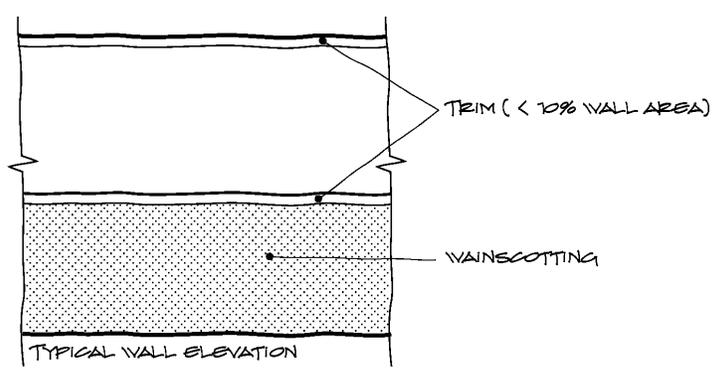
Decorative Materials

- In Group A, B, E, I, M and R-1 occupancies and in Group R-2 dormitories, curtains, draperies, fabric hangings, and similar combustible decorative materials suspended from walls or ceilings must meet the flame propagation performance criteria of NFPA 701, Test 1 or Test 2, or exhibit a maximum heat release rate of 100 kW when tested per NFPA 289 with a 20 kW ignition source.



84

Decorative Materials and Trim (continued)



85

Fire Protection and Life Safety Systems

Self-Certification Training Class
January 18-20, 2022

CHICAGO
Department of Buildings

87

About Fire Protection and Life Safety Systems

- Fire protection and life safety systems (active protection) may be required by the code or required to take advantage of trade offs in the code.
- Sprinkler and standpipe systems require an additional permit issued by the Chicago Fire Department based on shop drawing review.
- Fire alarm systems require an additional permit from the Department of Buildings based on shop drawings.
- Adequate space and clearances must be provided for systems.

88



89

KEY CONCEPT



Automatic Sprinkler Systems

- 3 sprinkler installation standards
 - NFPA 13
 - NFPA 13R (Low-rise Residential)
 - NFPA 13D (Groups R-4, R-5 only)
- A building is not fully sprinklered if a portion uses an alternative automatic extinguishing system (chemical, etc.)
- Sprinkler system requires separate permit from Chicago Fire Department, Fire Prevention Bureau



90

Automatic Sprinkler Systems (continued)

Sprinkler system triggers:

- Based on occupancy classification of building or fire area
- Specific building areas/hazards (underground parking)
- Buildings over 70 feet in height
- Incidental uses
- Additional requirements for fire suppression systems

91

KEY CONCEPT



Fire Areas

A fire area separation is not the same as a mixed-occupancy separation. The required fire-resistance rating for fire area separations is in Table 707.3.10:

**TABLE 707.3.10
FIRE-RESISTANCE RATING REQUIREMENTS FOR
FIRE BARRIERS OR HORIZONTAL
ASSEMBLIES BETWEEN FIRE AREAS**

OCCUPANCY GROUP	FIRE-RESISTANCE RATING (hours)
H-1, H-2	4
F-1, H-3, S-1	3
A, B, E, F-2, H-4, H-5, I, M, R, S-2, U	2

92

Automatic Sprinkler Systems (continued)

Occupancy-based Automatic Sprinkler System Requirements			
Occupancy	Fire Area (ft²)	Occupant Load (persons)	Stories Above / Below Grade
A-1, A-3, A-4 ^{a, e}	> 12,000	300	—
A-2 ^{a, e}	> 12,000	300 / 100 ^j	—
A-3 ^{d, e} (exhibition area)	> 5,000	—	—
A-5 ^{a, b, c}	> 1,000	—	—
B ^f (ambulatory care)	—	—	1 / 1 ^g
B (telephone exchange)	Note h	—	—

93

Automatic Sprinkler Systems (continued)

Occupancy-based Automatic Sprinkler System Requirements			
Occupancy	Fire Area (ft²)	Occupant Load (persons)	Stories Above / Below Grade
E-1 ^{d, i}	> 7,200	—	—
E-2	Note h	—	—
F-1 ^k (general)	> 12,000	—	3 / NA
F-1 ^k (upholstery, woodworking)	> 2,500	—	—
F (electricity generation)	Note h	—	—
H	Note h	—	—

94

Automatic Sprinkler Systems (continued)

Occupancy-based Automatic Sprinkler System Requirements			
Occupancy	Fire Area (ft²)	Occupant Load (persons)	Stories Above / Below Grade
I	Note h	—	—
M ^k (general)	> 12,000	—	3 / 1
M ^k (upholstered furniture)	> 5,000	—	—
R-1, R-2, R-3, R-4	Note h	—	—

- Never required for R-5
- Limited exception for R-2 ([903.2.8, Exception 1](#))

95

Automatic Sprinkler Systems (continued)

Occupancy-based Automatic Sprinkler System Requirements			
Occupancy	Fire Area (ft²)	Occupant Load (persons)	Stories Above / Below Grade
S-1 ^{k, m} (general)	> 12,000	—	3 / NA
S-1 ^k (commercial vehicles)	> 5,000	—	3 / NA
S-1 ^k (upholstered furniture)	> 5,000	—	3 / NA
S-1 ^{k, l} (repair garage)	> 12,000	—	2 / 1
S-2 (general)	> 12,000	—	1
S-2 ⁿ (parking garage)	> 12,000	—	NA / 1

96

Automatic Sprinkler Systems (continued)

- Specific hazards:
 - Stories without openings / basements
 - Rubbish and linen chutes
 - Shops and storerooms
 - Telecommunication equipment areas > 150 ft²
- Incidental uses (Table 509)
- Additional required suppression systems (Table 903.2.11.8)

97

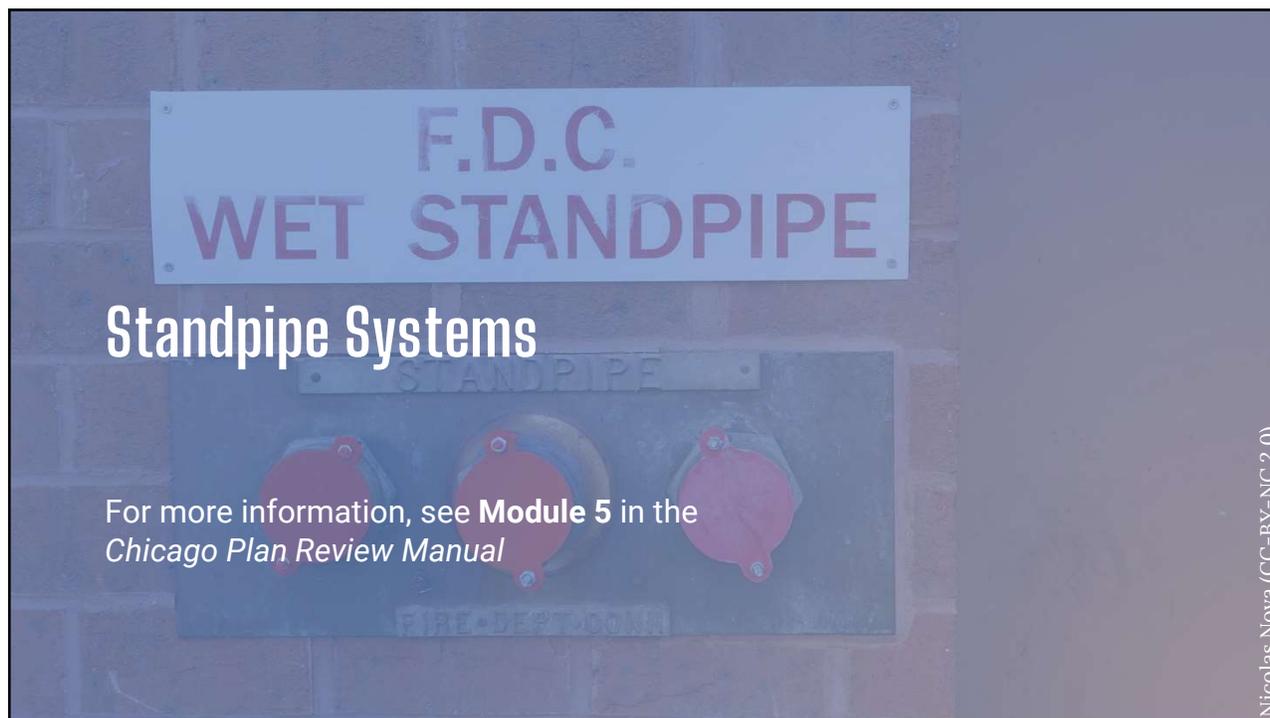


ACTIVITY

Required Sprinkler System Activity

- 1-story temporary classroom annex for Chicago Public Schools
- 3-story apartment building, 2 dwelling units per floor (incl. basement) (8 total dwelling units), 2 interior exit stairways in 2-hour-rated enclosures, 2-hour-rated floors
- Strip mall with 5, 5,000 ft² tenant spaces: 1 mattress store, 2 cell phone stores, 1 pharmacy, 1 pet supply store; separated by 2-hour-rated fire barriers
- 2-story professional office building, 4,000 ft²/story with 300 ft² server room in basement with 1-hour rated walls and ceiling
- Same as 4, but with 2-hour-rated walls and ceiling

98



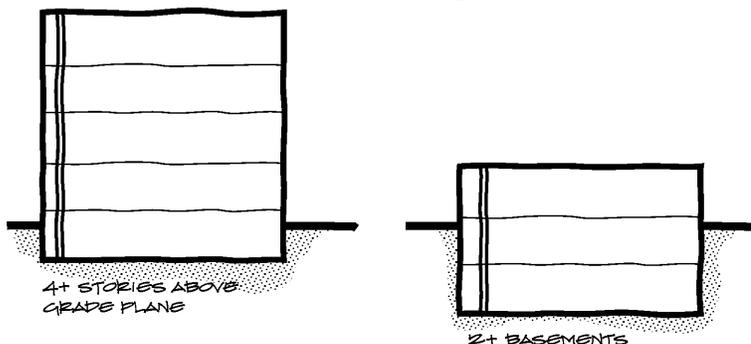
101

KEY CONCEPT



Standpipe Systems

- Required in buildings with 4 or more stories above grade or 2 or more basements
- For Groups R-2, R-3, R-4 and R-5 not required if 4 or fewer stories above grade



102

Standpipe Systems (continued)

Other standpipe triggers:

- Group A occupancies with OL > 1,000
- Stages > 1,000 ft²
- Underground buildings (Sec. 405)
- Helistop or heliport
- Vegetative or landscaped roof; occupiable rooftop
- In buildings where standpipes are required, ensure adequate space is provided at stair landings and other required locations

103

Fire Alarm and Detection Systems

For more information, see **Module 5** in the *Chicago Plan Review Manual*

104

KEY CONCEPT

Fire Alarm and Detection Systems

- **Manual** – Relies on manual fire alarm boxes or pull stations to activate a notification sequence.
- **Automatic** – Relies on input from devices that detect smoke or heat without occupant interaction or may activate based on waterflow.
- **Presignal-type** – Does not automatically initiate occupant notification throughout the building; notifies trained personnel at constantly-attended location. Required in high-rise buildings by the Chicago Fire Department.



105

Fire Alarm and Detection Systems (continued)

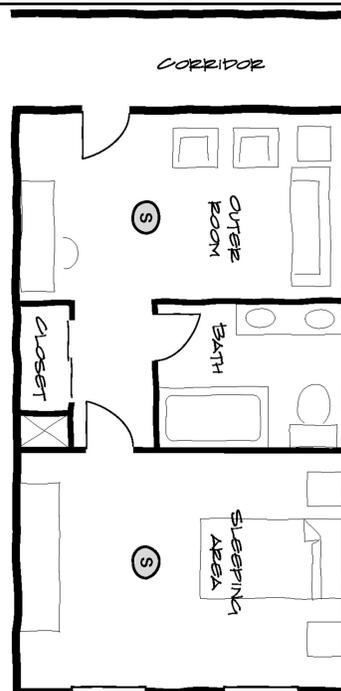
- Manual fire alarm system requirements summarized in Table on p. II-130 of *Manual*.
- Where code allows elimination of pull stations throughout building (usually due to sprinklers), pull stations must still be installed at each exit on the level of exit discharge. (907.2)

106

Single- or Multiple-station Smoke Alarms

• Group R-1

- In sleeping areas.
- In every room in the path of the means of egress from sleeping area to door leading from sleeping unit.
- In each story within the sleeping unit, including basements.
- At the uppermost ceiling of each interior exit stairway.



107

Single- or Multiple-station Smoke Alarms (continued)

Groups R-2, R-3, R-4 and R-5

- On ceiling or wall outside of and within 15 feet of each room used for sleeping.
- In each room used for sleeping.
- In each story within a dwelling unit, including basements but not including crawl spaces and uninhabitable attics.
- At the uppermost ceiling of each interior exit stairway.



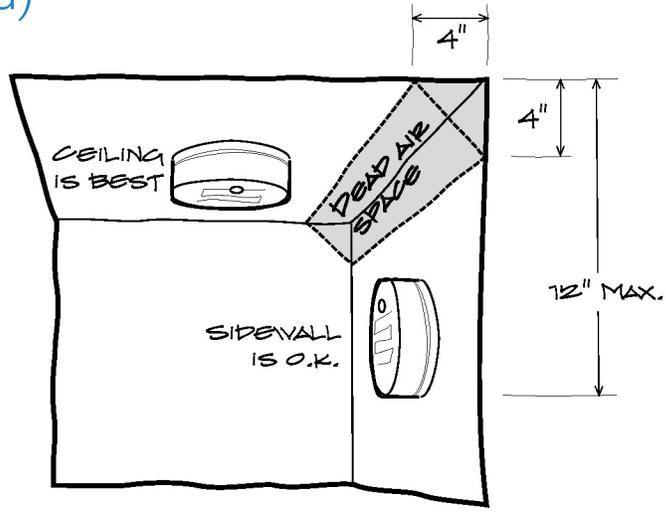
108

Single- or Multiple-station Smoke Alarms (continued)

- Where more than one smoke alarm is required to be installed within an individual dwelling unit or sleeping unit in Group R or I-1 occupancies, the smoke alarms must be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit.
- Physical interconnection of smoke alarms is not required where listed wireless alarms are installed and all alarms sound upon activation of one alarm.
- Limits on placement of certain types of smoke alarms near cooking appliances, bathrooms.

109

Single- or Multiple-station Smoke Alarms (continued)



110



Portable Fire Extinguishers

For more information, see **Module 5** in the *Chicago Plan Review Manual*

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111

KEY CONCEPT



Portable Fire Extinguishers

- Fire extinguishers are required in most occupancies.
- Make allowances for fire extinguisher placement:
 - Surface mounted could create obstruction
 - Recessed cabinets must maintain fire-resistance rating of wall construction
- Locations must be conspicuous and unobstructed.
- For most commonly-required type, maximum travel distance is 75 ft.



112

Carbon Monoxide Detectors

For more information, see **Module 5** in the *Chicago Plan Review Manual*

U.S. Fire Administration

113

KEY CONCEPT



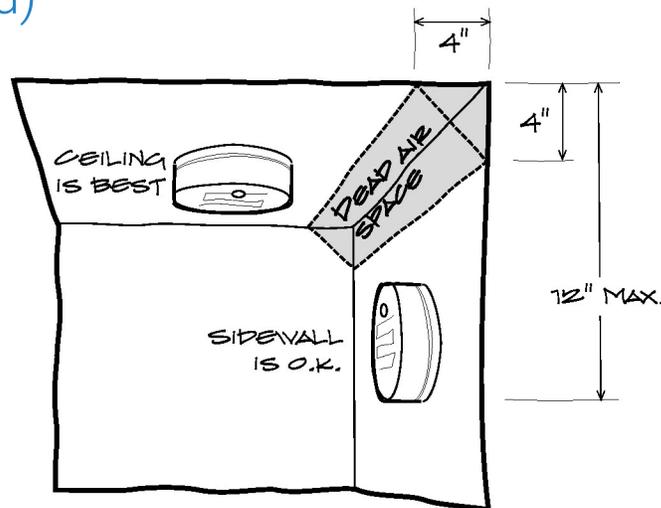
Carbon Monoxide Detection

- Required in Groups E, I-1, I-2, I-4, and R where hazard exists:
 - Fuel-burning appliances
 - Fuel-burning fireplace
 - Attached private garage
- May be combined with smoke alarms
- May be part of building alarm system



114

Single- or Multiple-station Smoke Alarms (continued)



110



Portable Fire Extinguishers

For more information, see **Module 5** in the *Chicago Plan Review Manual*

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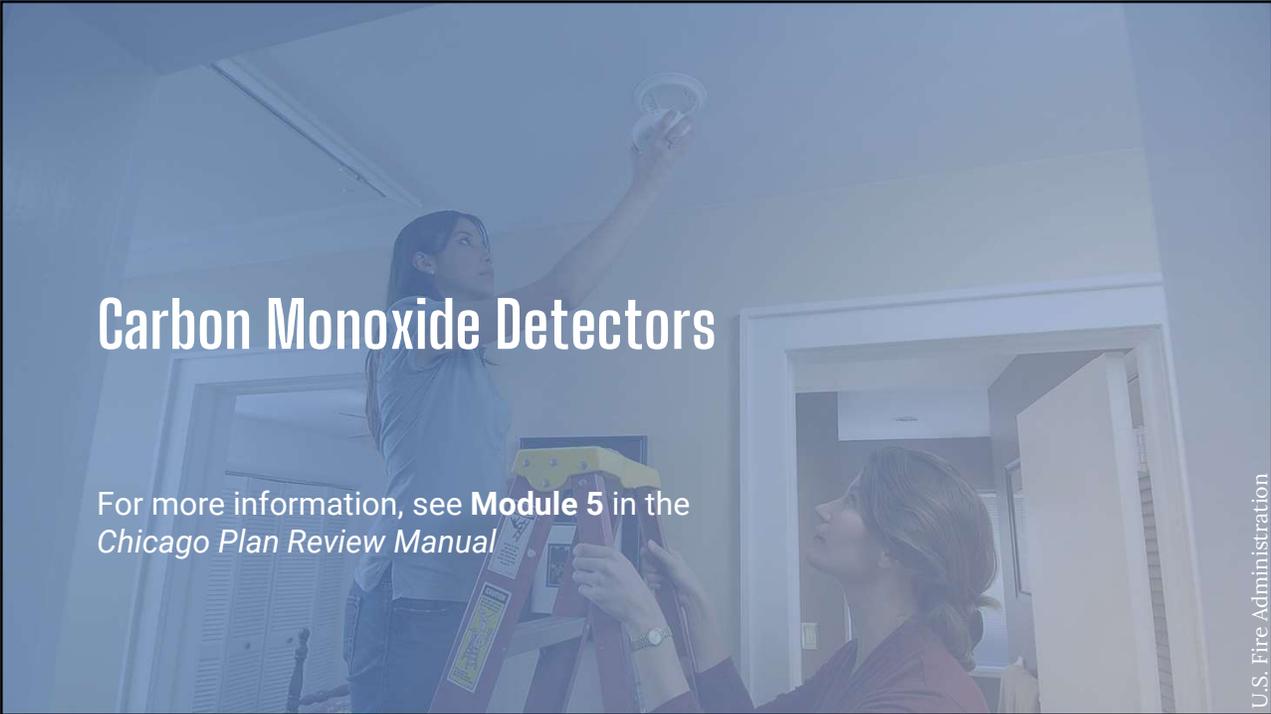
KEY CONCEPT



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113

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114

slido



Audience Q&A Session

⌚ Start presenting to display the audience questions on this slide.

115





Nonstructural Material Requirements

Self-Certification Training Class
January 18-20, 2022

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Glass Types by Strength

- **Annealed glass**
Regular float glass which is cooled slowly to reduce in built stress
- **Tempered glass**
Produced by cutting annealed glass to required size, reheating and then cooling rapidly. Higher strength and breaks into small shards



118

Glass Types by Strength

- **Laminated glass**
 - Sandwich of multiple layers of glass with PVB interlayer.
 - Suitable for security applications as glass stays in place.



119

Glass Identification

2403.1 Identification. Each pane shall bear the manufacturer's *mark* designating the type and thickness of the glass or glazing material. The identification shall not be omitted unless *approved* and an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with *permitted construction documents* that comply with the provisions of this chapter. Safety glazing shall be identified in accordance with Section 2406.3.

Each pane of tempered glass, except tempered spandrel glass, shall be permanently identified by the manufacturer. The identification *mark* shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that, once applied, cannot be removed without being destroyed.

Tempered spandrel glass shall be provided with a removable paper marking by the manufacturer.

120

Glass Installation



2403.2 Glass supports. Where one or more sides of any pane of glass are not firmly supported, or are subjected to unusual load conditions, detailed *construction documents*, detailed shop drawings and analysis or test data ensuring safe performance for the specific installation shall be prepared by a *registered design professional*.

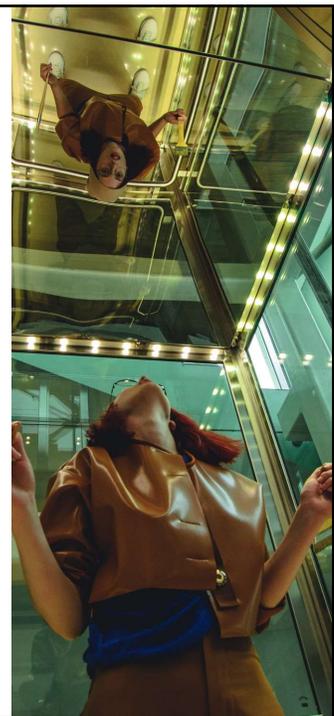
2403.3 Framing. To be considered firmly supported, the framing members for each individual pane of glass shall be designed so the deflection of the edge of the glass perpendicular to the glass pane shall not exceed $\frac{1}{175}$ of the glass edge length or $\frac{3}{4}$ inch (19.1 mm), whichever is less, when subjected to the larger of the positive or negative load where loads are combined as specified in Section 1605.

2403.4 Interior glazed areas. Where interior glazing is installed adjacent to a walking surface, the differential deflection of two adjacent unsupported edges shall be not greater than the thickness of the panels when a force of 50 pounds per linear foot (plf) (730 N/m) is applied horizontally to one panel at any point up to 42 inches (1067 mm) above the walking surface.

121

Hazardous Locations

- Section 2406.1 Human impact loads
- Section 2406.2 Impact test
- Section 2406.3 Identification
- Sections 2406.4 Hazardous Locations
- Section 2407 Glass in Handrails and Guards
- Section 2408 Glazing in Athletic Facilities
- Section 2409 Glass in Walkways, Elevator Hoistways and Elevator Cabs



122

Human Impact Loads

Glazed areas, including glass mirrors, in hazardous must comply with Sections 2406.1.1 - 2406.1.4 except:

- Mirrors and other glass panels mounted or hung on a surface that provides a continuous backing support.
- Glass unit masonry
- IBC: Plastic glazing shall meet the weathering requirements of ANSI Z97.1.

123

Identification of safety glazing

Manufacturer's designation for each pane of glazing in hazardous location:

- Who applied the designation,
- Type of glass
- Safety glazing standard
- Visible in the final installation
- Label permitted

Exceptions:

- Certificate, or other evidence (not tempered)
- Tempered spandrel glass - removable paper



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Identification of safety glazing

PYRAN Platinum F by
SAFTIFIRST
ANSI/UL 9, 10B, 10C
CPSC CAT II
OH-D-H-NT
20/45/60/90/180

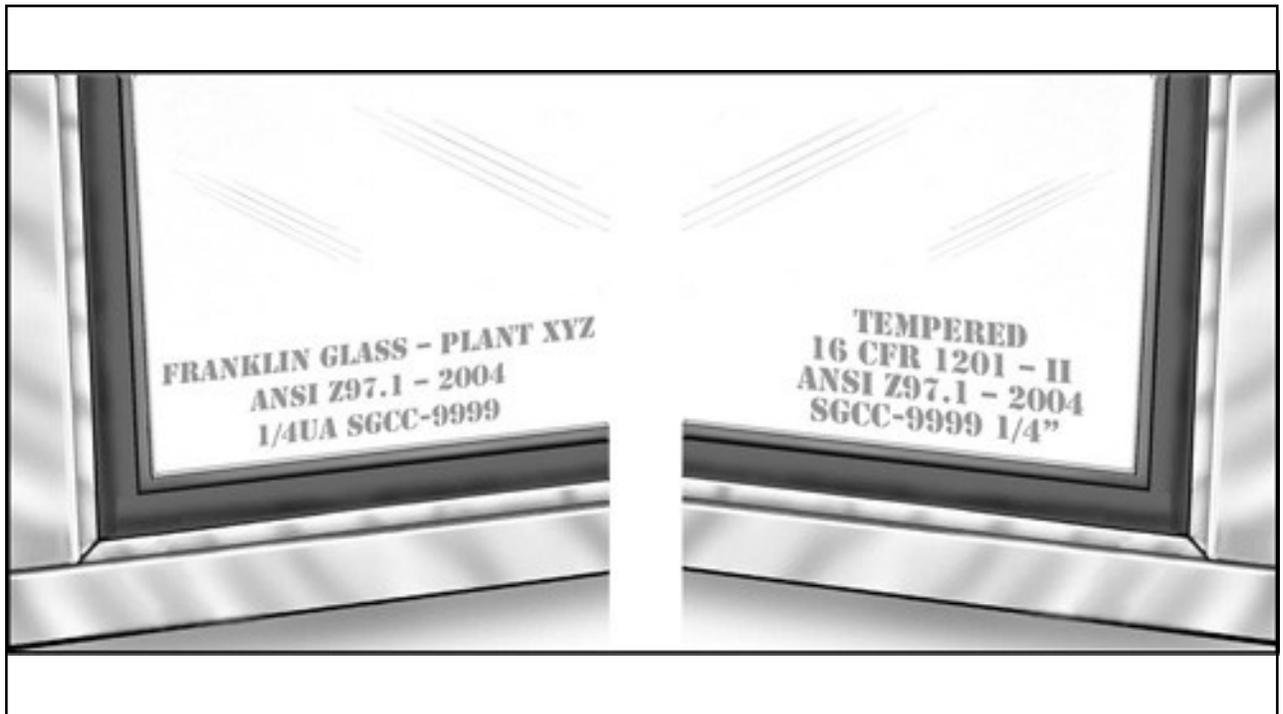


Intertek



FireLife PLUS
16 CFR 1201 CAT. II
ANSI Z97.1-2009 U A
ANSI/UL9/10B/10C
D-H-45
OH-45

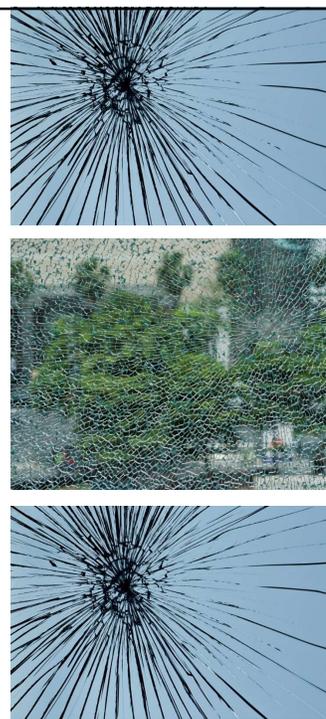
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Types of Glazing

- Except as indicated in Section 2406.3.1, each pane of safety glazing installed in hazardous locations shall be identified by:
- Manufacturer's designation specifying who applied the designation,
- Manufacturer or installer and the safety glazing standard with which it complies.
- The designation shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or, when applied, cannot be removed in one piece.



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Multiple Pane Assemblies

Multipane glazed assemblies having individual panes not exceeding 1 square foot exposed areas shall have at least one pane marked as indicated in Section 2406.3.

Other panes shall be marked "CPSC 16 CFR Part 1201" or "ANSI Z97.1," as appropriate.

128

Louvered Windows or Jalousies

- Regular, float, wired or patterned glass in jalousies and louvered windows:
 - $\geq 3/16$ in. thick nominal and
 - ≤ 48 in. in length
- Exposed glass edges shall be smooth.
- Wired glass with wire exposed on longitudinal edges prohibited.

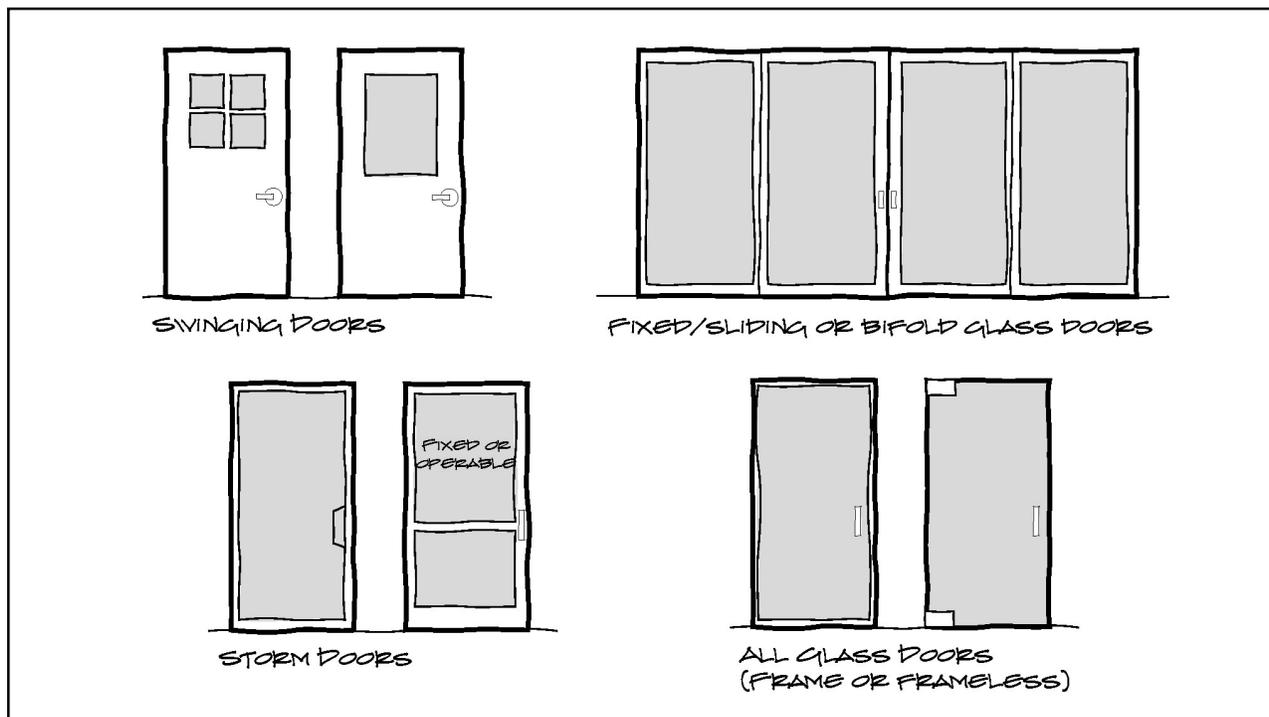


129

Doors

- Glazing in fixed and operable panels of swinging, sliding and bi-fold doors are considered a hazardous location.
- Exceptions:
 - Glazed openings where a 3-in.-diameter sphere cannot pass through
 - Decorative glazing
 - Curved glazed panels in revolving doors
 - Commercial refrigerated cabinet glazed doors

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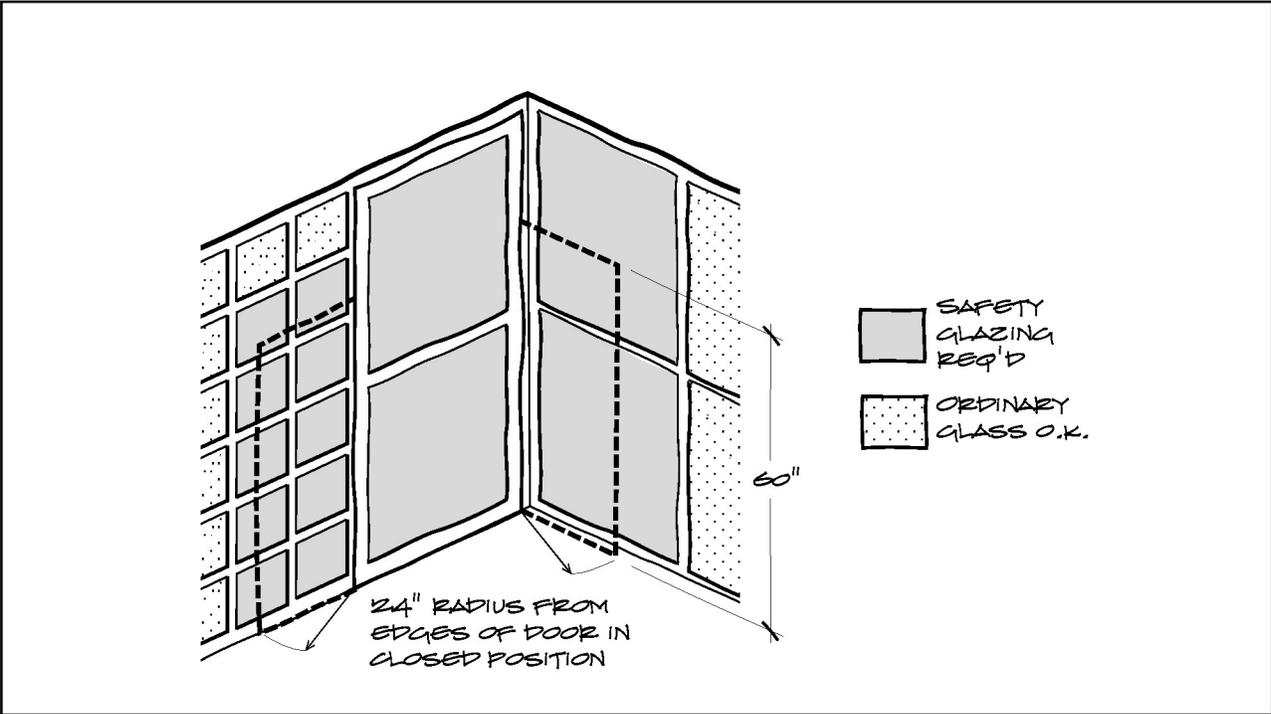
131

Glazing Adjacent to Doors

Glazing is considered in a hazardous location when:

- It is an individual panel within a 24-inch arc of either vertical edge of the door in a closed position.
- Where the bottom edge of the glazing is less than 60 inches above grade. shall be considered a hazardous location.

132



133



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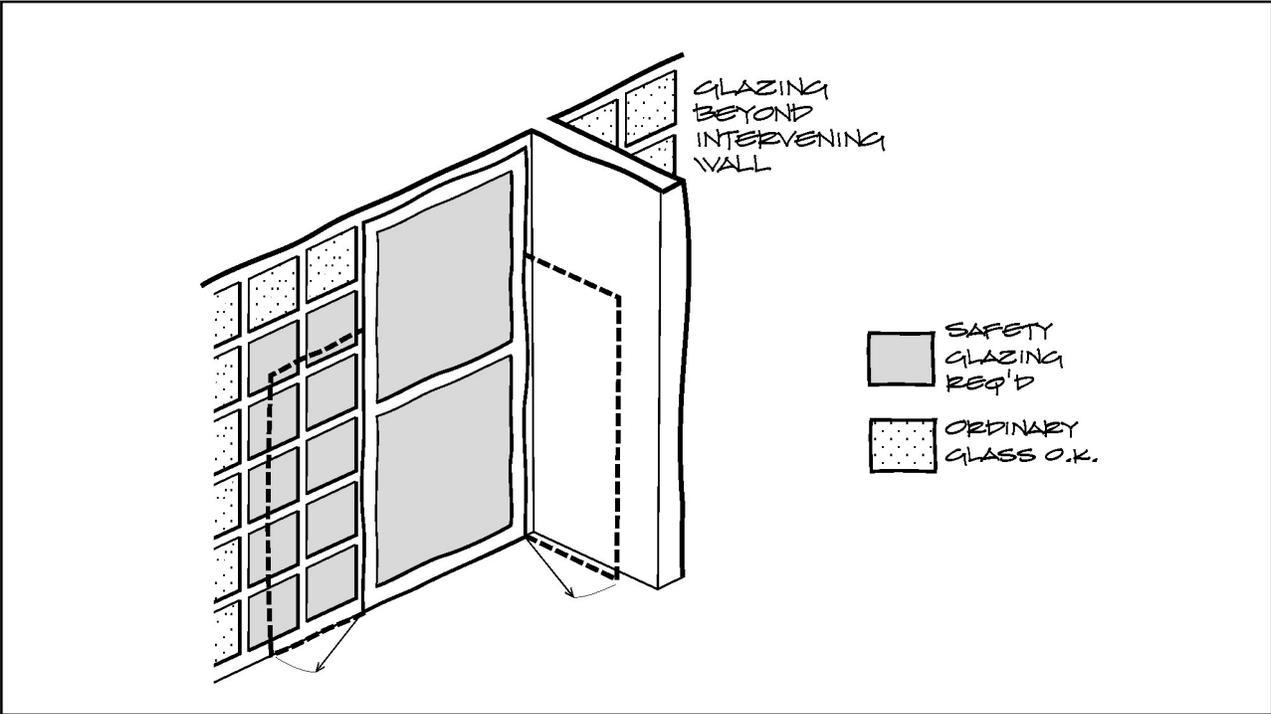
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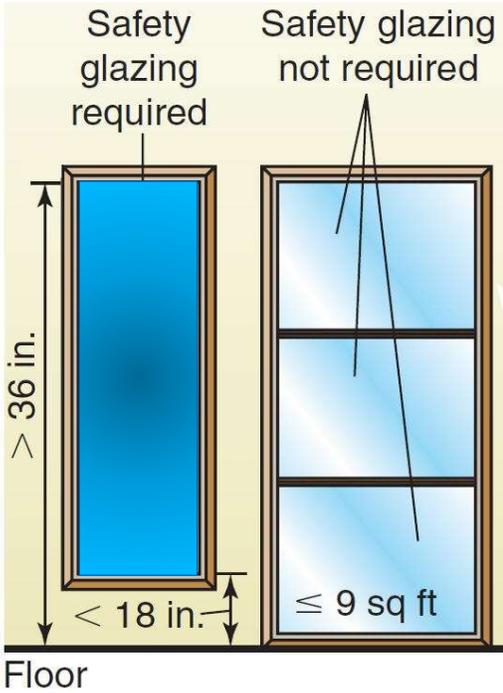
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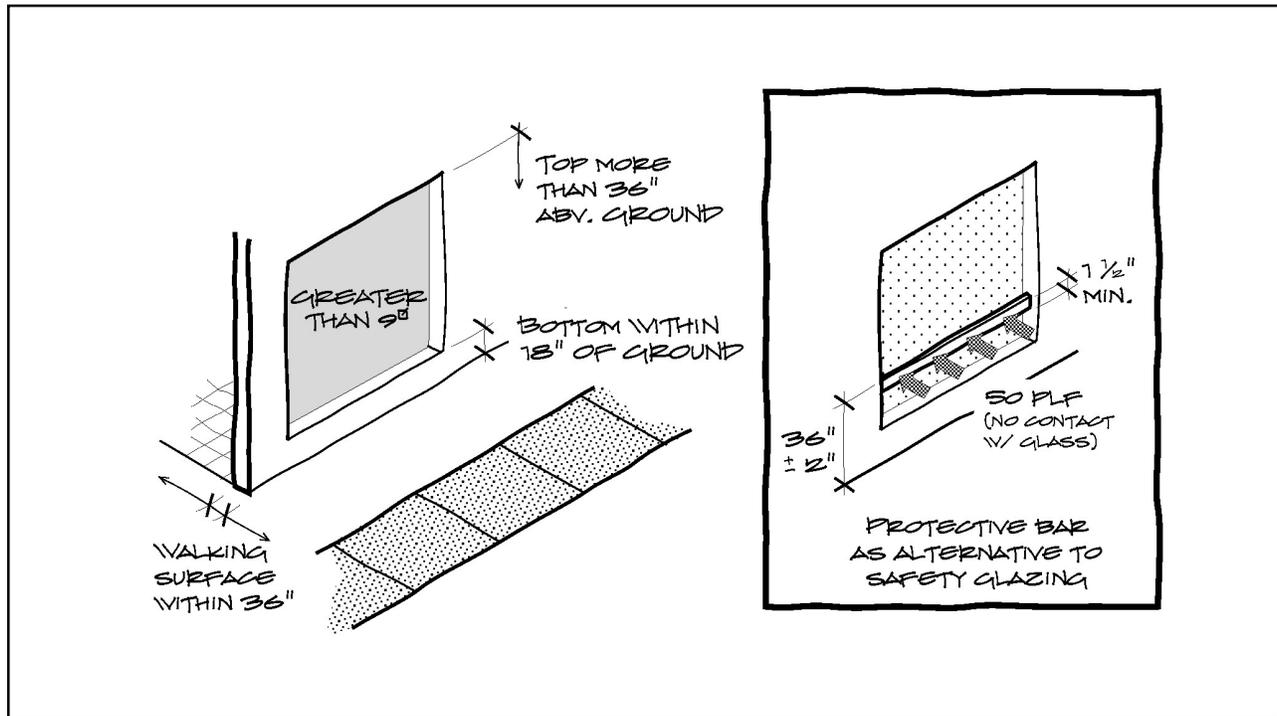
139

Windows

- Exposed area of an individual pane > 9 sq. ft.
- Bottom edge of glazing < 18 in. above floor
- Top edge of glazing > 36 in. above floor
- Walking surface within 36 in.



140



141

Windows

Exceptions

- Decorative glazing
- Horizontal rail on accessible side 34 to 38 in. above walking surface.
 - Withstand horizontal load of 50 lb. per lin. ft. without contacting glass
 - $\geq 1 \frac{1}{2}$ in. in height.
- Outboard panes ≥ 25 feet above any grade, roof, walking surface or other surface adjacent to the glass exterior

Safety glazing not required

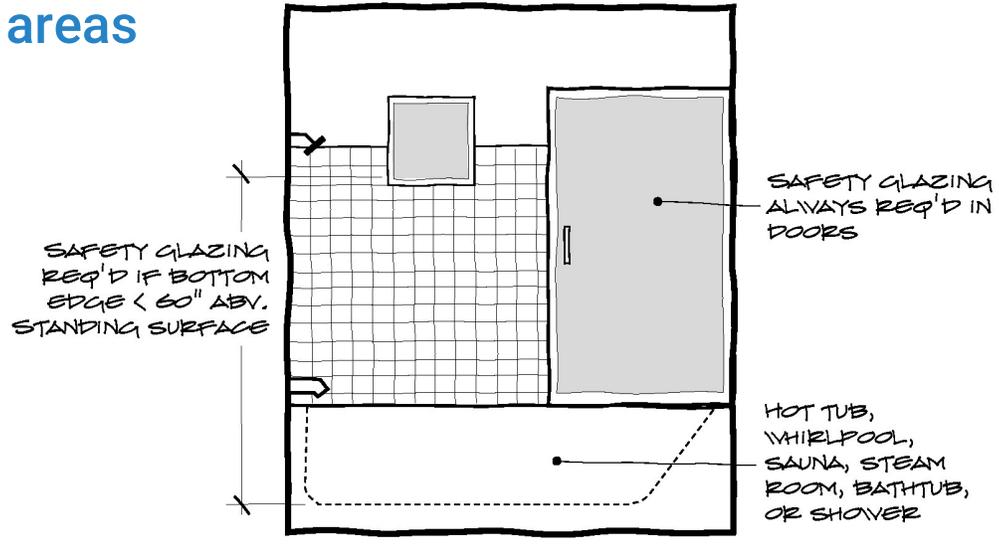
34 - 38 in.

< 18 in.

Floor

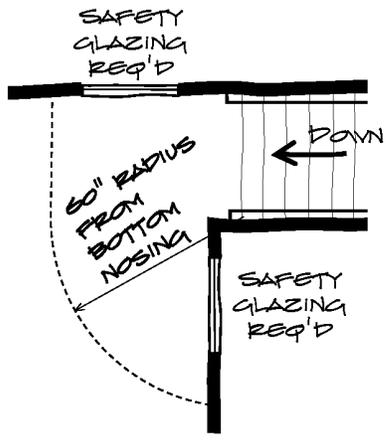
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Wet areas



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Stairway Landings



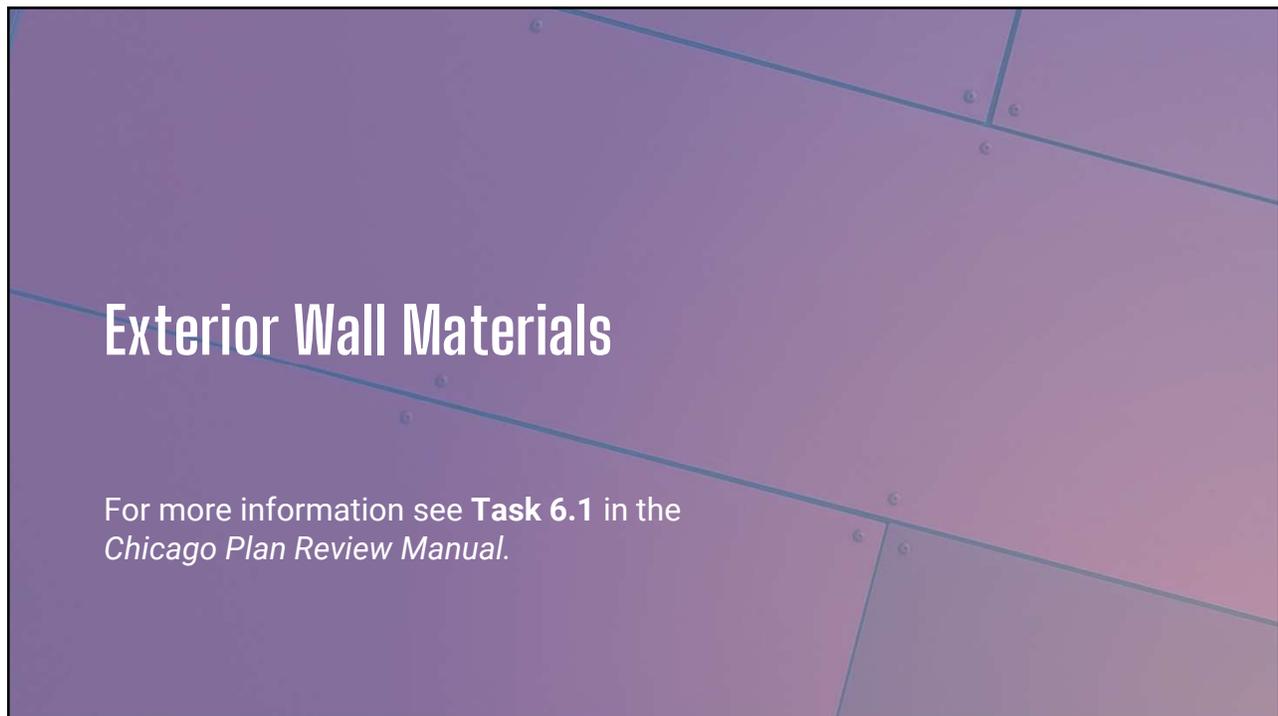
144



Window Opening Control Devices

- Required in Group R if:
 - Opening is less than 36” above floor, and
 - More than 72” above ground on outside
- Exception: Group R-2 and R-5:
 - Opening 24” or more above floor, and
 - More than 72” but less than 20 feet above ground

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Exterior Wall Materials

- Check weather resistance
 - Weather protection details
 - Material standards
- Check combustibility and fire propagation
 - Combustible water-resistive barrier
 - Foam plastic insulation
 - Metal composite materials (MCM)
 - EIFS
 - High pressure laminate (HPL)
 - Other combustible exterior wall coverings

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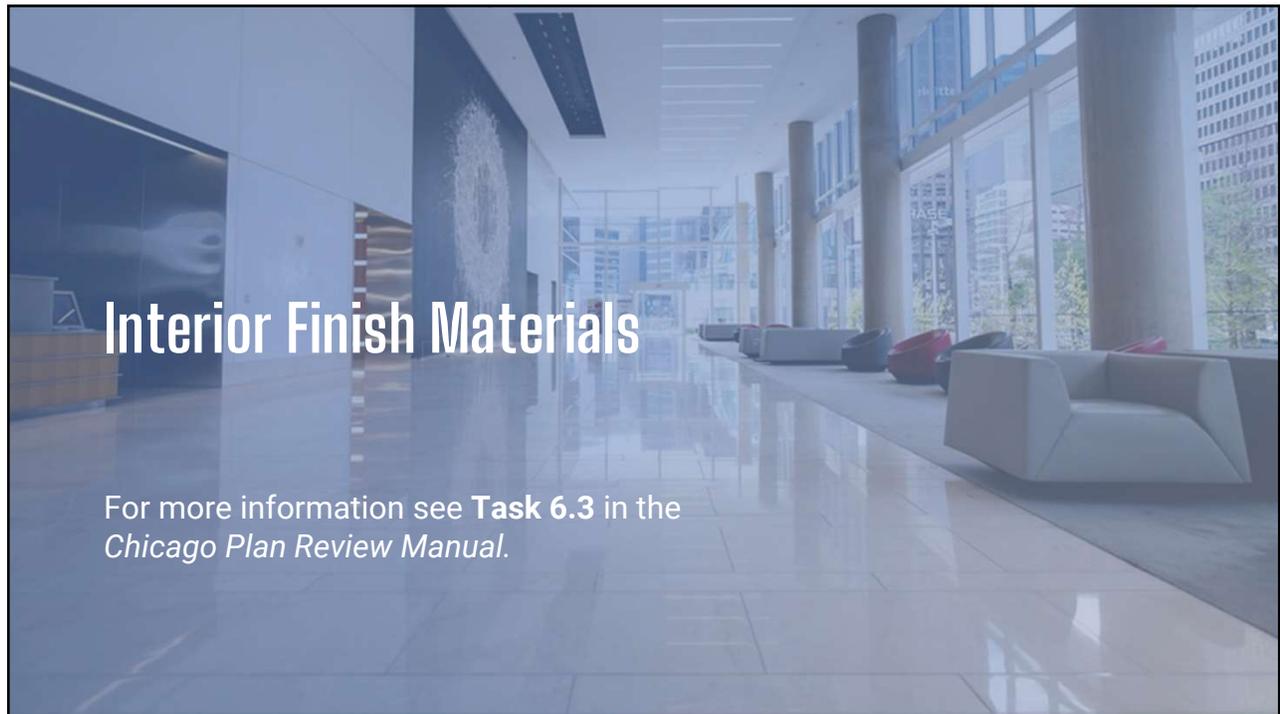


149

Roof Assemblies and Roof Coverings

- Roof covering classification
- Roof covering details
- Ballasted roofs
- Materials for occupiable rooftops
- Vegetative roofs

150



151

Interior Finish Materials

- Flooring
 - Sanitation
 - Slip-resistance
 - Firmness and stability
- Wall and Ceiling Surfaces
 - Sanitation
 - Moisture and mold resistance
 - Weather exposure

152



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Other Nonstructural Material Requirements

- Foundations
 - Dampproofing or waterproofing
 - Slab conditions
- Single-wythe masonry exterior walls
- Cold-formed steel design requirements
- Wood products
 - Fire-retardant treated wood (FRTW)
 - Heavy timber (and mass timber)

154