



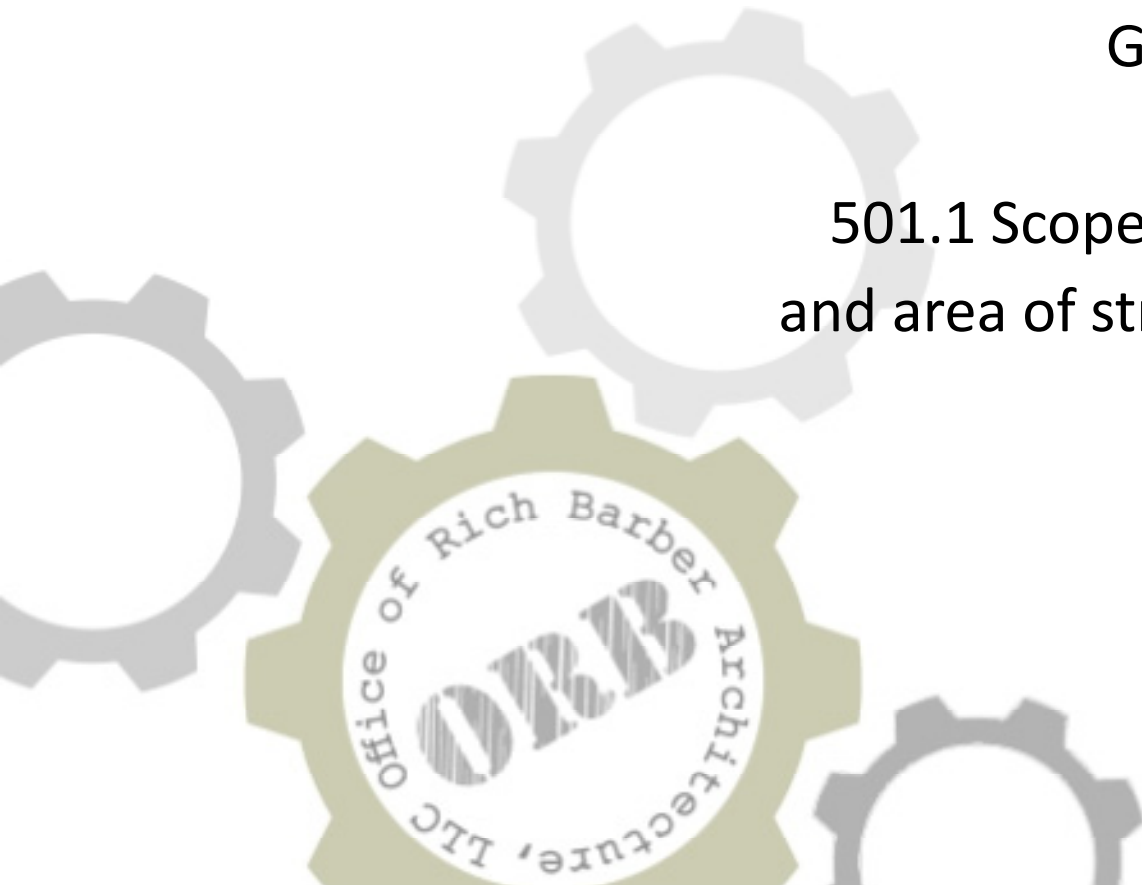
ORB UNIVERSITY

IBC 2018

CHAPTER 5

GENERAL BUILDING HEIGHT AND AREAS


501.1 Scope. The provisions of this chapter control the height and area of structures hereafter erected and additions to existing structures.



What do we need to determine the building height and the building areas?

“506.1 General. The floor area of a building shall be determined based on the type of construction, occupancy classification, whether there is an automatic sprinkler system installed throughout the building and the amount of building frontage on public way or open space.”

- Type of construction (Chapter 6).
- Occupancy classification (Chapter 3).
- Whether is an automatic sprinkler system provided (Section 903.3.1.3).
- Amount of building frontage on public way or open space.



Three factors to classify our building according to the client:

- How tall of a building does your client want?
- How much SF per Floor is desired?
- What type of occupancy is planned for the building?
 - Fact: Different Occupancies have different Occupant loads (more people)! the more people, the higher safety needed.



506.2.3 Single-occupancy, multistory buildings.

The allow-able area of a single-occupancy building with more than one story above grade plane shall be determined in accordance with Equation 5-2:

$$Aa = [At + (NS \times If)] \times Sa$$

Where:

Aa = Allowable area (square feet).

At = Tabular allowable area factor (NS, S13R, S13D or SM value, as applicable) in accordance with Table 506.2.

NS = Tabular allowable area factor in accordance with Table 506.2 for a no sprinklered building (regardless of whether the building is sprinklered).

If = Area factor increase due to frontage (percent) as calculated in accordance with Section 506.3.

Sa = Actual number of building stories above grade plane, not to exceed three. For buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2, use the actual number of building stories above grade plane, not to exceed four.

No individual story shall exceed the allowable area (Aa) as determined by Equation 5-2 using the value of Sa =1.

Type of construction (Chapter 6).



Why building types are important?

Taller buildings = higher risk of life safety.

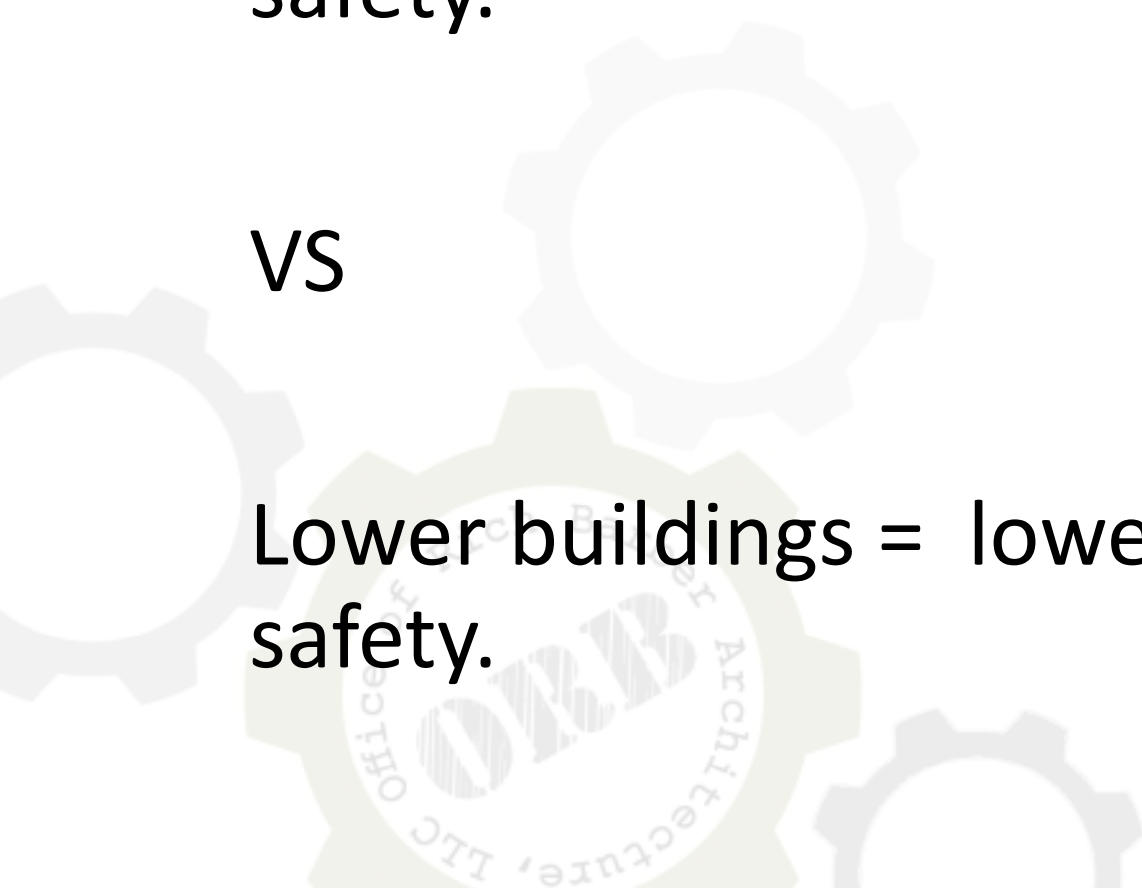


VS

Lower buildings = lower risk of life safety.



It's a matter of time!





International Building Code - (Chapter 6 – Table 601)

TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
A	B	A	B	A	B	HT	A	B
Limited to: - Ratings in 601. - Non-combustible materials.				Exterior Walls: -Non-combustible. Interior Walls: Any material allowed in code.		Heavy Timber	Any material allowed in code	

**MOST
RESTRICTIVE**

**LEAST
RESTRICTIVE**





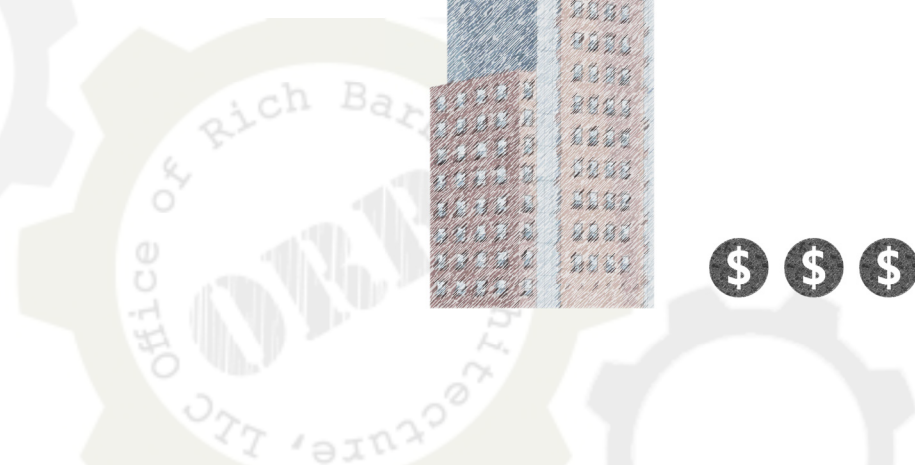
International Building Code - (Chapter 6 – Table 601)

TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
A	B	A	B	A	B	HT	A	B
Limited to: - Ratings in 601. - Non-combustible materials.				Exterior Walls: -Non-combustible. Interior Walls: Any material allowed in code.	Heavy Timber		Any material allowed in code	

**MOST
RESTRICTIVE**



**LEAST
RESTRICTIVE**





NORMALLY USED ON MULTIFAMILY BUILDINGS.

• TYPE I-A:

Fire Resistive Non-Combustible:

Normally found in high-rise buildings and Group I Occupancies.

Common Fire Ratings:

- 3hr – Exterior Walls
- 3hr – Structural Frame
- 2hr – Floor/Ceiling Assembly
- 1 ½hr – Roof Protection

• TYPE III-A:

Protected Combustible:

Also as know as “ordinary” construction with brick or CMU block walls, and wooden roof or floor assembly which is 1 hour fire protected.

Common Fire Ratings:

- 2hr – Exterior Walls
- 1hr – Structural Frame
- 1hr – Floor/Ceiling Assembly

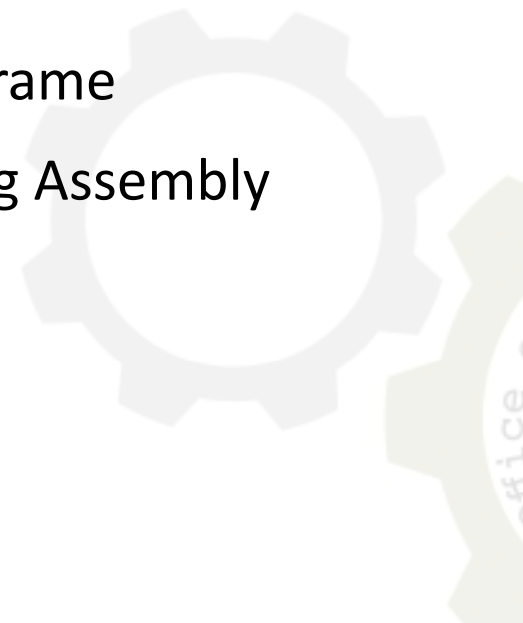
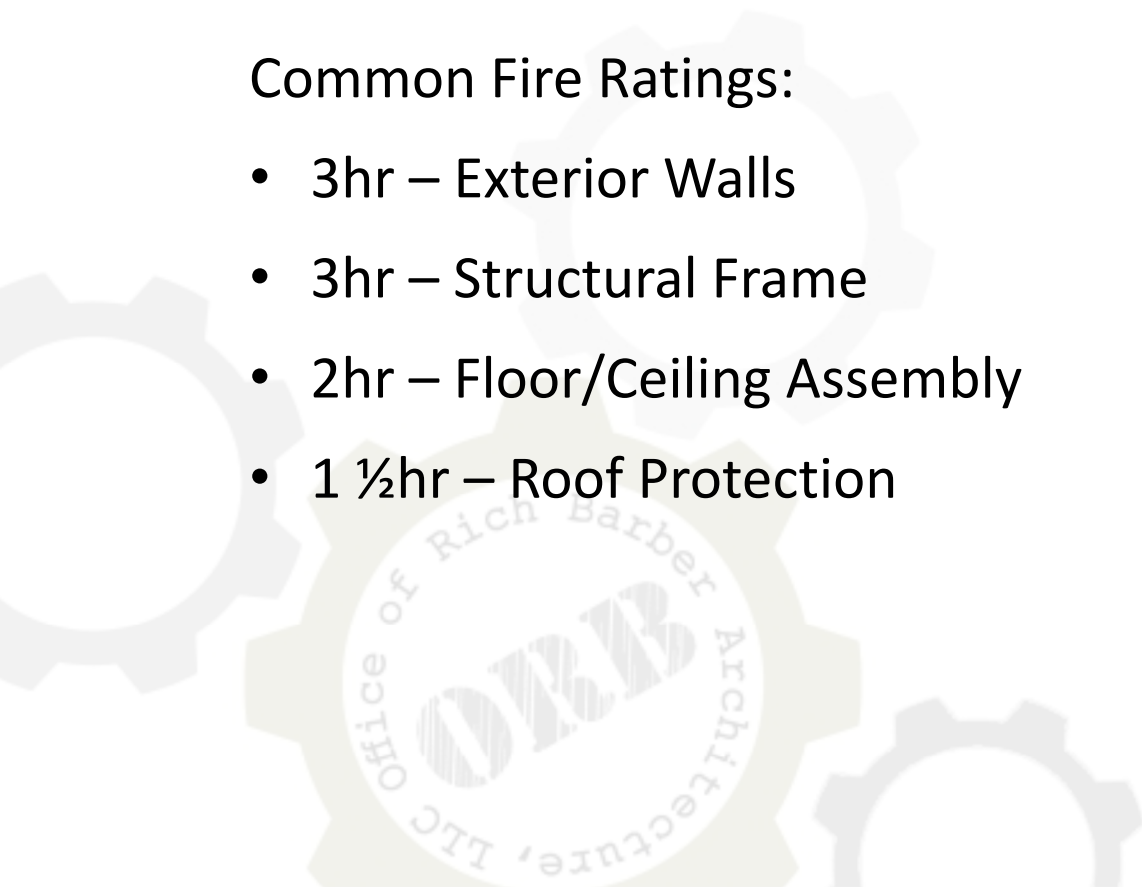
• TYPE V-A:

Protected Wood Frame:

Commonly used in the construction of newer apartment buildings; there is no exposed wood visible.

Common Fire Ratings:

- 1hr – Exterior Walls
- 1hr – Structural Frame
- 1hr – Floor/Ceiling Assembly

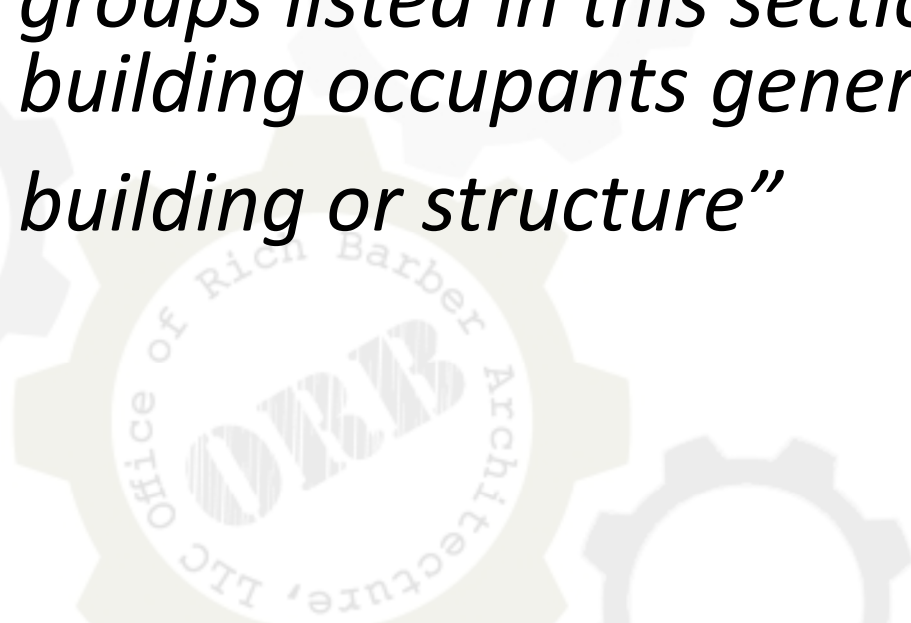




Occupancy classifications and use (Chapter 3)

*“301.1 General. The provisions of this chapter shall **control the classification of all buildings and structures as to occupancy and use**. Different classifications of occupancy and use represent varying levels of hazard and risk to building occupants and adjacent properties”*

*“302.1 Occupancy classification. **Occupancy classification is the formal designation of the primary purpose of the building**, structure or portion thereof. Structures shall be classified into one or more of the occupancy groups listed in this section based on the nature of the hazards and risks to building occupants generally associated with the intended purpose of the building or structure”*





Occupancy groups: Vs Occupancy use:

1. Assembly (see Section 303): Groups A-1, A-2, A-3, A-4 and A-5.
2. Business (see Section 304): Group B.
3. Educational (see Section 305): Group E.
4. Factory and Industrial (see Section 306): Groups F-1 and F-2.
5. High Hazard (see Section 307): Groups H-1, H-2, H-3, H-4 and H-5.
6. Institutional (see Section 308): Groups I-1, I-2, I-3 and I-4.
7. Mercantile (see Section 309): Group M.
8. Residential (see Section 310): Groups R-1, R-2, R-3 and R-4.
9. Storage (see Section 311): Groups S-1 and S-2.
10. Utility and Miscellaneous (see Section 312): Group U.

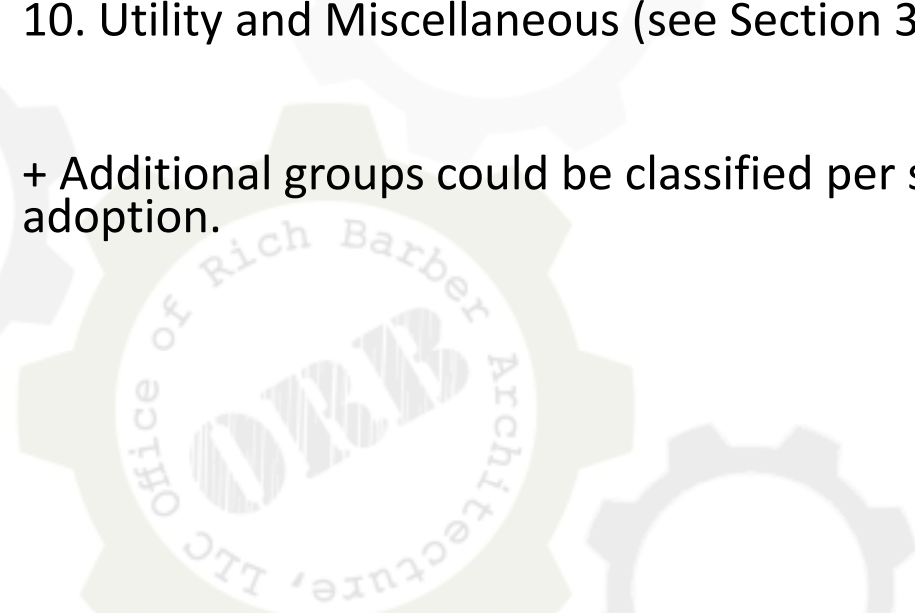
+ Additional groups could be classified per state code adoption.

**TABLE 1004.5
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT**

FUNCTION OF SPACE	OCCUPANT LOAD FACTOR ^a
Accessory storage areas, mechanical equipment room	300 gross
Agricultural building	300 gross
Aircraft hangars	500 gross
Airport terminal	
Baggage claim	20 gross
Baggage handling	300 gross
Concourse	100 gross
Waiting areas	15 gross
Assembly	
Gaming floors (keno, slots, etc.)	11 gross
Exhibit gallery and museum	30 net
Assembly with fixed seats	See Section 1004.6
Assembly without fixed seats	
Concentrated (chairs only—not fixed)	7 net
Standing space	5 net
Unconcentrated (tables and chairs)	15 net
Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for additional areas	7 net
Business areas	150 gross
Concentrated business use areas	See Section 1004.8
Courtrooms—other than fixed seating areas	40 net
Day care	35 net
Dormitories	50 gross
Educational	
Classroom area	20 net
Shops and other vocational room areas	50 net
Exercise rooms	50 gross
Group H-5 fabrication and manufacturing areas	200 gross
Industrial areas	100 gross
Institutional areas	
Inpatient treatment areas	240 gross
Outpatient areas	100 gross
Sleeping areas	120 gross
Kitchens, commercial	200 gross
Library	
Reading rooms	50 net
Stack area	100 gross
Locker rooms	50 gross
Mall buildings—covered and open	See Section 402.8.2
Mercantile	60 gross
Storage, stock, shipping areas	300 gross
Parking garages	200 gross
Residential	200 gross
Skating rinks, swimming pools	
Rink and pool	50 gross
Decks	15 gross
Stages and platforms	15 net
Warehouses	500 gross

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

a. Floor area in square feet per occupant.



8. Residential (see Section 310): Groups R-1, R-2, R-3 and R-4.

- 310.1 Residential **Group R**. Residential Group R includes, among others, the use of a building or structure, or a portion thereof, for **sleeping purposes** when not classified as an Institutional Group I or when not regulated by the International Residential Code.
- 310.3 Residential **Group R-2**. Residential Group R-2 occupancies containing sleeping units or more than two dwelling units where the occupants are primarily permanent in nature, including:
 - **Apartment houses**



Other occupancy groups you may have:

- 2. Business (see Section 304):
Group B

- 7. Mercantile (see Section 309):
Group M

- 9. Storage (see Section 311):
Groups S-1 and S-2



- AURA Watermark apartments. The layout for the project will consist of five-story construction over three levels of parking, one below-grade. Grade level townhouse units provide direct access to lake frontage and amenities.



- Broadstone Waterfront is a vibrant mixed-use project located in downtown Scottsdale.



- Roosevelt Row. This mixed-use project contains retail and restaurant space on the first floor, with residential areas above.



Method of design: Mixed use and occupancy

- 508.4.1 Occupancy classification.** Separated occupancies shall be individually classified in accordance with Section 302.1. Each separated space shall comply with this code based on the **occupancy classification of that portion of the building.** The most restrictive provisions of Chapter 9 that apply to the separate occupancies shall apply to the total non-fire-barrier-separated occupancy areas. Occupancy separations that serve to define fire area limits established in Chapter 9 for requiring a fire protection system shall also comply with Section 901.7.

**TABLE 508.4
REQUIRED SEPARATION OF OCCUPANCIES (HOURS)^f**

OCCUPANCY	A, E		I-1 ^a , I-3, I-4		I-2		R ^a		F-2, S-2 ^b , U		B ^c , F-1, M, S-1		H-1		H-2		H-3, H-4		H-5	
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
A, E	N	N	1	2	2	NP	1	2	N	1	1	2	NP	NP	3	4	2	3	2	NP
I-1 ^a , I-3, I-4	—	—	N	N	2	NP	1	NP	1	2	1	2	NP	NP	3	NP	2	NP	2	NP
I-2	—	—	—	—	N	N	2	NP	2	NP	2	NP	NP	NP	3	NP	2	NP	2	NP
R ^a	—	—	—	—	—	—	N	N	1 ^c	2 ^c	1	2	NP	NP	3	NP	2	NP	2	NP
F-2, S-2 ^b , U	—	—	—	—	—	—	—	—	N	N	1	2	NP	NP	3	4	2	3	2	NP
B ^c , F-1, M, S-1	—	—	—	—	—	—	—	—	—	—	N	N	NP	NP	2	3	1	2	1	NP
H-1	—	—	—	—	—	—	—	—	—	—	—	—	N	NP	NP	NP	NP	NP	NP	NP
H-2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	N	NP	1	NP	1	NP
H-3, H-4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1 ^d	NP	1	NP
H-5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	N	NP

S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

NS = Buildings not equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

N = No separation requirement.

NP = Not Permitted.

a. See Section 420.

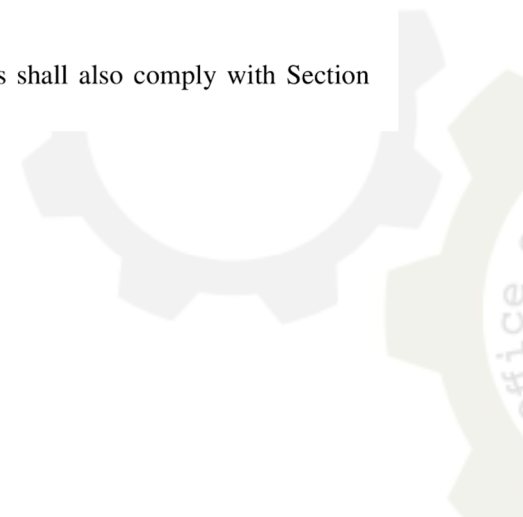
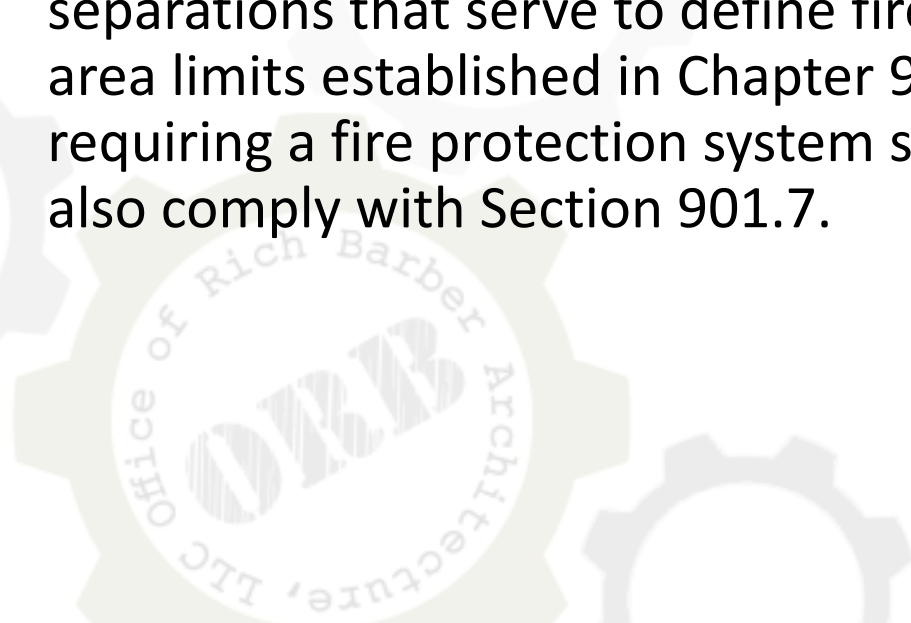
b. The required separation from areas used only for private or pleasure vehicles shall be reduced by 1 hour but not to less than 1 hour.

c. See Section 406.3.2.

d. Separation is not required between occupancies of the same classification.

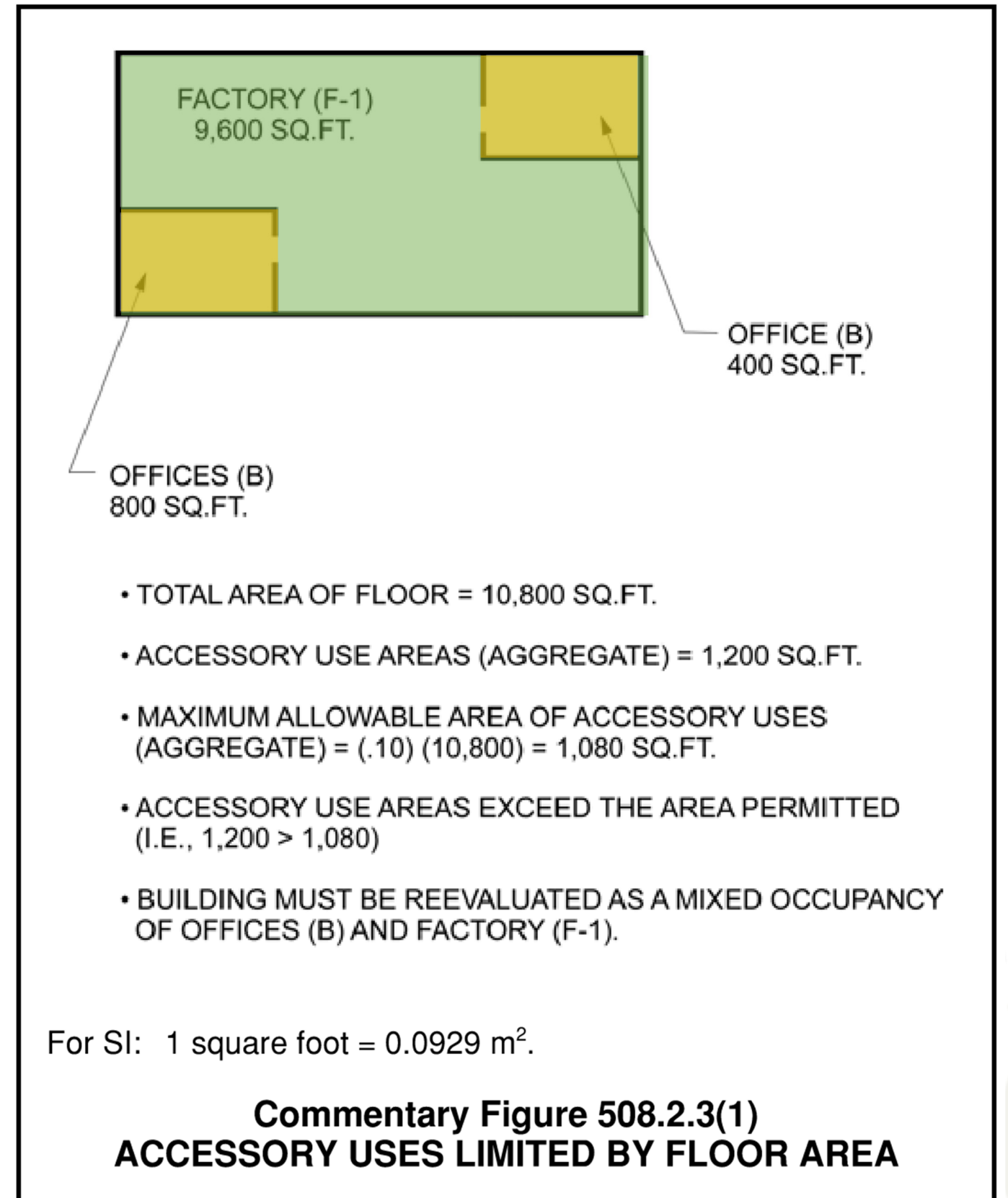
e. See Section 422.2 for ambulatory care facilities.

f. Occupancy separations that serve to define fire area limits established in Chapter 9 for requiring fire protection systems shall also comply with Section 707.3.10 and Table 707.3.10 in accordance with Section 901.7.



Accessory occupancies

- 508.2 **Accessory occupancies**. Accessory occupancies are those occupancies that are **ancillary to the main occupancy** of the building or portion thereof. Accessory occupancies shall comply with the provisions of Sections 508.2.1 through 508.2.4.
- 508.2.2 Allowable building height. **The allowable height and number of stories** of the building containing accessory occupancies shall be in accordance with Section 504 for **the main occupancy of the building**.
- 508.2.3 **Allowable building area**. The allowable area of the building shall be based on the applicable provisions of Section 506 for the main occupancy of the building. **Aggregate accessory occupancies** shall not occupy more **than 10 percent** of the floor area of the story in which they are located and shall not exceed the tabular values for nonsprinklered buildings in Table 506.2 for each such accessory occupancy.



Method of design: Non separated use and occupancy

- 508.3 Nonseparated occupancies. Buildings or portions of buildings that comply with the provisions of this section shall be considered as nonseparated occupancies.
- 508.3.1 Occupancy classification. Nonseparated occupancies shall be individually classified in accordance with Section 302.1. The requirements of this code shall apply to each portion of the building based on the occupancy classification of that space. In addition, the most restrictive provisions of Chapter 9 that apply to the nonseparated occupancies shall apply to the total nonseparated occupancy area.
- 508.3.2 Allowable building area, height and number of stories. The allowable building area, height and number of stories of the building or portion thereof shall be based on the most restrictive allowances for the occupancy groups under consideration for the type of construction of the building in accordance with Section 503.1.
- 508.3.3 Separation. No separation is required between non-separated occupancies.
 - Exceptions: 1. Group H-2, H-3, H-4 and H-5 occupancies shall be separated from all other occupancies in accordance with Section 508.4.
 - 2. Group I-1, R-1, R-2 and R-3 dwelling units and sleeping units shall be separated from other dwelling or sleeping units and from other occupancies contiguous to them in accordance with the requirements of Section 420.



How to measure our buildings?

- [BG] AREA, BUILDING. The area included within surrounding exterior walls, or exterior walls and fire walls, exclusive of vent shafts and courts. Areas of the building not provided with surrounding walls shall be included in the building area if such areas are included within the horizontal projection of the roof or floor above.

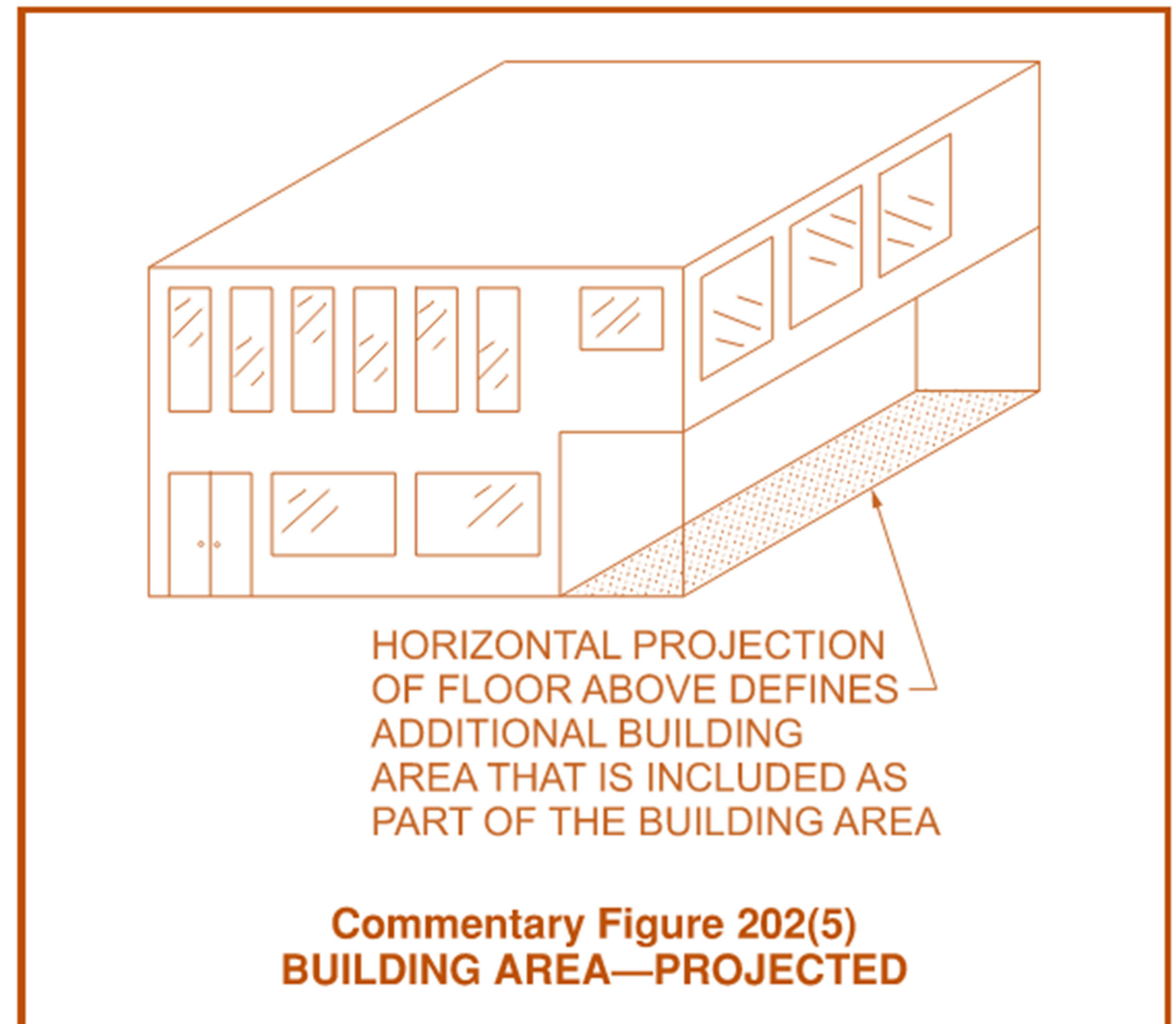
THE BUILDING AREA IS THE FOOTPRINT OF THE BUILDING!

You can **exclude**:

Spaces that are inside this perimeter and open to the outside atmosphere at the top, such as open shafts and courts.

You may **include**:

The projection of the roof or floor above.





GROSS AREA VS NET AREA

- These definitions are only mentioned in Chapter 11 and are not intended to calculate building areas.
- The intent is only to calculate occupant loads of buildings, certain areas, or portions thereof.
- Why do you need the occupant load?
 1. To know the number of exits required by the code.
 2. To properly size your exits.

GROSS INCLUDES ALMOST EVERYTHING!

[B E] FLOOR AREA, GROSS. The floor area within the inside perimeter of the exterior walls of the building under consideration, exclusive of vent shafts and courts, without deduction for corridors, stairways, ramps, closets, the thickness of interior walls, columns or other features. The floor area of a building, or portion thereof, not provided with surrounding exterior walls shall be the usable area under the horizontal projection of the roof or floor above. The gross floor area shall not include shafts with no openings or interior courts.

NET DOES NOT ALWAYS CATCH EVERYTHING!

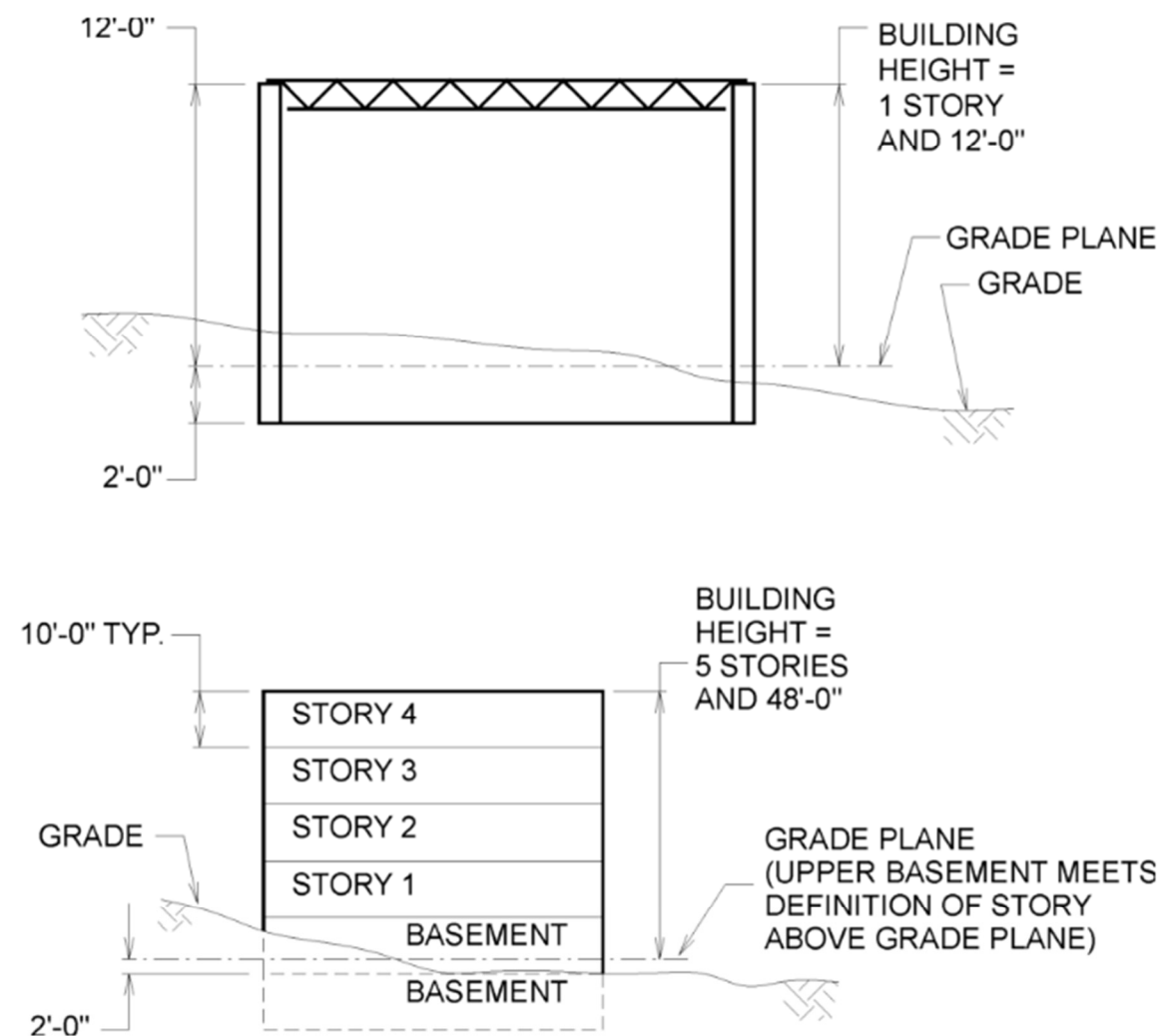
[BE] FLOOR AREA, NET. The actual occupied area not including unoccupied accessory areas such as corridors, stairways, ramps, toilet rooms, mechanical rooms and closets.

**LIFE
SAFETY
ONLY**



ALLOWABLE HEIGHT

- [BG] HEIGHT, BUILDING. The vertical distance from grade plane to the average height of the highest roof surface.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

Commentary Figure 202(27)
BUILDING HEIGHT



LET'S FUN BEGIN!

ALLOWABLE BUILDING HEIGHT

**TABLE 504.3
ALLOWABLE BUILDING HEIGHT IN FEET ABOVE GRADE PLANE^a**

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
A, B, E, F, M, S, U	NS ^b	UL	160	65	55	65	55	65	50	40
	S	UL	180	85	75	85	75	85	70	60
H-1, H-2, H-3, H-5	NS ^{c, d}	UL	160	65	55	65	55	65	50	40
	S	UL	180	85	75	85	75	85	70	60
H-4	NS ^{c, d}	UL	160	65	55	65	55	65	50	40
	S	UL	180	85	75	85	75	85	70	60
I-1 Condition 1, I-3	NS ^{d, e}	UL	160	65	55	65	55	65	50	40
	S	UL	180	85	75	85	75	85	70	60
I-1 Condition 2, I-2	NS ^{d, e, f}	UL	160	65	55	65	55	65	50	40
	S	UL	180	85		65	55	65	50	40
I-4	NS ^{d, g}	UL	160	65	55	65	55	65	50	40
	S	UL	180	85	75	85	75	85	70	60
R ^h	NS ^d	UL	160	65	55	65	55	65	50	40
	S13D	60	60	60	60	60	60	60	50	40
	S13R	60	60	60	60	60	60	60	60	60
	S	UL	180	85	75	85	75	85	70	60

For SI: 1 foot = 304.8 mm.

UL = Unlimited; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2; S13D = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.3.

- See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
- See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
- New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
- The NS value is only for use in evaluation of existing building height in accordance with the *International Existing Building Code*.
- New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies Condition 1, see Exception 1 of Section 903.2.6.
- New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and Section 1103.5 of the *International Fire Code*.
- For new Group I-4 occupancies, see Exceptions 2 and 3 of Section 903.2.6.
- New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.



ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE

TABLE 504.4—continued
ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE^{a, b}

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION									
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V		
		A	B	A	B	A	B	HT	A	B	
R-1 ^h	NS ^d	UL	11	4	4	4	4	4	4	3	2
	S13R	4	4							4	3
	S	UL	12	5	5	5	5	5	4	3	
R-2 ^h	NS ^d	UL	11	4	4	4	4	4	4	3	2
	S13R	4	4							4	3
	S	UL	12	5	5	5	5	5	4	3	
R-3 ^h	NS ^d	UL	11	4	4	4	4	4	4	3	3
	S13D	4	4							3	3
	S13R	4	4							4	4
	S	UL	12	5	5	5	5	5	4	4	
R-4 ^h	NS ^d	UL	11	4	4	4	4	4	4	3	2
	S13D	4	4							3	2
	S13R	4	4							4	3
	S	UL	12	5	5	5	5	5	4	3	
S-1	NS	UL	11	4	2	3	2	4	3	1	
	S	UL	12	5	3	4	3	5	4	2	
S-2	NS	UL	11	5	3	4	3	4	4	2	
	S	UL	12	6	4	5	4	5	5	3	
U	NS	UL	5	4	2	3	2	4	2	1	
	S	UL	6	5	3	4	3	5	3	2	

UL = Unlimited; NP = Not Permitted; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2; S13D = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.3.

- See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
- See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
- New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
- The NS value is only for use in evaluation of existing building height in accordance with the *International Existing Building Code*.
- New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies, Condition 1, see Exception 1 of Section 903.2.6.
- New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and 1103.5 of the *International Fire Code*.
- For new Group I-4 occupancies, see Exceptions 2 and 3 of Section 903.2.6.
- New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.

ALLOWABLE AREA FACTOR

TABLE 506.2—continued
ALLOWABLE AREA FACTOR (A_i = NS, S1, S13R, S13D or SM, as applicable) IN SQUARE FEET^{a, b}

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
I-1	NS ^{d, c}	UL	55,000	19,000	10,000	16,500	10,000	18,000	10,500	4,500
	S1	UL	220,000	76,000	40,000	66,000	40,000	72,000	42,000	18,000
	SM	UL	165,000	57,000	30,000	49,500	30,000	54,000	31,500	13,500
I-2	NS ^{d, f}	UL	UL	15,000	11,000	12,000	NP	12,000	9,500	NP
	S1	UL	UL	60,000	44,000	48,000	NP	48,000	38,000	NP
	SM	UL	UL	45,000	33,000	36,000	NP	36,000	28,500	NP
I-3	NS ^{d, e}	UL	UL	15,000	10,000	10,500	7,500	12,000	7,500	5,000
	S1	UL	UL	45,000	40,000	42,000	30,000	48,000	30,000	20,000
	SM	UL	UL	45,000	30,000	31,500	22,500	36,000	22,500	15,000
I-4	NS ^{d, g}	UL	60,500	26,500	13,000	23,500	13,000	25,500	18,500	9,000
	S1	UL	121,000	106,000	52,000	94,000	52,000	102,000	74,000	36,000
	SM	UL	181,500	79,500	39,000	70,500	39,000	76,500	55,500	27,000
M	NS	UL	UL	21,500	12,500	18,500	12,500	20,500	14,000	9,000
	S1	UL	UL	86,000	50,000	74,000	50,000	82,000	56,000	36,000
	SM	UL	UL	64,500	37,500	55,500	37,500	61,500	42,000	27,000
R-1 ^h	NS ^g	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S13R									
	S1	UL	UL	96,000	64,000	96,000	64,000	82,000	48,000	28,000
	SM	UL	UL	72,000	48,000	72,000	48,000	61,500	36,000	21,000
R-2 ^h	NS ^g	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S13R									
	S1	UL	UL	96,000	64,000	96,000	64,000	82,000	48,000	28,000
	SM	UL	UL	72,000	48,000	72,000	48,000	61,500	36,000	21,000
R-3 ^h	NS ^g	UL	UL	UL	UL	UL	UL	UL	UL	UL
	S13D									
	S13R									
	S1									
	SM									
R-4 ^h	NS ^g	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S13D									
	S13R									
	S1	UL	UL	96,000	64,000	96,000	64,000	82,000	48,000	28,000
	SM	UL	UL	72,000	48,000	72,000	48,000	61,500	36,000	21,000
S-1	NS	UL	48,000	26,000	17,500	26,000	17,500	25,500	14,000	9,000
	S1	UL	192,000	104,000	70,000	104,000	70,000	102,000	56,000	36,000
	SM	UL	144,000	78,000	52,500	78,000	52,500	76,500	42,000	27,000
S-2	NS	UL	79,000	39,000	26,000	39,000	26,000	38,500	21,000	13,500
	S1	UL	316,000	156,000	104,000	156,000	104,000	154,000	84,000	54,000
	SM	UL	237,000	117,000	78,000	117,000	78,000	115,500	63,000	40,500
U	NS ⁱ	UL	35,500	19,000	8,500	14,000	8,500	18,000	9,000	5,500
	S1	UL	142,000	76,000	34,000	56,000	34,000	72,000	36,000	22,000
	SM	UL	106,500	57,000	25,500	42,000	25,500	54,000	27,000	16,500

(continued)



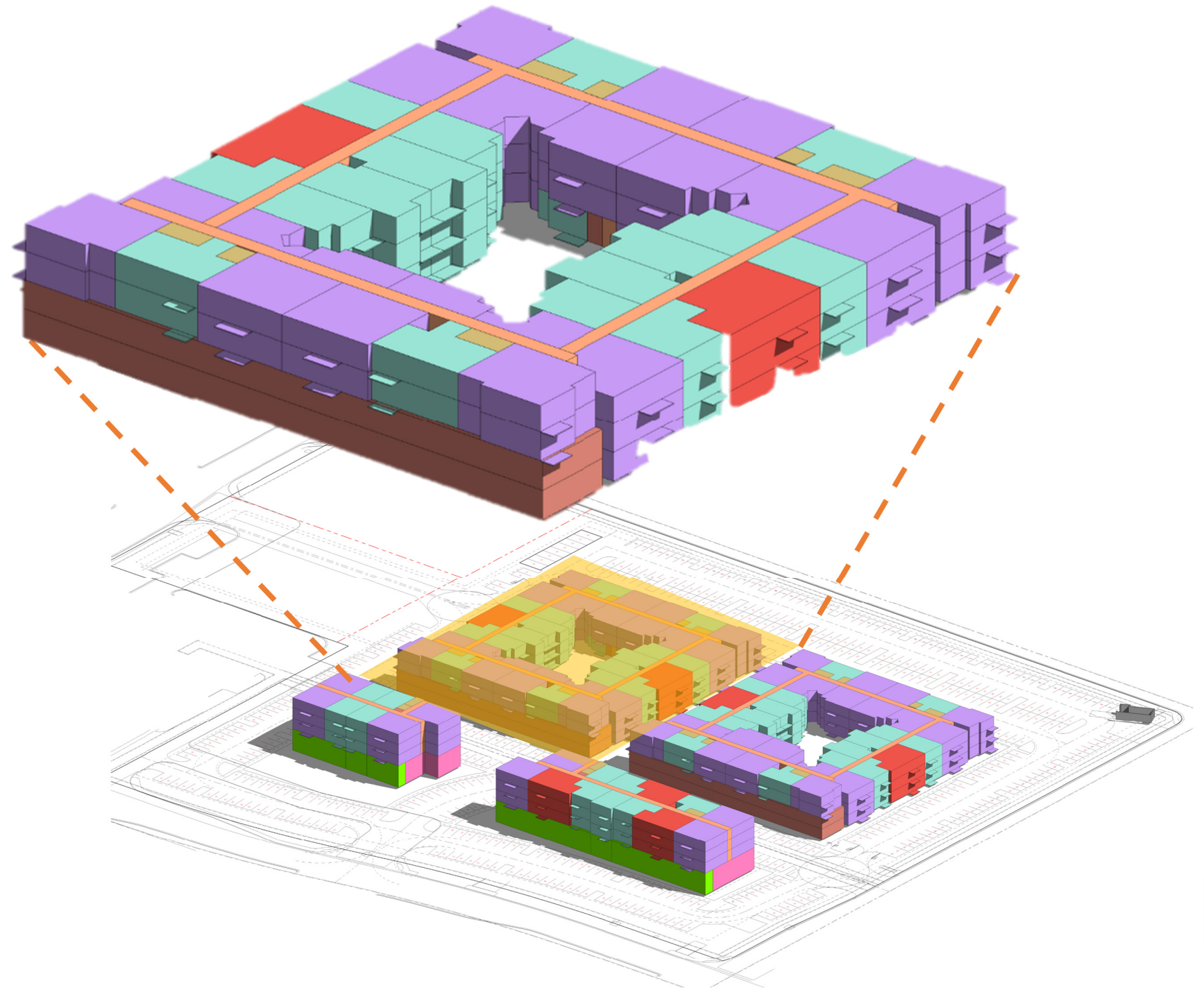


CASE STUDY

- What does the client want?

Building 4:

- Three stories of apartments.
- Central courtyard
- About 132,690 SF total.
- 108 apartment total.
- Desire type of construction type V-A





ALLOWABLE BUILDING HEIGHT

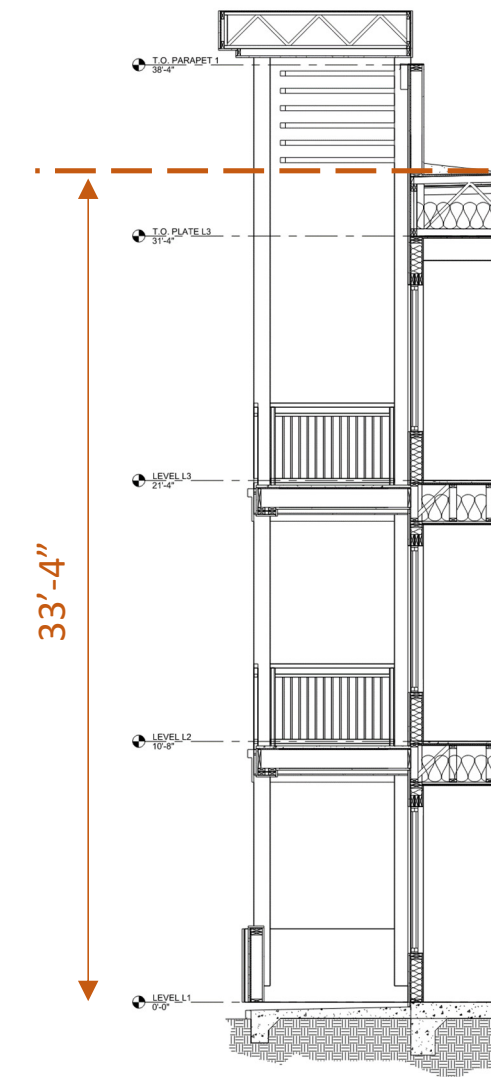
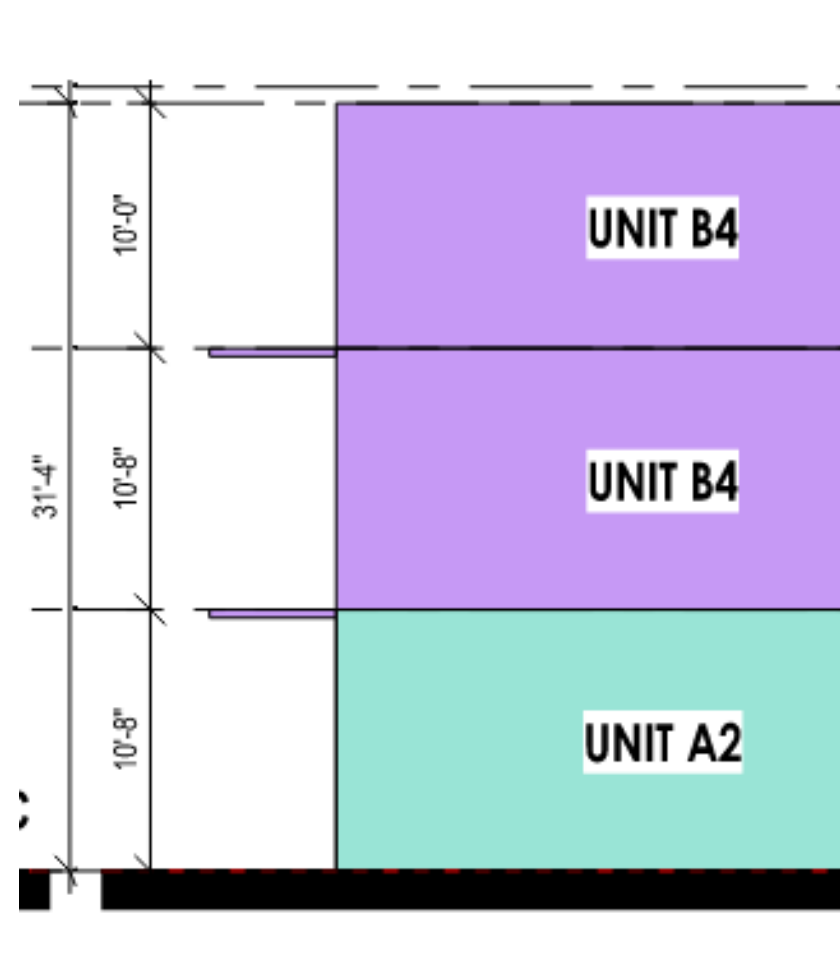
TABLE 504.3
ALLOWABLE BUILDING HEIGHT IN FEET ABOVE GRADE PLANE^a

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION									
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V		
		A	B	A	B	A	B		HT	A	B
A, B, E, F, M, S, U	NS ^b	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
H-1, H-2, H-3, H-5	NS ^{c,d}	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
H-4	NS ^{c,d}	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
I-1 Condition 1, I-3	NS ^{d,e}	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
I-1 Condition 2, I-2	NS ^{d,e,f}	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
I-4	NS ^{d,g}	UL	160	65	55	65	55	65	50	40	
	S	UL	180	85	75	85	75	85	70	60	
R ^h	NS ^d	UL	160	65	55	65	55	65	50	40	
	S13D	60	60	60	60	60	60	60	50	40	
	S13R	60	60	60	60	60	60	60	60	60	
	S	UL	180	85	75	85	75	85	70	60	

For SI: 1 foot = 304.8 mm.

UL = Unlimited; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2; S13D = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.3.

- See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
- See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
- New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
- The NS value is only for use in evaluation of existing building height in accordance with the *International Existing Building Code*.
- New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies Condition 1, see Exception 1 of Section 903.2.6.
- New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and Section 1103.5 of the *International Fire Code*.
- For new Group I-4 occupancies, see Exceptions 2 and 3 of Section 903.2.6.
- New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.





ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE

TABLE 504.4—continued
ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE^{a, b}

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION									
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V		
		A	B	A	B	A	B	HT	A	B	
R-1 ^h	NS ^d	UL	11	4	4	4	4	4	4	3	2
	S13R	4	4	4	4	4	4	4	4	3	3
	S	UL	12	5	5	5	5	5	4	3	3
R-2 ^h	NS ^d	UL	11	4	4	4	4	4	4	3	2
	S13R	4	4	4	4	4	4	4	4	3	3
	S	UL	12	5	5	5	5	5	4	3	3
R-3 ^h	NS ^d	UL	11	4	4	4	4	4	4	3	3
	S13D	4	4	4	4	4	4	4	4	3	3
	S13R	4	4	4	4	4	4	4	4	4	4
	S	UL	12	5	5	5	5	5	5	4	4
R-4 ^h	NS ^d	UL	11	4	4	4	4	4	4	3	2
	S13D	4	4	4	4	4	4	4	4	3	2
	S13R	4	4	4	4	4	4	4	4	4	3
	S	UL	12	5	5	5	5	5	5	4	3
S-1	NS	UL	11	4	2	3	2	4	4	3	1
	S	UL	12	5	3	4	3	5	5	4	2
S-2	NS	UL	11	5	3	4	3	4	4	4	2
	S	UL	12	6	4	5	4	5	5	5	3
U	NS	UL	5	4	2	3	2	4	4	2	1
	S	UL	6	5	3	4	3	5	5	3	2

UL = Unlimited; NP = Not Permitted; NS = Buildings not equipped throughout with an automatic sprinkler system; S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1; S13R = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2; S13D = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.3.

- See Chapters 4 and 5 for specific exceptions to the allowable height in this chapter.
- See Section 903.2 for the minimum thresholds for protection by an automatic sprinkler system for specific occupancies.
- New Group H occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.5.
- The NS value is only for use in evaluation of existing building height in accordance with the *International Existing Building Code*.
- New Group I-1 and I-3 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6. For new Group I-1 occupancies, Condition 1, see Exception 1 of Section 903.2.6.
- New and existing Group I-2 occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.6 and 1103.5 of the *International Fire Code*.
- For new Group I-4 occupancies, see Exceptions 2 and 3 of Section 903.2.6.
- New Group R occupancies are required to be protected by an automatic sprinkler system in accordance with Section 903.2.8.

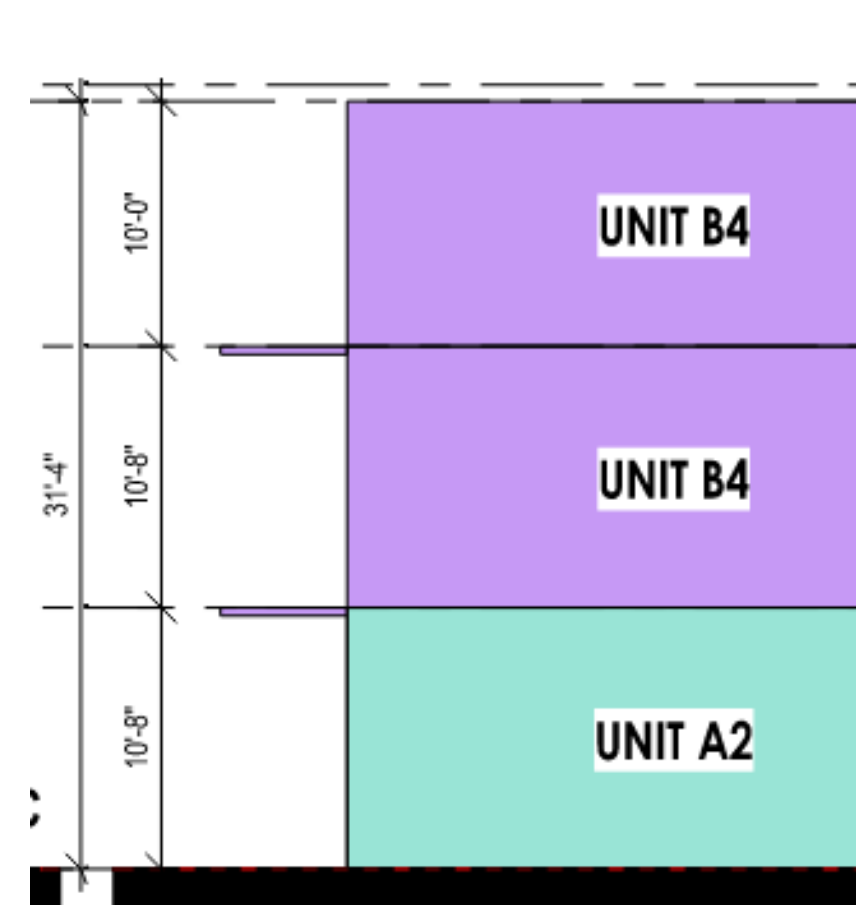


TABLE 506.2—continued
ALLOWABLE AREA FACTOR (A_t = NS, S1, S13R, S13D or SM, as applicable) IN SQUARE FEET^{a,b}

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
I-1	NS ^{d,c}	UL	55,000	19,000	10,000	16,500	10,000	18,000	10,500	4,500
	S1	UL	220,000	76,000	40,000	66,000	40,000	72,000	42,000	18,000
	SM	UL	165,000	57,000	30,000	49,500	30,000	54,000	31,500	13,500
I-2	NS ^{d,f}	UL	UL	15,000	11,000	12,000	NP	12,000	9,500	NP
	S1	UL	UL	60,000	44,000	48,000	NP	48,000	38,000	NP
	SM	UL	UL	45,000	33,000	36,000	NP	36,000	28,500	NP
I-3	NS ^{d,c}	UL	UL	15,000	10,000	10,500	7,500	12,000	7,500	5,000
	S1	UL	UL	45,000	40,000	42,000	30,000	48,000	30,000	20,000
	SM	UL	UL	45,000	30,000	31,500	22,500	36,000	22,500	15,000
I-4	NS ^{d,g}	UL	60,500	26,500	13,000	23,500	13,000	25,500	18,500	9,000
	S1	UL	121,000	106,000	52,000	94,000	52,000	102,000	74,000	36,000
	SM	UL	181,500	79,500	39,000	70,500	39,000	76,500	55,500	27,000
M	NS	UL	UL	21,500	12,500	18,500	12,500	20,500	14,000	9,000
	S1	UL	UL	86,000	50,000	74,000	50,000	82,000	56,000	36,000
	SM	UL	UL	64,500	37,500	55,500	37,500	61,500	42,000	27,000
R-1 ^h	NS ^d	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S13R	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S1	UL	UL	96,000	64,000	96,000	64,000	82,000	48,000	28,000
	SM	UL	UL	72,000	48,000	72,000	48,000	61,500	36,000	21,000
R-2 ^h	NS ^d	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S13R	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S1	UL	UL	96,000	64,000	96,000	64,000	82,000	48,000	28,000
R-3 ^h	SM	UL	UL	72,000	48,000	72,000	48,000	61,500	36,000	21,000
	NS ^d	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S13D	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S13R	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S1	UL	UL	96,000	64,000	96,000	64,000	82,000	48,000	28,000
R-4 ^h	SM	UL	UL	72,000	48,000	72,000	48,000	61,500	36,000	21,000
	NS ^d	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S13D	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S13R	UL	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000
	S1	UL	UL	96,000	64,000	96,000	64,000	82,000	48,000	28,000
S-1	NS	UL	48,000	26,000	17,500	26,000	17,500	25,500	14,000	9,000
	S1	UL	192,000	104,000	70,000	104,000	70,000	102,000	56,000	36,000
	SM	UL	144,000	78,000	52,500	78,000	52,500	76,500	42,000	27,000
S-2	NS	UL	79,000	39,000	26,000	39,000	26,000	38,500	21,000	13,500
	S1	UL	316,000	156,000	104,000	156,000	104,000	154,000	84,000	54,000
	SM	UL	237,000	117,000	78,000	117,000	78,000	115,500	63,000	40,500
U	NS ⁱ	UL	35,500	19,000	8,500	14,000	8,500	18,000	9,000	5,500
	S1	UL	142,000	76,000	34,000	56,000	34,000	72,000	36,000	22,000
	SM	UL	106,500	57,000	25,500	42,000	25,500	54,000	27,000	16,500

(continued)

ALLOWABLE AREA FACTOR

$$A_a = [A_t + (NS \times I_f)] \times S_a$$

$$A_a = [12,000 + (12,000 \times 0)] \times 3$$

$$A_a = 12,000 \times 3$$

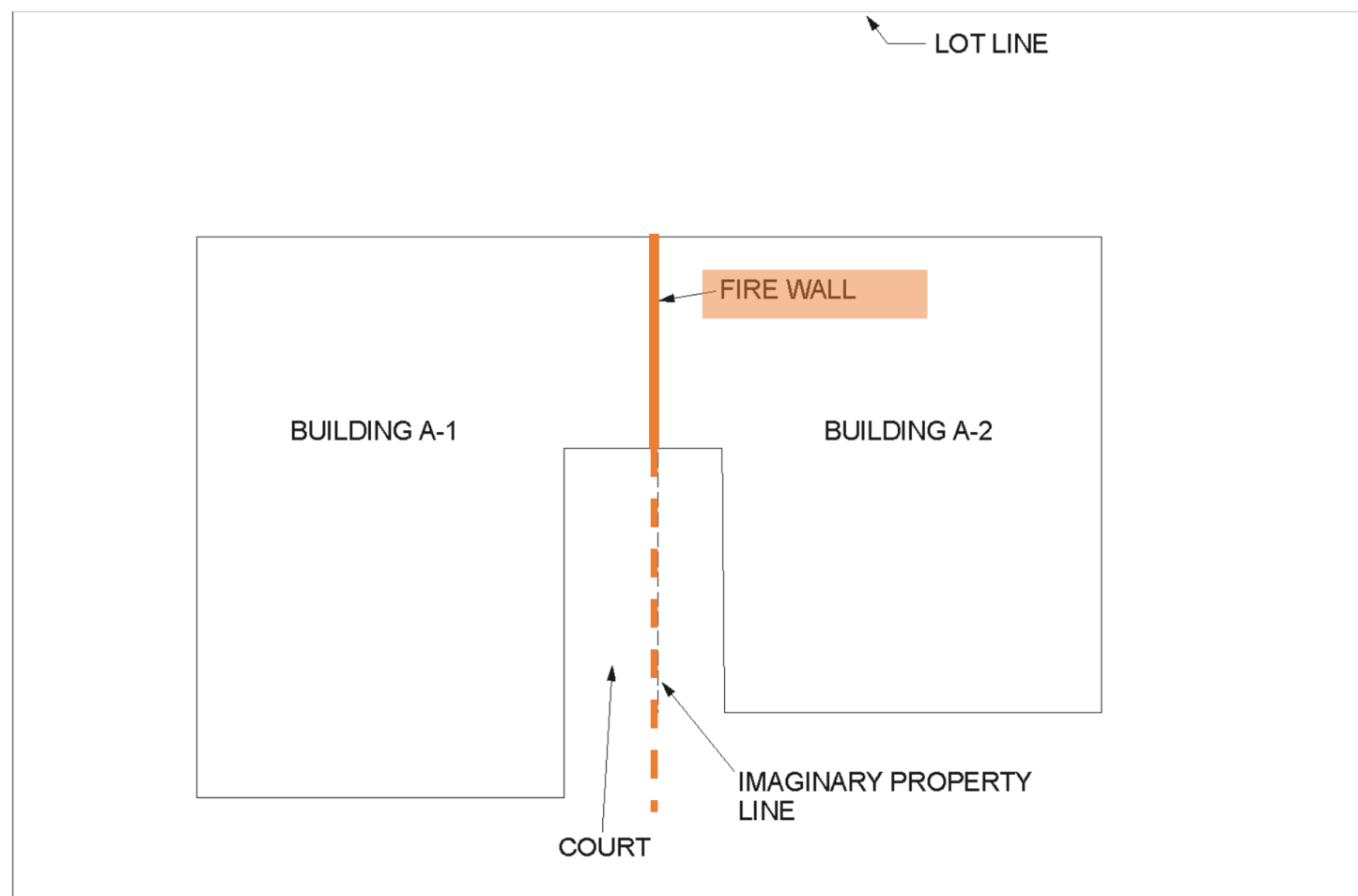
$$A_a = 36,000$$

AREA PROVIDED = 132,690.

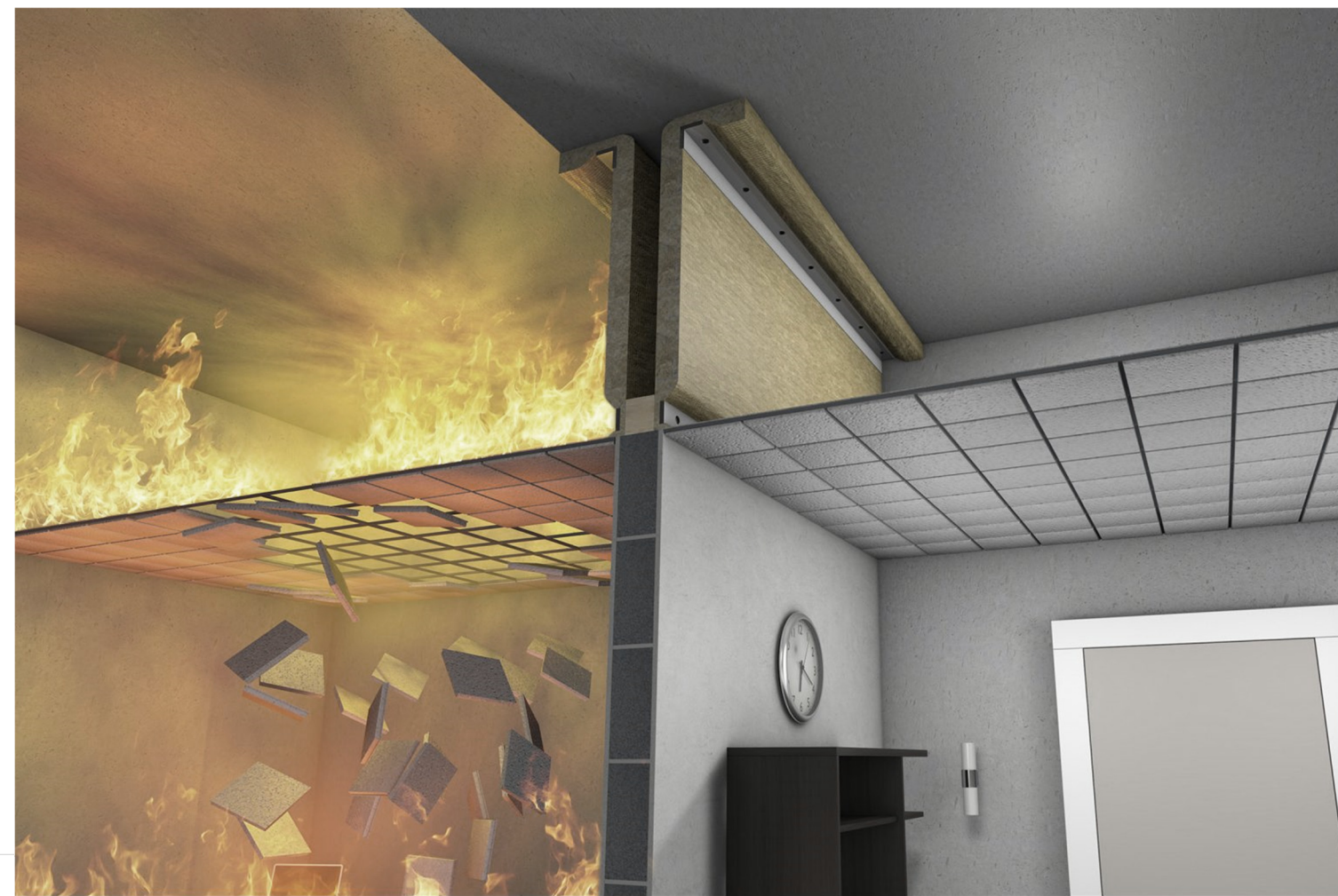
What options do we have?



Split the building in smaller portions.

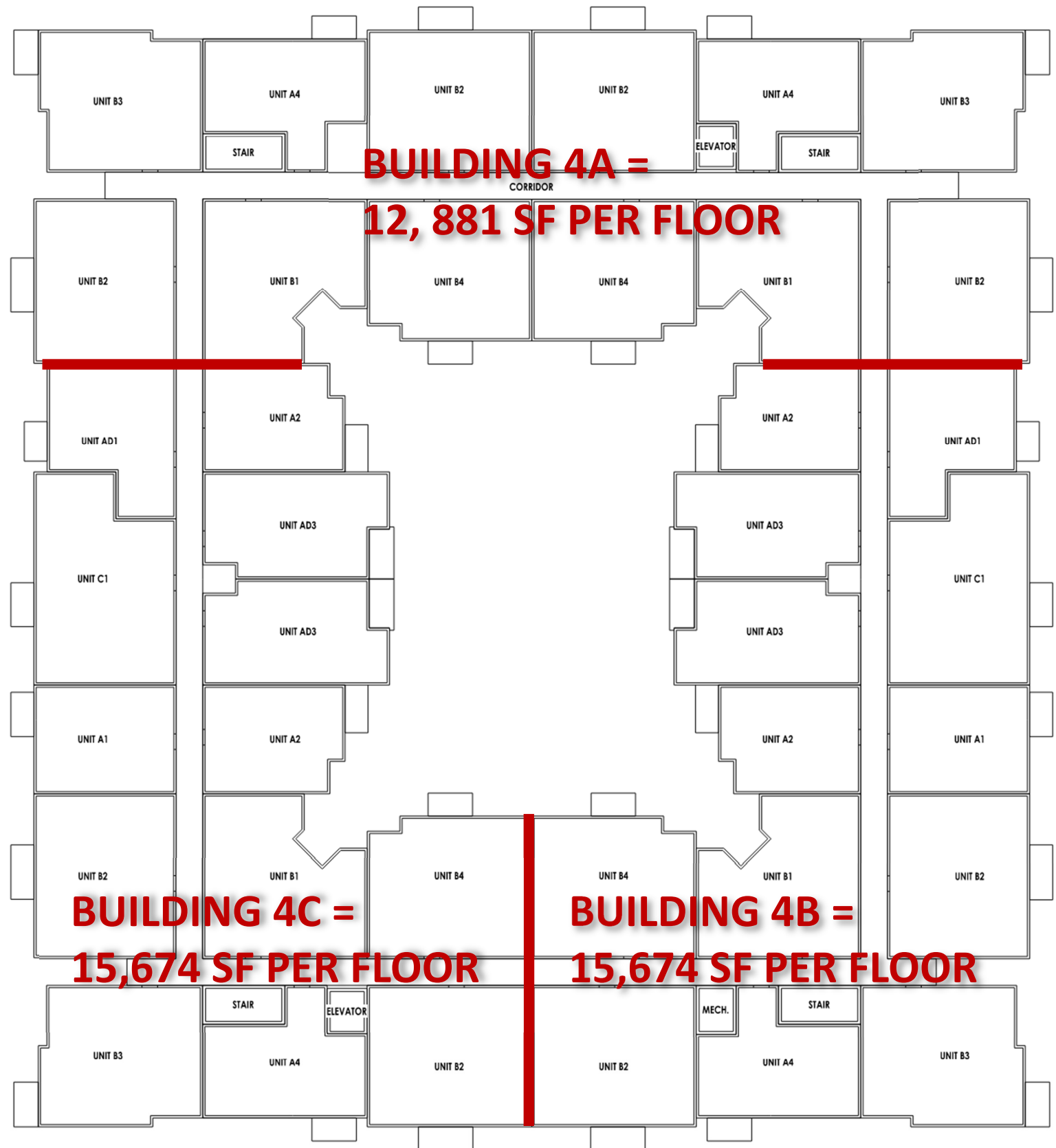


**Commentary Figure 503.1.2(2)
TWO BUILDINGS ON SAME LOT CREATED BY FIRE WALL**



A fire wall, unlike the fire barrier and fire partition, must be constructed so it will remain in place if the construction on either side of it collapses.





Three portions to comply.

BUILDING 4B = 15,674 SF PER FLOOR

Total area provided = 47,022 SF

Aa= 36,000 SF

What other resources do we have?



$$A_a = [A_t + (NS \times I_f)] \times S_a$$

- 506.3 **Frontage increase**. Every building shall adjoin or have access to a public way to receive an area factor increase based on frontage. **Area factor increase** shall be determined in accordance with Sections 506.3.1 through 506.3.3

