

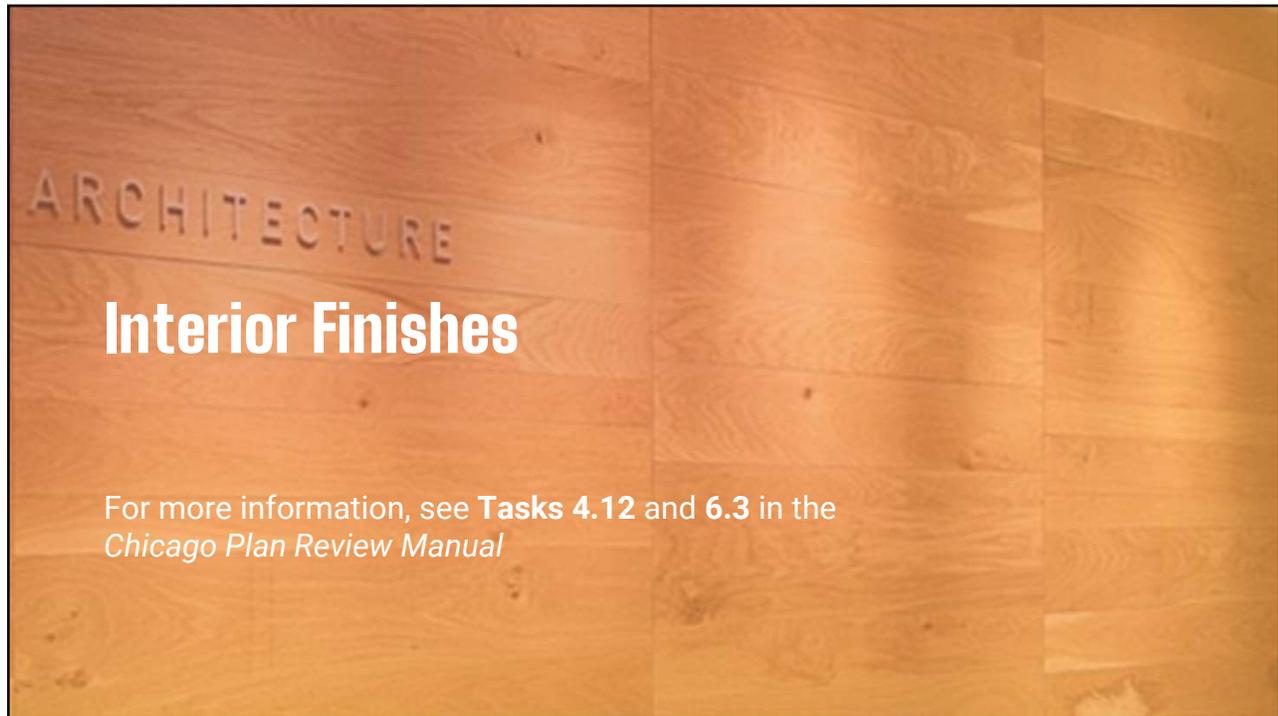


270

## Afternoon Session 1

- ❶ Interior Finishes
- ❷ Fire Protection and Life Safety Systems
- ❸ Structural Basics

271



272

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.



273

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.

274

## 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)

275

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

GROUP	SPRINKLERED <sup>1</sup>			NONSPRINKLERED		
	Interior exit stairways and ramps and exit passageways <sup>a</sup>	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces <sup>c</sup>	Interior exit stairways and ramps and exit passageways <sup>a</sup>	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces <sup>c</sup>
A-1 & A-2	A	B	C	A	A	B <sup>c</sup>
A-3, A-4, A-5	A	B	C	A	A	C
B, E, M, R-1	A	C <sup>m</sup>	C	A	B	C
R-4	B	C	C	A	B	B
F	A	C	C	A	C	C
H	A	B	C <sup>g</sup>	A	A	B
I-1	A	C	C	A	B	B
I-2	A	B	B <sup>h,i</sup>	A	A	A
I-3	A	A <sup>j</sup>	C	A	A	B
I-4	A	B	B <sup>h,i</sup>	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		

276

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

GROUP	SPRINKLERED <sup>1</sup>			NONSPRINKLERED		
	Interior exit stairways and ramps and exit passageways <sup>a</sup>	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces <sup>c</sup>	Interior exit stairways and ramps and exit passageways <sup>a</sup>	Corridors and enclosure for exit access stairways and ramps	Rooms and enclosed spaces <sup>c</sup>
A-1 & A-2	A	B	C	A	A	B <sup>c</sup>
A-3, A-4, A-5	A	B	C	A	A	C
B, E, M, R-1	A	C <sup>m</sup>	C	A	B	C
R-4	B	C	C	A	B	B
F	A	C	C	A	C	C
H	A	B	C <sup>g</sup>	A	A	B
I-1	A	C	C	A	B	B
I-2	A	B	B <sup>h,i</sup>	A	A	A
I-3	A	A <sup>j</sup>	C	A	A	B
I-4	A	B	B <sup>h,i</sup>	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		

Sprinklered

Library (Group A-3)

Reading room

Corridor

Exit stairs

277

## 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.

278

## 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.



279

## 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.

280

## Decorative Materials and Trim (continued)

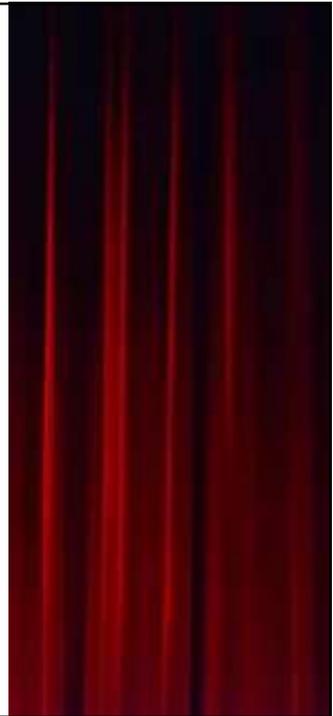
- Where interior floor-wall base does not comply with the requirements for wall trim:
- Interior floor-wall base that is 6 inches or less in height must be tested in accordance with requirements for floor finishes and must be at least Class II.
- Where a Class I floor finish is required, the floor-wall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

281

## 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.



282



283

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



284

## 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

285

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

286

## Automatic Sprinkler Systems (continued)

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

287

## Automatic Sprinkler Systems (continued)

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

288

## Automatic Sprinkler Systems (continued)

Occupancy-based Automatic Sprinkler System Requirements			
Occupancy	Fire Area (ft <sup>2</sup> )	Occupant Load (persons)	Stories Above / Below Grade
I	Note h	—	—
M <sup>k</sup> (general)	> 12,000	—	3 / 1
M <sup>k</sup> (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](#))

289

## Automatic Sprinkler Systems (continued)

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

290

## Automatic Sprinkler Systems (continued)

- Specific hazards:
  - Stories without openings / basements
  - Rubbish and linen chutes
  - Shops and storerooms
  - Telecommunication equipment areas > 150 ft<sup>2</sup>
- Incidental uses (Table 509)
- Additional required suppression systems (Table 903.2.11.8)

291



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 ft<sup>2</sup> 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 ft<sup>2</sup>/story with 300 ft<sup>2</sup> server room in basement with 1-hour rated walls and ceiling
- Same as 4, but with 2-hour-rated walls and ceiling

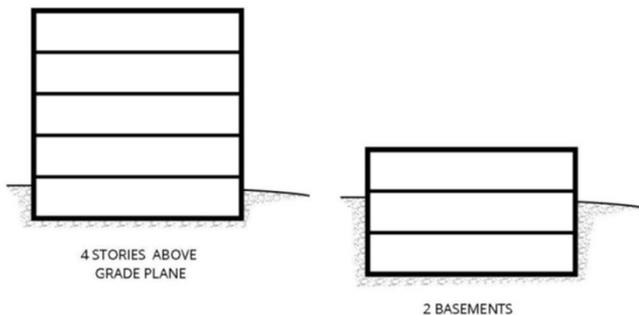
292

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



294

## Standpipe Systems (continued)

### Other standpipe triggers:

- Group A occupancies with OL > 1,000
- Stages > 1,000 ft<sup>2</sup>
- 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

295

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.



296

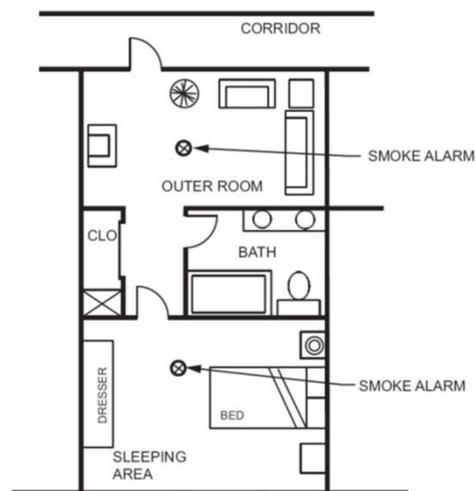
## Fire Alarm and Detection Systems (continued)

- 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)

297

## 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.

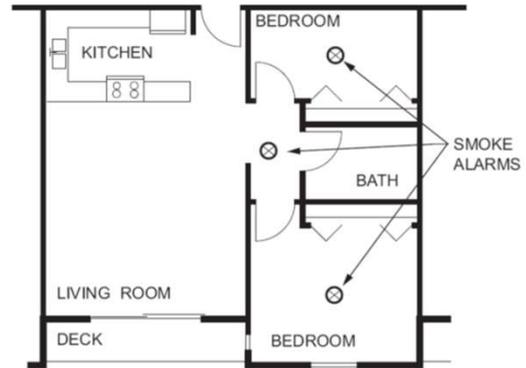


298

## 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.



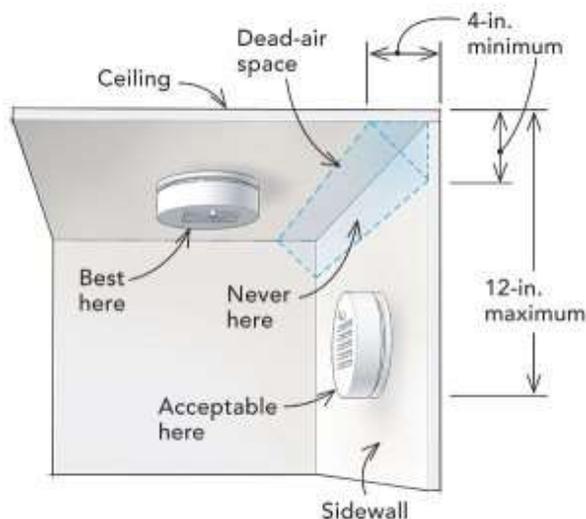
299

## 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.

300

## Single- or Multiple-station Smoke Alarms (continued)



301

### 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.



302

KEY CONCEPT

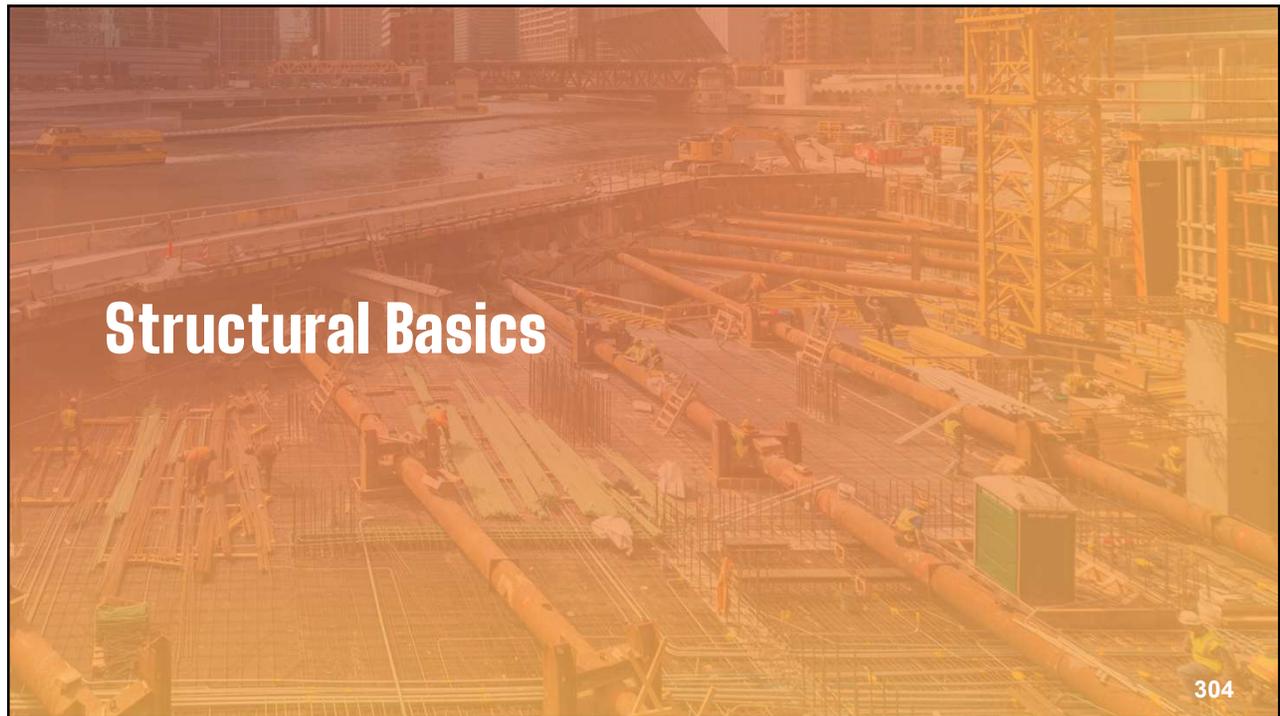


## Carbon Monoxide Detection

- 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



303



304

KEY CONCEPT



# Structural Peer Review

- Optional with Standard Plan Review
- Required for Self-Certification per Table C-2:

TABLE C-2 (2020): STRUCTURAL PEER REVIEW REQUIREMENTS

Use or Occupancy Classification of Finished Building	Scope of Work	
	New Construction & Additions	Repairs, Renovations & Alterations
All buildings	<ul style="list-style-type: none"> <li>- work includes adding balcony to existing building</li> <li>- work includes construction within 1 foot of property line</li> <li>- work includes excavation <math>\geq</math> 10 feet below grade</li> </ul>	Structural scope of work includes: <ul style="list-style-type: none"> <li>- adding, altering, or removing load-bearing elements</li> <li>- adding, altering, or removing floor openings</li> <li>- use of earth retention system</li> </ul>
Exclusively residential use	<ul style="list-style-type: none"> <li>- scope of work exceeds 3 stories above grade plane</li> <li>- scope of work includes occupiable rooftop above third story above grade plane</li> </ul>	- structural scope of work in building greater than 3 stories above grade plane
Any non-residential use	<ul style="list-style-type: none"> <li>- scope of work exceeds 1 story above grade plane</li> <li>- scope of work includes occupiable rooftop above second story above grade plane</li> <li>- work includes excavation <math>\geq</math> 5 feet below grade within 5 feet of an existing building</li> </ul>	- structural scope of work in building greater than 1 story above grade plane

305

REFERENCE



# Structural Loads

## Gravity Loads

- Dead Loads
- Live Loads
- Snow Loads
- Flood Loads
- Rain/Ice Loads

## Lateral Loads

- Wind Loads
- Earthquake Loads



306

# Load Paths (Sec. 1604.4)

- Gravity Load Path
  - Member sizing
  - Unsupported or compromised elements
- Lateral Load Path
  - Connections!



307



# Excavation Notices

October 2020 amendments

- *Administrative Provisions* Sec. 406
- More than 10 feet below existing grade
- More than 5 feet below existing grade and within 5 feet of an existing building **or** the public way
- Underpinning plan may be required.



308



## Geotechnical Report

- No report required
  - Single-story storage buildings up to 2,000 ft<sup>2</sup>
  - Alterations and additions, load increase < 5% existing capacity
- Limited or deferred report
  - Design bearing pressure limited by Table 1806.2(2)
- Report required before permit issuance
  - Excavation or soil penetration > 8 ft below existing grade
  - Construction exceeding 4 stories above grade
  - Construction covering more than 16,000 ft<sup>2</sup> ground area
  - Less conservative design bearing pressure

309

## Foundations

- If no geotechnical report at time of permitting, presumptive lateral soil pressure in Table 1610.1
- Dampproofing and waterproofing per Sec. 1805
- Prescriptive foundation design options in Sec. 1807
- For more information on footing and foundation design basics, see [Task 8.4](#)



310

KEY CONCEPT



## Structural Risk Category

- **Category I:** lowest risk
  - Agricultural and storage structures
- **Category II:** average risk
  - Most buildings
- **Category III:** heightened risk
  - Denser occupant concentration, utilities, regulated substances
- **Category IV:** critical facilities
  - Emergency response: medical, government, utilities, aviation
  - Hazardous materials

311

## Live Loads

- Loads that can or do change over time:
  - People (based on occupancy)
  - Movable objects (furniture, movable equipment, etc.)
- Code-specified minimums based on intended use of each room, space, or area (Table 1607.1)
- Classification is independent of classifications in Chapter 3 (Occupancy Classification) and Chapter 10 (Occupant Load)

312

CODE BOOK



# Table 1607.1

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATE D (pounds)
1. Apartments (see residential)	—	—
2. Access floor systems		
Office use	50	2,000
<i>Telecommunication equipment area</i>	100	2,000
3. Armories and drill rooms	150 <sup>a</sup>	—
4. Assembly areas		
Dressing rooms	40	
Fixed seats (fastened to floor)	60 <sup>m</sup>	
Follow spot, projections and control rooms	50	
Lobbies	100 <sup>m</sup>	—
Movable seats	100 <sup>m</sup>	
Stage floors	150 <sup>a</sup>	
Platforms (assembly)	100 <sup>m</sup>	
Other assembly areas	100 <sup>m</sup>	
5. <i>Porches, exterior balconies, decks and similar structures<sup>b</sup></i>		
Accessible from a single <i>dwelling unit</i>	60	300 <sup>f</sup>
All others	100	300 <sup>f</sup>
6. Catwalks	40	300
7. Cornices	60	—

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
23. Penal institutions		
Cell blocks	40	—
Corridors	100	
24. Recreational uses:		
Bowling alleys, poolrooms and similar uses	75 <sup>m</sup>	
Dance halls and ballrooms	100 <sup>m</sup>	
Gymnasiums	100 <sup>m</sup>	
Ice skating rink	250 <sup>a</sup>	—
Reviewing stands, grandstands and bleachers	100 <sup>a-m</sup>	
Roller skating rink	100 <sup>m</sup>	
Stadiums and arenas with fixed seats (fastened to floor)	60 <sup>a-m</sup>	
25. Residential		
Group R-3, R-4 and R-5 occupancies		
Uninhabitable attics without storage <sup>l</sup>	10	
Uninhabitable attics with storage <sup>h,i,k</sup>	20	
All other areas	40	
Group R-1 and R-2 occupancies		—
Private rooms and corridors serving		

313



## Changes from Old Code to New

	Old	New
Telecommunication Equip. Area (Tech. Ctr.)	125	↓ 100
Assembly—projection and control rooms	60 or 100	↓ 50
Assembly—platforms other than stages	150	↓ 100
Porches, decks, balconies, and occupiable rooftops accessible from a single unit (incl. porch/deck on single-family home)	100	↓ 60
Public dining rooms in residential buildings	75	↑ 100
Parking garages	50	↓ 40

314



## Changes from Old Code to New

	Old	New
Library corridors above 1 <sup>st</sup> floor	100	↓ 80
Office building corridors above 1 <sup>st</sup> floor	50	↑ 80
Correctional facility corridors above 1 <sup>st</sup> floor	80	↑ 100
Assembly—bowling alleys, poolrooms, etc.	100	↓ 75
Assembly—ice skating rink	100	↑ 250
R-3, R-4, R-5 inaccessible attics	?	10
R-3, R-4, R-5 uninhabitable attics with storage	40	↓ 20
Retail, above 1 <sup>st</sup> floor	100	↓ 75

315

KEY CONCEPT



## Design Live Loads for Egress Components

<b>Interior</b> (except within dwelling)		<b>Exterior</b> (except single dwelling)	
Exit access	var.	Exit access	100
Exit access corridors		Stairs, porches	100
Serving apts. only	40	Exit discharge, egress court	100
All other	80-100		
Exit access stairs	100	<b>Exterior</b> (single dwelling)	
Exit stairs	100	Porch, deck, balcony, or occupiable rooftop	60
Exit passageways	100		
Exit discharge lobbies, etc.	100		

316



## Load Placards

- *Administrative Provisions* Sec. 803
- No longer issued/reviewed by Department
- Required if design live load > **100 psf**
- Calculation must be certified by architect/engineer
- Sign must be posted by owner before C of O inspection



317

## Seismic

- Exempt from seismic design:
  - Group R-3 or R-5
  - Prescriptive wood light-frame design (2308)
  - Agricultural/storage with incidental occupancy
  - Specialized structures (bridges, utility, etc.)
- Seismic Design Category A
  - Risk category I, II or III
  - Soil site class A, B, C or D
  - For D, mean roof height  $\leq$  60 ft, span  $\leq$  40 ft



318

## Special Inspections

- Will become mandatory **1/1/2021**
- Will require design professional to complete and file special inspection schedule with permit applications
- Optional and strongly encouraged to start now



319

CODE BOOK



## For more information...

- Single-wythe masonry limitations ([2101.2.2](#))
- Fireplaces and chimneys ([2111-2113](#))
- Steel light-frame construction ([2211](#))
- Heavy timber ([2304.11](#))
- Conventional light-frame construction ([2308](#))
- Structural glass ([Ch 24](#))
- Glass guards ([2407](#))
- Safety glazing / impact areas ([Ch. 24, Task 6.4](#))



320