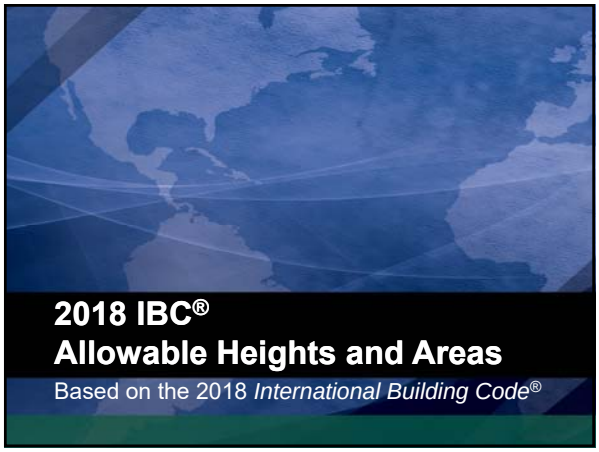
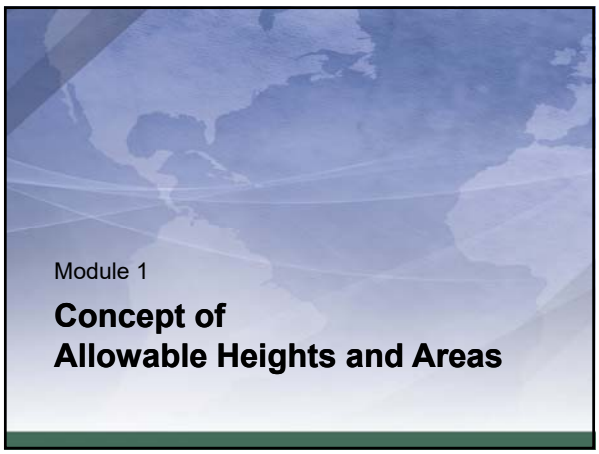




Allowable Height and Area Introduction

- After determining a building's occupancy and type of construction, the next step in the classification process is to verify compliance with the height and area limitations.
- Building occupancy, building type of construction and allowable building height and area must simultaneously be considered in order to achieve code compliance.

Allowable Height and Area Introduction

- As the size of the building increases, either in height or area, the number of acceptable construction types is reduced.
- Conversely, where a higher type of construction is provided, the building size may be increased.

Tabular Height and Area Values Tables 504.3, 504.4 and 506.2

- Tables 504.3, 504.4 and 506.2 are the foremost code provisions used in establishing "equivalent risk"—offsetting a building's inherent fire hazard—represented by group—with materials and construction features.

Tabular Height and Area Values Tables 504.3, 504.4 and 506.2

- The application of Tables 504.3, 504.4 and 506.2 is accomplished by:

1. Identifying the group classification of the building in question along the left column.
2. Identifying the building's type of construction across the top of the table.
3. The cell at the intersection of the occupancy classification and type of construction establishes the tabular values for allowable height in feet, allowable number of stories above grade plane, and allowable building floor area per story.

Allowable Height in Feet Table 504.3

REFER TO CODE BOOK

Partial Table 504.3 Page 104

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[b,c]	UL	160	65	55	65	55	65	50	40
	S									
H-4	NS[b,c]	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[b,c]	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[b,c,d]	UL	160	65	55	65	55	65	50	40
	S	UL	180	85						
I-4	NS[b,c]	UL	160	65	55	65	55	65	50	40
	S	UL	180	85	75	85	75	85	70	60
R[e]	NS[b]	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	50	40
	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.

Allowable Height in Stories Above Grade Plane Table 504.4

REFER TO CODE BOOK

Partial Table 504.4 Page 106

TABLE 504.4[a,b]
ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE

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-1	NS	UL	5	3	2	3	2	3	2	1
	S	UL	6	4	3	4	3	4	3	2
A-2	NS	UL	11	3	2	3	2	3	2	1
	S	UL	12	4	3	4	3	4	3	2
A-3	NS	UL	11	3	2	3	2	3	2	1
	S	UL	12	4	3	4	3	4	3	2
A-4	NS	UL	11	3	2	3	2	3	2	1
	S	UL	12	4	3	4	3	4	3	2
A-5	NS	UL	UL	UL	UL	UL	UL	UL	UL	UL
	S	UL	UL	UL	UL	UL	UL	UL	UL	UL
B	NS	UL	11	5	3	5	3	5	3	2
	S	UL	12	6	4	6	4	6	4	3
E	NS	UL	5	3	2	3	2	3	1	1
	S	UL	6	4	3	4	3	4	2	2
F-1	NS	UL	11	4	2	3	2	4	2	1
	S	UL	12	5	3	4	3	5	3	2
F-2	NS	UL	11	5	3	4	3	5	3	2
	S	UL	12	6	4	5	4	6	4	3
H-1	NS[c,d]	1	1	1	1	1	1	1	1	NP
	S									

Allowable Area Factors Table 506.2

REFER TO CODE BOOK

Partial
Table 506.2
Page109

TABLE 506.2[a,b]
ALLOWABLE AREA FACTOR (A, = NS, S1, S13R, or SM, as applicable) IN SQUARE FEET

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-1	NS	UL	UL	15,500	8,500	14,000	8,500	15,000	11,500	5,500
	S1	UL	UL	62,000	34,000	56,000	34,000	60,000	46,000	22,000
	SM	UL	UL	46,500	25,500	42,000	25,500	45,000	34,500	16,500
A-2	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000
A-3	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000
A-4	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000
A-5	NS	UL	UL	UL	UL	UL	UL	UL	UL	UL
	S1									
	SM									
B	NS	UL	UL	37,500	23,000	28,500	19,000	36,000	18,000	9,000
	S1	UL	UL	150,000	92,000	114,000	76,000	144,000	72,000	36,000
	SM	UL	UL	112,500	69,000	85,500	57,000	108,000	54,000	27,000
E	NS	UL	UL	26,500	14,500	21,500	14,500	25,500	18,500	9,500
	S1	UL	UL	106,000	58,000	94,000	58,000	102,000	74,000	38,000
	SM	UL	UL	79,500	43,500	70,500	43,500	76,500	55,500	28,500

Allowable Height and Area Modifications to Tables 504.3, 504.4 and 506.2

The tables regulating allowable height and area generally provide for sizeable increases where the building is sprinklered throughout.

- The sprinkler increase to allowable area is one of the most generous benefits for fully sprinklered buildings.
- The sprinkler increases for height in feet and number of stories also provide a significant benefit in the determination allowable construction types.

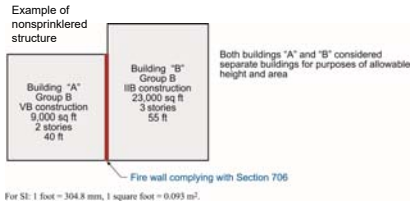
Allowable Area Modifications to Table 506.2

A more comprehensive review is necessary when the building:

- Has sizable frontage on open yards or streets, or both,
- Is multistory,
- Contains multiple occupancies.

Allowable Height and Area Use of Fire Walls

- One or more fire walls complying with Section 706 may be also utilized to gain compliance with height and area limitations, as well as type of construction.



Module 2

Relationship of Building Classification

Building Classification

It is critical that a building be classified according to the *occupancy group* and the *type of construction* prior to determining the building's allowable height and area.

The maximum building size is based on the specific occupancy groups within the building, as well as the materials of construction and the building's degree of fire resistance.

Occupancy Classification Chapter 3

Evaluate the building for use and occupancy:

- How the space will be used.
- The abilities of the occupants to respond in an emergency.
- Specific requirements (levels of safety) related to the various occupancy groups.

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Occupancy Classification Section 302.1

Types of Use	General Occupancy Group	Occupancy Sub-Groups
Assembly	Group A	A-1, A-2, A-3, A-4, A-5
Business	Group B	None
Educational	Group E	None
Factory and Industrial	Group F	F-1, F-2
High Hazard	Group H	H-1, H-2, H-3, H-4, H-5
Institutional	Group I	I-1, I-2, I-3, I-4
Mercantile	Group M	None
Residential	Group R	R-1, R-2, R-3. R-4
Storage	Group S	S-1, S-2
Utility	Group U	None

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Type of Construction Chapter 6

- Equally as important as occupancy designation, the determination of a building's type of construction describes its resistance to fire by addressing whether:
  - The materials of construction that make up the building's key elements are combustible or noncombustible, and
  - These same key elements are protected from fire by a recognized level of fire resistance.

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Type of Construction
Chapter 6

- The relationship of a building's construction type and its allowable height and area is the most important reason for correctly evaluating the type of construction.
- The permitted building size is directly related to the construction type.

Type of Construction—Table 601

TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A	B	A	B	HT	A	B
Primary structural frame[f] (see Section 202)	3[a,b]	2[a,b]	1[b]	0	1[b]	0	HT	1[b]	0
Bearing walls Exterior[c,e,f] Interior	3 3[a]	2 2[a]	1 1	0 0	2 1	2 0	2 1/HT	1 1	0 0
Nonbearing walls and partitions Exterior	See Table 602								
Nonbearing walls and partitions Interior[d]	0	0	0	0	0	0	See Section 2304.11.2	0	0
Floor construction and associated secondary members (see Section 202)	2	2	1	0	1	0	HT	1	0
Roof construction and associated secondary members (see Section 202)	1½[b]	1[b,c]	1[b,c]	0[c]	1[b,c]	0	HT	1[b,c]	0

For SI: 1 foot = 304.8 mm.
a. Roof supports: Fire-resistance ratings of primary structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.
b. Except in Group F-1, H, M and S-1 occupancies, fire protection of structural members in roof construction shall not be required, including protection of primary structural frame members, roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.
c. In all occupancies, heavy timber complying with Section 2304.11 shall be allowed where a 1-hour or less fire-resistance rating is required.
d. Not less than the fire-resistance rating required by other sections of this code.
e. Not less than the fire-resistance rating based on fire separation distance (see Table 602).
f. Not less than the fire-resistance rating as referenced in Section 704.10.

Module 3

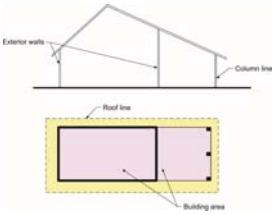
Calculation of Actual Building Height and Area

Actual Building Height and Area Introduction

- The IBC establishes a specific approach to establishing a building's actual:
  - Height in feet
  - Height in stories above grade plane
  - Floor area
- This determination may not necessarily be consistent with the height and area established by zoning regulations, real estate terminology, and other uses.

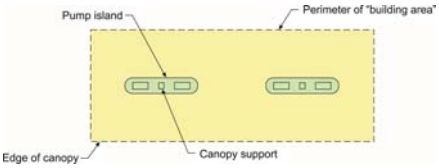
Building Area Section 202

- For that portion of the building surrounded by exterior walls and/or fire walls, the building area is considered the floor area within such walls.



Building Area Section 202

- For that portion of the building not surrounded by exterior walls, the building area is considered the floor area within the horizontal projection of the roof or floor above.

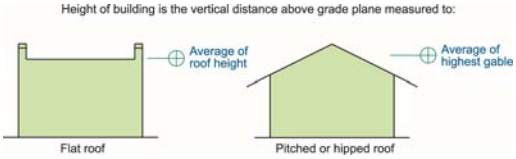


Building Height (in feet) Section 202

- **Building height (in feet):** Defined as the vertical distance from grade plane to the average height of the highest roof surface.
- Average height for a sloping roof is the midway point between the extremes of the sloping roof.
- Grade plane is established by definition as the average of finished ground level adjoining the building.

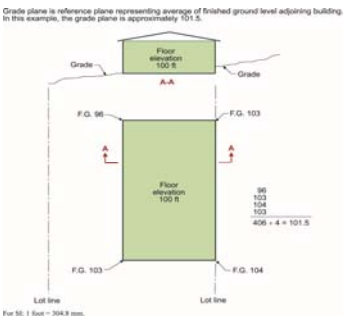
Building Height Section 202

- Building height is not measured to the top of a parapet wall.



Grade Plane Section 202

- Grade plane is relatively simple to calculate if the land adjoining a building is relatively flat.



Building Height (in stories) Table 504.4

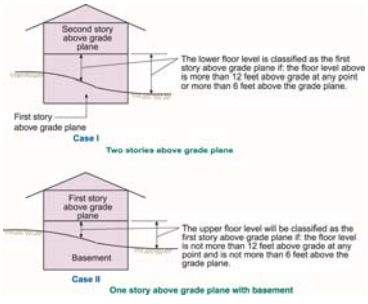
- The allowable height limitations on stories based on Table 504.4 are only applicable to stories considered as “stories above grade plane.”
- Unlike the limitation on height in feet, the limits on allowable stories above grade plane vary significantly based on the occupancy classification of the building.

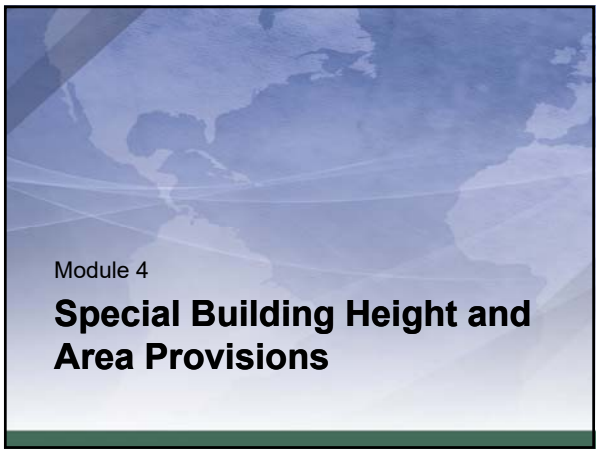
Story Above Grade Plane Section 202

Story Above Grade Plane: Any story having its finished floor surface entirely above grade plane, or in which the finished surface of the floor next above is:

1. More than 6 feet above grade plane, or
2. More than 12 feet above the finished ground level at any point.

Story Above Grade Plane Section 202





Special Provisions Introduction

- It is important that all special allowances and limitations in the determination of allowable building height and area be reviewed for application.
- Key special provisions include:
  - Special industrial occupancies
  - Buildings on the same lot
  - Mezzanines

Special Industrial Occupancies Section 503.1.1

- Buildings containing special industrial processes that require large floor areas and/or unusual heights are exempt from the height and area limitations of Sections 504 and 506.
- The allowance is limited to low-hazard and moderate-hazard occupancies housing manufacturing and energy-producing uses (typically classified as Groups F-1 and F-2).

Buildings on the Same Lot
Section 503.1.2

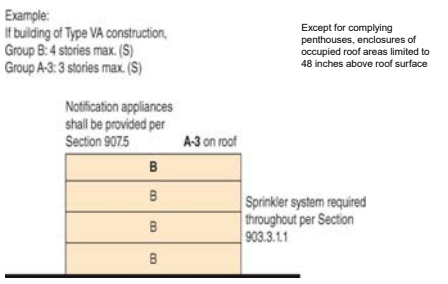
If two or more buildings are located on the same lot, they must be:

- Regulated as separate buildings in accordance with Section 705.3, or
- Considered as portions of one building.

Occupied Roofs
Section 503.1.4

- A roof level is permitted to be used as an occupied roof provided the rooftop occupancy is permitted by Table 504.4 to be located on the story immediately below the roof.
  - Exceptions permitted for sprinklered buildings with occupant notification extended to roof area, and for Type I or II open parking garages.
- Area of occupied roofs are not to be included in building area regulated by Section 506.

Occupied Roofs
Section 503.1.4



Mezzanines
Section 505

- A mezzanine is a complying intermediate floor level placed between the floor and ceiling of a story.
- The use of the mezzanine provisions is a design option, because an intermediate floor level can also be considered an additional story.

Mezzanines
Section 505

The use of mezzanine provisions focuses on the fact that:

- Mezzanines do not contribute to the number of stories in the building.
- Mezzanines do not contribute to the building area.
- Mezzanines contribute to floor area for fire area size determination.

Module 5

Determining Maximum Allowable Building Height

Allowable Building Height Introduction

- Once the actual building height is determined, in both feet and stories above grade plane, it cannot exceed the allowable height as determined by Section 504 based on:
  - Occupancy classification
  - Type of construction
- Where towers, steeples, spires and other rooftop structures are provided, specific provisions are to be applied.

Height Increase for Sprinklers Section 504.1

- The tabular limits on height in both feet and stories are typically greater where the building is protected by an automatic sprinkler system.
- Tables 504.3 and 504.4 identify the type of sprinkler system required to receive any sprinkler increase.
  - S = buildings equipped throughout with an NFPA 13 sprinkler system
  - S13R = buildings equipped throughout with an NFPA 13R sprinkler system
  - S13D = buildings equipped throughout with an NFPA 13D sprinkler system

REFER TO CODE BOOK

Allowable Height in Feet Table 504.3

Partial Table 504.3 Page 104

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[b,c]	UL	160	65	55	65	55	65	50	40
	S									
H-4	NS[b,c]	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[b,c]	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[b,c,d]	UL	160	65	55	65	55	65	50	40
	S	UL	180	85						
I-4	NS[b,c]	UL	160	65	55	65	55	65	50	40
	S	UL	180	85	75	85	75	85	70	60
R[e]	NS[b]	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.

Allowable Height in Stories Above Grade Plane Table 504.4

REFER TO CODE BOOK

Partial
Table 504.4
Page 106

TABLE 504.4[a]
ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE

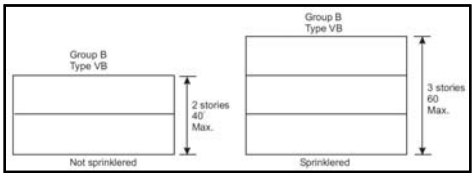
OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
A-1	NS	UL	5	3	2	3	2	3	2	1
	S	UL	6	4	3	4	3	4	3	2
A-2	NS	UL	11	3	2	3	2	3	2	1
	S	UL	12	4	3	4	3	4	3	2
A-3	NS	UL	11	3	2	3	2	3	2	1
	S	UL	12	4	3	4	3	4	3	2
A-4	NS	UL	11	3	2	3	2	3	2	1
	S	UL	12	4	3	4	3	4	3	2
A-5	NS	UL	UL	UL	UL	UL	UL	UL	UL	UL
	S	UL	UL	UL	UL	UL	UL	UL	UL	UL
B	NS	UL	11	5	3	5	3	5	3	2
	S	UL	12	6	4	6	4	6	4	3
E	NS	UL	5	3	2	3	2	3	1	1
	S	UL	6	4	3	4	3	4	2	2
F-1	NS	UL	11	4	2	3	2	4	2	1
	S	UL	12	5	3	4	3	5	3	2
F-2	NS	UL	11	5	3	4	3	5	3	2
	S	UL	12	6	4	5	4	6	4	3
H-1	NS[e]	1	1	1	1	1	1	1	1	NP
	S									

Allowable Height Increase Example 1

- **Given:** A Type VB building classified as a Group B occupancy.
- **Determine:** The maximum allowable height in feet and stories if:
  - the building is not sprinklered, and
  - if the building is sprinklered.

Allowable Height Increase Example #1

- **Solution:** Taken directly from Tables 504.3 and 504.4



Height Increases for Sprinklers

Group R Occupancies
Tables 504.3 and 504.4

- If the building is a Group R occupancy sprinklered with an NFPA 13R system, the 1-story and 20-foot increases are also applied; however, the building cannot exceed a total of 4 stories or 60 feet in height as reflected in the tables.

Allowable Height Increase
Tables 504.3 and 504.4

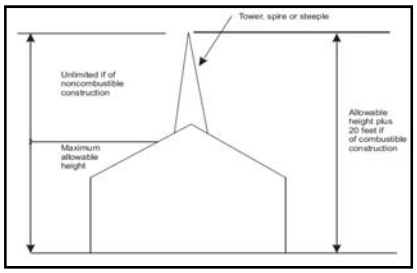
- Occupancies where the installation of an automatic sprinkler system does not provide for an increase in allowable height include:
  - Group I-2 occupancies in Type IIB, III, IV and V buildings.
  - Group H-1, H-2, H-3 and H-5 occupancies.
- In these high-hazard occupancies, sprinkler protection is such an integral part of the building's overall protection package that no additional benefit is granted.

Roof Structures
Section 504.3, Exception

The height limitations for towers, spires, steeples and other roof structures are found in:

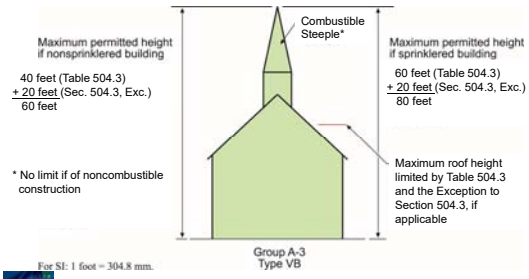
- Exception to Section 504.3, which regulates such roof structures in regard to the contribution to the overall height of the building.
- Section 1510 deals more with rooftop structures as independent elements.

Roof Structures
Section 504.3



Height Limits of Roof Structures

Roof Structures
Example



Module 6

Determining Maximum Allowable Building Area

Allowable Building Area Section 506

- Building area is limited to that established by Table 506.2, along with any permitted increase due to the presence of significant frontage on open space.
- The table addresses the presence of an automatic sprinkler system, as well as multistory conditions, where applicable.
- The entire building must be analyzed for allowable area compliance, along with the area of each individual story.

Automatic Sprinkler System Increase Table 506.2

- The allowable area increase reflected in Table 506.2 for the installation of an automatic sprinkler system is only applicable where an NFPA 13 system is provided throughout the building.
- In addition, Table 506.2 does not provide for a sprinkler increase for:
  - Group H-1 occupancies
  - Portions of buildings classified as Group H-2 or H-3

Allowable Area Factors Table 506.2

REFER TO CODE BOOK

Partial Table 506.2 Page 109

NS = Nonsprinklered

S1 = Sprinklered 1-story

SM = Sprinklered Multistory

S13R = NFPA 13R System

S13D = NFPA 13D System

TABLE 506.2[a]
ALLOWABLE AREA FACTOR (A, = NS, S1, S13R, or SM, as applicable) IN SQUARE FEET

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-1	NS	UL	UL	15,500	8,500	14,000	8,500	15,000	11,500	5,500	
	S1	UL	UL	62,000	34,000	56,000	34,000	60,000	46,000	22,000	
	SM	UL	UL	46,500	25,500	42,000	25,500	45,000	34,500	16,500	
A-2	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000	
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000	
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000	
A-3	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000	
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000	
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000	
A-4	NS	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000	
	S1	UL	UL	62,000	38,000	56,000	38,000	60,000	46,000	24,000	
	SM	UL	UL	46,500	28,500	42,000	28,500	45,000	34,500	18,000	
A-5	NS	UL	UL	UL	UL	UL	UL	UL	UL	UL	
	S1										
	SM										
B	NS	UL	UL	37,500	23,000	28,500	19,000	36,000	18,000	9,000	
	S1	UL	UL	150,000	92,000	114,000	76,000	144,000	72,000	36,000	
	SM	UL	UL	112,500	69,000	85,500	57,000	108,000	54,000	27,000	
E	NS	UL	UL	26,500	14,500	23,500	14,500	25,500	18,500	9,500	
	S1	UL	UL	106,000	58,000	94,000	58,000	102,000	74,000	38,000	
	SM	UL	UL	79,500	43,500	70,500	43,500	76,500	55,500	28,500	

Basements
Section 506.1.3

- A single basement does not need to be included in the total allowable area, provided the basement does not exceed the area permitted for a single-story building.

Frontage Increase
Section 506.3

- An increase in allowable area is permitted for buildings that have substantial open space adjacent to the exterior walls (to facilitate fire department access). Open space greatly limits the potential for exterior materials to contribute to a fire within the building.
- To qualify, the yard or public way must have a minimum width of 20 feet. No allowable area increase is given unless more than 25% of the building's perimeter has complying frontage.

Frontage Increase
Section 506.3.3

- Formula to calculate the frontage increase (I_f) for allowable area purposes:

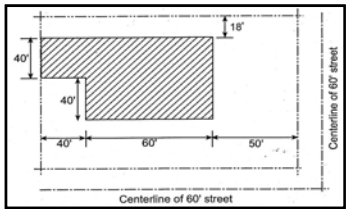
$$I_f = [F/P - 0.25]\, W/30$$

I_f	=	Area factor increase due to frontage
F	=	Building perimeter that fronts on a public way or open space having 20 feet open minimum distance
P	=	Perimeter of entire building
W	=	Width of public way or open space per Section 506.3.2

The value of W must be a minimum of 20 feet. Where W exceeds 30 feet, a value of 30 feet is to be used. (Section 506.3.2)

Frontage Increase Example

- **Given:** Yards as shown, and two 60-foot streets.
- **Determine:** Percentage of frontage increase for allowable area.



Frontage Increase Example

- **Solution:**

$$I_f = \left[\frac{F}{P} - 0.25\right]\frac{W}{30}$$

F = 220 feet
P = 360 feet
W = 40 feet

$$= \left[\frac{220}{360} - 0.25\right]\frac{30^*}{30}$$

*Value of 30' to be used as all yards ≥ 20' are also ≥ 30'

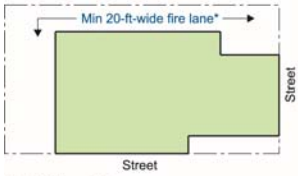
$$= [0.61 - 0.25]\,1.0$$
$$= [0.36]\,1.0$$
$$I_f = 0.36$$

Open Space Limits Section 506.3.1

- Section 506.3.1 mandates that the open space used for a frontage increase must be on the same lot as the building or dedicated for public use.
- This ensures that the space will remain open and available. Fire personnel must also be able to access the open space from a street or fire lane.

Open Space Limits
Section 506.3.1

Entire perimeter considered for frontage increase



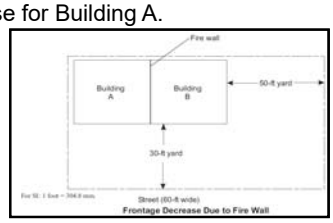
Open space to be on same lot or dedicated for public use and accessed from a street or approved fire lane

* Fire lane need only be provided to within 150 feet of exterior wall per Section 503.1.1 of the IFC

For SI: 1 foot = 304.8 mm.

Open Space Availability
Example

- A fire wall separates a single structure into two buildings. In this case, the use of the fire wall prohibits the use of the 50-foot yard for a frontage increase for Building A.



Allowable Area Determination
Section 506.2

- Determination of the allowable area of a building differs depending on the conditions presented:
  - Single-occupancy, one-story building 506.2.1
  - Mixed-occupancy, one-story building 506.2.2
  - Single-occupancy, multistory building 506.2.3
  - Mixed-occupancy, multistory building 506.2.4

Allowable Area Determination Single-Occupancy, One-Story Section 506.2.1

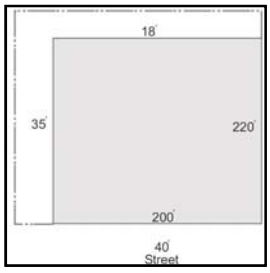
- The allowable area of a single-occupancy building with no more than one story above grade plane shall be determined by the following equation:

$$A_a = A_t + (NS \times I_f)$$

A_a = Allowable building area
A_t = Tabular allowable area factor (NS, S1, S13R or S13D value, as applicable) in accordance with Table 506.2
NS = Tabular allowable area factor in accordance with Table 506.2 for nonsprinklered building (regardless of whether building is sprinklered)
I_f = Area factor increase due to frontage in accordance with Section 506.3

Total Allowable Area Example 1

- **Given:** A one-story, Type VA building housing a Group B occupancy.
- **Determine:** The maximum allowable area if the building is fully sprinklered (include frontage increase).



Total Allowable Area Example 1

- **Solution:** $A_a = A_t + (NS \times I_f)$

Tabular area (A_t):	72,000 sf	S1, T506.2
Frontage increase ($NS \times I_f$):	4,500 sf	18,000 x 0.25
Total allowable area (A_a):	76,500 sf	Additive

The building is limited to 76,500 sf.

Allowable Area Determination Single-Occupancy, Multistory Section 506.2.3

- The allowable area of a single-occupancy building with more than one story above grade plane shall be determined by the following equation:

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

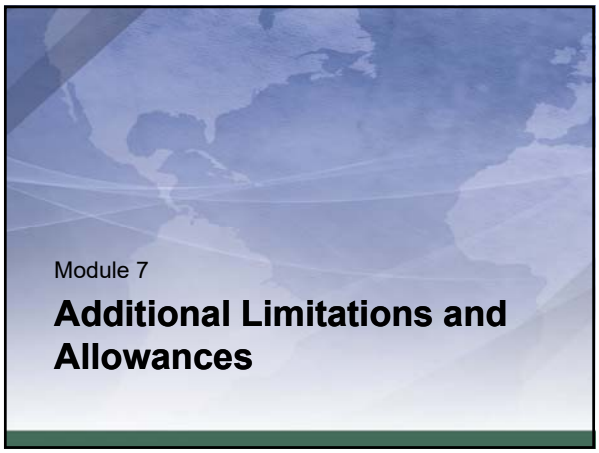
A_a = Allowable building area
A_t = Tabular allowable area factor (NS, S1, S13R or S13D value, as applicable) in accordance with Table 506.2
NS = Tabular allowable area factor in accordance with Table 506.2 for nonsprinklered building (regardless of whether building is sprinklered)
I_f = Area factor increase due to frontage in accordance with Section 506.3
S_a = Actual number of building stories above grade plane, not to exceed three. (not to exceed four for 13R sprinklered buildings)

Allowable Area Determination Mixed-Occupancy, Multistory Section 506.2.4

- Each story of a mixed-occupancy building with more than one story above grade plane shall individually comply with the applicable requirements of Section 508.1.
- In addition, for those buildings four or more stories above grade plane, the total building area shall be such that the aggregate sum of the ratios of the actual area of each story divided by the allowable area of such stories does not exceed three.

Mixed Occupancy Area Determination Section 506.5

- Further information required to evaluate allowable building area, as well as height, is provided in Section 508.
- The evaluation of height and area varies depending on which of the following options is chosen by the designer:
  - Accessory occupancies
  - Nonseparated occupancies
  - Separated occupancies



Unlimited Area Buildings Section 507

- The provisions of Section 507 allow for buildings with large floor areas to be constructed with no requirement for:
  - Fire-resistance-rated construction, or
  - Fire walls.
- The area limitations of Sections 503 and 506 are not applicable where compliance with Section 507 is achieved.
- Risks have been addressed to the point that the regulation for allowable area is unnecessary.

Unlimited Area Buildings Section 507

- Concept based on four main criteria:
  - Limited height
  - Moderate-hazard and low-hazard occupancies
  - Significant open frontage
  - Sprinkler protection
- This section provides alternative approach to regulating building size

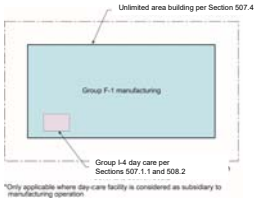
Unlimited Area Buildings Section 507

- Although the allowance for unlimited floor area typically permits the building to be of any construction type, the actual type of construction will be important in the application of other code provisions, such as:
  - Accessory occupancies
  - Group H occupancies in unlimited area Group F and S occupancies

Unlimited Area Buildings Section 507.1.1

- The use of the unlimited area provisions is limited to those occupancies specifically addressed in Section 507, but other occupancies are permitted where in compliance with Section 508.2 (Accessory Occupancies).

Example:



One-story Nonsprinklered Buildings Section 507.3

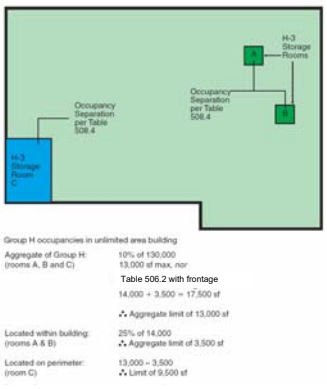
- A one-story building housing a Group F-2 and/or S-2 occupancy is permitted to be unlimited in area if it is completely surrounded by minimum 60-foot public ways and/or yards.
- An automatic sprinkler system is not required in order to obtain unlimited area status because the occupancies involved are not expected to have any significant fire loading.

Group H Occupancies
Section 507.8

- Although very limited in unlimited area buildings, hazardous materials may be found in greater quantities in manufacturing and storage facilities. Allowance is made for these materials. Group H-2, H-3 and H-4 occupancies are permitted to be located in unlimited area buildings containing Group F and S occupancies with the following limitations:
  - Compliance with the unlimited area provisions of Sections 507.4 and 507.5 for Group F and S occupancies.

Group H Occupancies
Section 507.8

- Aggregate floor area of Group H occupancies located at the building's perimeter limited to 10 percent of the actual building area or Group H allowable area per Section 506 with any applicable frontage increase.
- Aggregate floor area of Group H occupancies not located on perimeter of building are limited to 25 percent of Group H area limits as specified in Section 506.



Mixed Occupancies Section 508

Where two or more distinct occupancies are located within a building, the provisions of Section 508 must be applied.

The scope of Section 508 is limited to:

- Occupancy classification.
- **Allowable building height.**
- **Allowable building area.**
- Separation.

2018 IBC Allowable Heights and Areas 79

Mixed Occupancies Section 508

- Three design options for compliance in mixed-occupancy buildings are established:
  - Accessory occupancies
  - Nonseparated occupancies
  - Separated occupancies
- Each design option varies in its approach to allowable building height and area

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Mixed Occupancies Section 508

When dealing with mixed occupancies the height and area provisions are established as follows:

- Accessory occupancies: Per main occupancy
- Nonseparated occupancies: Most restrictive applies to entire building
- Separated occupancies: Sum of ratios for area, each occupancy separately for height

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Special Provisions Section 510

- Allows for modifications or exceptions to the general requirements for building areas and heights, taking precedence over any general provisions that may apply.
- Because Section 510 permits, rather than requires, the use of its special conditions, the provisions are *optional*.

Horizontal Building Separation Allowance Section 510.2

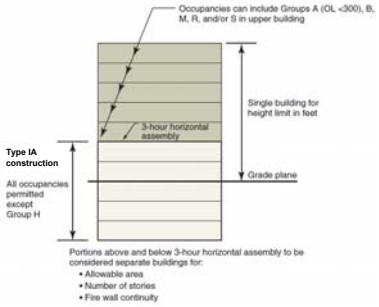
- The benefit of Section 510.2 is the ability to create two separate buildings, one above the other, for the purpose of applying several specific code provisions independently to each building.

Horizontal Building Separation Allowance Section 510.2

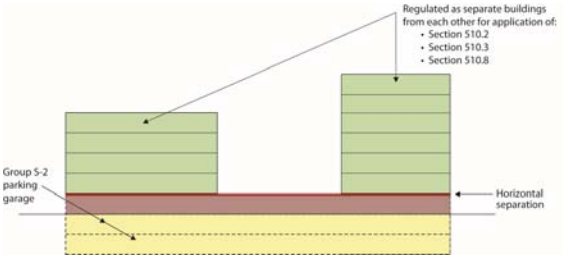
Referred to as “podium” or “pedestal” buildings, they may be viewed as separate buildings above and below the required fire separation for these purposes:

- Determination of allowable area limits.
- Continuity of fire walls.
- Limitation on number of stories.
- Type of construction.

Horizontal Building Separation Allowance Section 510.2



Multiple Buildings Above Group S-2 Parking Garages Section 510.9



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