

Welcome to the

2018 Annual Conference Educational Sessions

Session: 2018 IBC Essentials – Building Planning

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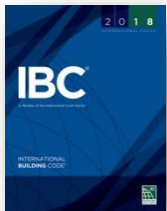
A stylized world map in shades of blue, serving as the background for the title. The map is centered and shows the outlines of continents. The text is overlaid on the map.

2018 IBC Essentials Building Planning

Based on the 2018 International Building
Code[®] (IBC[®])

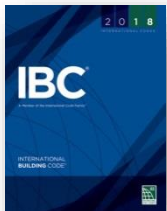
Description

- This seminar focuses on the basic concepts pertaining to building planning in the 2018 *International Building Code*[®] (IBC[®]).
- Concepts provide a basis for the correct utilization of the code.
 - A clear understanding of the identified requirements allows the code user to apply the IBC in specific situations and helps to build an understanding of the intent of the code when asked to make a judgment on code compliance.



Goal

- To identify the critical concepts and code provisions pertaining to building planning in the IBC regarding the applicable designs of commercial buildings requirements.



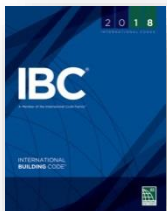
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Objectives

Upon completion, participants will be better able to:

- Explain the provisions of the 2018 IBC regarding building planning.
- Identify the intent of the building code.
- Describe the essential concepts of building planning.
- Describe the provisions applicable to building planning for design and construction of commercial buildings.



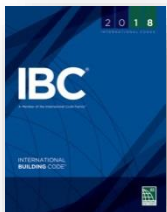


Chapter 3

Building Use and Occupancy

Basic Occupancies

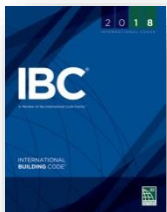
- There are 10 different basic occupancy classifications.
- Many are subdivided thus having 26 classifications
- Occupancy classification is based on use and function
- Occupancy classification is the most important part of the plan review process



Occupancy Classification—General Requirements (Section 302.1)

Occupancy Groups (*continued*)

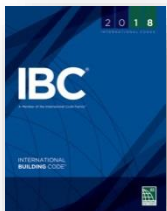
- Where a room or space is to be occupied for different types of uses at different times, all of the requirements applicable to each of the uses must be considered.
- Those buildings that contain two or more distinct occupancy classifications must comply with the provisions of **Section 508** for **mixed-occupancy buildings**.



Occupancy Classifications

- Group A (assembly) – the use of a building or structure, or a portion thereof, for the gathering of persons for purposes such as civic, social or religious functions; recreation, food or drink consumption or awaiting transportation.

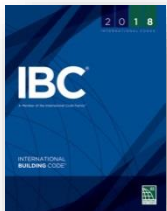
Occupancy Classification	Description
A-1	Assembly uses, usually with fixed seating, intended for the production and viewing of the performing arts or motion pictures
A-2	Assembly uses intended for food and/or drink consumption
A-3	Assembly uses intended for worship, recreation, or amusement and other assembly uses not classified elsewhere in Group A
A-4	Assembly uses intended for viewing of indoor sporting events and activities with spectator seating
A-5	Assembly uses intended for participation in or viewing outdoor activities.



Occupancy Classifications

- Group B (business)

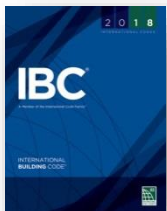
Occupancy Classification	Description
B	The use of a building or structure, or a portion thereof, for office, professional, or service-type transactions, including storage of records and accounts.



Occupancy Classifications

- Group E (educational)

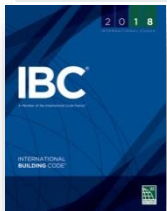
Occupancy Classification	Description
E	The use of a building or structure, or a portion thereof, by six or more persons at any one time for educational purposes through the 12th grade and child care facilities.
E Day Care	The use of buildings and structures or portions thereof occupied by more than five children older than 2½ years of age who receive educational, supervision or personal care services for fewer than 24 hours per day.



Occupancy Classifications

- Group F (factory) – the use of a building or structure, or a portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or Group S storage occupancy

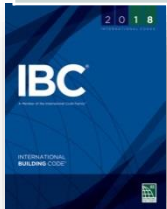
Occupancy Classification	Description
F-1	Factory industrial uses which are not classified as Factory Industrial F-2 Low Hazard
F-2	Factory industrial uses that involve the fabrication or manufacturing of noncombustible materials which during finishing, packing, or processing do not involve a significant fire hazard



Occupancy Classifications

- Group H (high hazard) – the use of a building or structure, or a portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a physical or health hazard in quantities in excess of those allowed in control areas

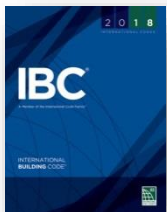
Occupancy Classification	Description
H-1	Buildings and structures containing materials that pose a detonation hazard
H-2	Buildings and structures containing materials that pose a deflagration hazard or a hazard from accelerated burning
H-3	Buildings and structures containing materials that readily support combustion or that pose a physical hazard
H-4	Buildings and structures which contain materials that are health hazards
H-5	Semiconductor fabrication facilities and comparable research and development areas in which hazardous production materials (HPM) are used



Occupancy Classifications

Occupancy Classification	Description
I-1	Buildings, structures or portions thereof for more than 16 persons, excluding staff, who reside on a 24-hour basis in a supervised environment and receive custodial care..
I-2	Buildings and structures used for medical care on a 24-hour basis for more than five persons who are incapable of self-preservation.
I-3	Buildings and structures that are inhabited by more than five persons who are under restraint or security. An I-3 facility is occupied by persons who are generally incapable of self-preservation due to security measures not under the occupants' control.
I-4	Buildings and structures occupied by persons of any age who receive custodial care for less than 24 hours by individuals other than parents or guardians, relatives by blood, marriage, or adoption, and in a place other than the home of the person cared for.

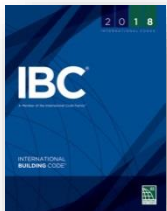
- Group I (institutional) – the use of a building or structure, or a portion thereof, in which care or supervision is provided to persons who are or are not capable of self-preservation without physical assistance or in which persons are detained for penal or correctional purposes or in which the liberty of the occupants is restricted



Occupancy Classifications

- Group M (mercantile)

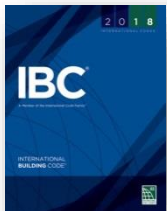
Occupancy Classification	Description
M	Buildings and structures or a portion thereof, for the display and sale of merchandise, and involves stocks of goods, wares or merchandise incidental to such purposes and accessible to the public.



Occupancy Classifications

- Group R (residential) – 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 IBC International Residential Code

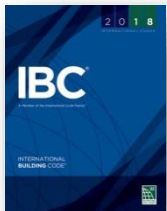
Occupancy Classification	Description
R-1	Residential occupancies containing sleeping units where the occupants are primarily transient in nature
R-2	Residential occupancies containing sleeping units or more than two dwelling units where the occupants are primarily permanent in nature
R-3	Residential occupancies where the occupants are primarily permanent in nature and not classified as Group R-1, R-2, R-4, or I
R-4	Buildings, structures or portions thereof for more than five but not more than 16 persons, excluding staff, who reside on a 24-hour basis in a supervised residential environment and receive custodial care.



Occupancy Classifications

- Group S (storage) – the use of a building or structure, or a portion thereof, for storage that is not classified as a hazardous occupancy

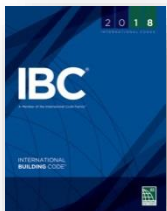
Occupancy Classification	Description
S-1	Buildings occupied for storage uses that are not classified as Group S-2
S-2	Buildings used for the storage of noncombustible materials such as products on wood pallets or in paper cartons with or without single thickness divisions; or in paper wrappings. Such products are permitted to have a negligible amount of plastic trim, such as knobs, handles, or film wrapping.



Occupancy Classifications

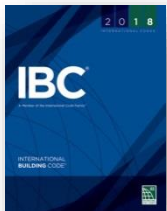
- Group U (utility)

Occupancy Classification	Description
U	Buildings and structures of an accessory character and miscellaneous structures not classified in any specific occupancy shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and life hazard incidental to their occupancy.





Need discussion or group activity here.



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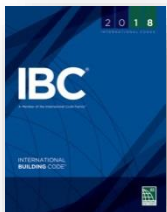


Chapter 4

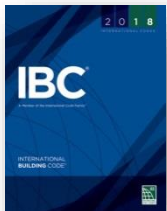
Construction Types

Type of Construction— Introduction

- Equally as important as occupancy designation, classifying 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.
 - These same key elements are protected from fire by a recognized level of fire resistance.
 - The permitted building size is directly related to the construction type.



Combustible vs Noncombustible

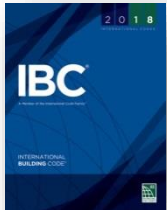


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LEARNING
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Protected vs Unprotected



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Type of Construction—Table 601

- A building must be classified as a single type of construction only.
- Unlike mixed-occupancy conditions where multiple uses occur, the type of construction must be established based on full compliance with the minimum requirements for the intended construction type.

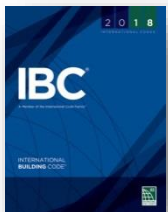




Table 601– Fire-Resistance Rating Requirements for Building Elements (hours)

§ - Section

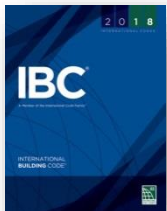
Building Element	Type I		Type II		Type III		Type IV	Type V	
	A	B	A	B	A	B	HT	A	B
Primary structural frame	3 ^a	2 ^a	1	0	1	0	HT	1	0
Bearing Walls									
Exterior ^{e,f}	3	2	1	0	2	2	2	1	0
Interior	3 ^a	2 ^a	1	0	1	0	1/HT	1	0
Nonbearing walls and partitions (exterior)	See Table 602								
Nonbearing walls and partitions (interior)	0	0	0	0	0	0	See §602.4.6	0	0
Floor construction and secondary members	2	2	1	0	1	0	HT	1	0
Roof construction and secondary members	1½ ^b	1 ^{b,c}	1 ^{b,c}	0 ^c	1 ^{b,c}	0	HT	1 ^{b,c}	0

Comparison of Construction Types

Type of Construction	Subgroup	Combustible Materials	Fire Resistant Construction	Common Materials
I	A	No	Yes	Steel, concrete, masonry
	B	No	Yes	
II	A	No	Yes	
	B	No	No	
III	A	Yes	Yes	Concrete & masonry exterior walls Wood roof and floor systems
	B	Yes	No	
IV	HT	Yes	Yes	Large dimension lumber
V	A	Yes	Yes	Wood
	B	Yes	No	



Need discussion or group activity here.



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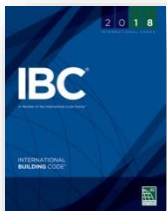


Chapter 5

Building Size

Allowable height in feet (based on IBC Table 504.3)

Occupancy classification	Type of construction									
	See footnotes	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	UL	160	65	55	65	55	65	50	40
	S	UL	180	85	75	86	75	85	70	60
R	NS ^a	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



Height of Building

Determine Grade Plane

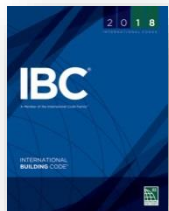
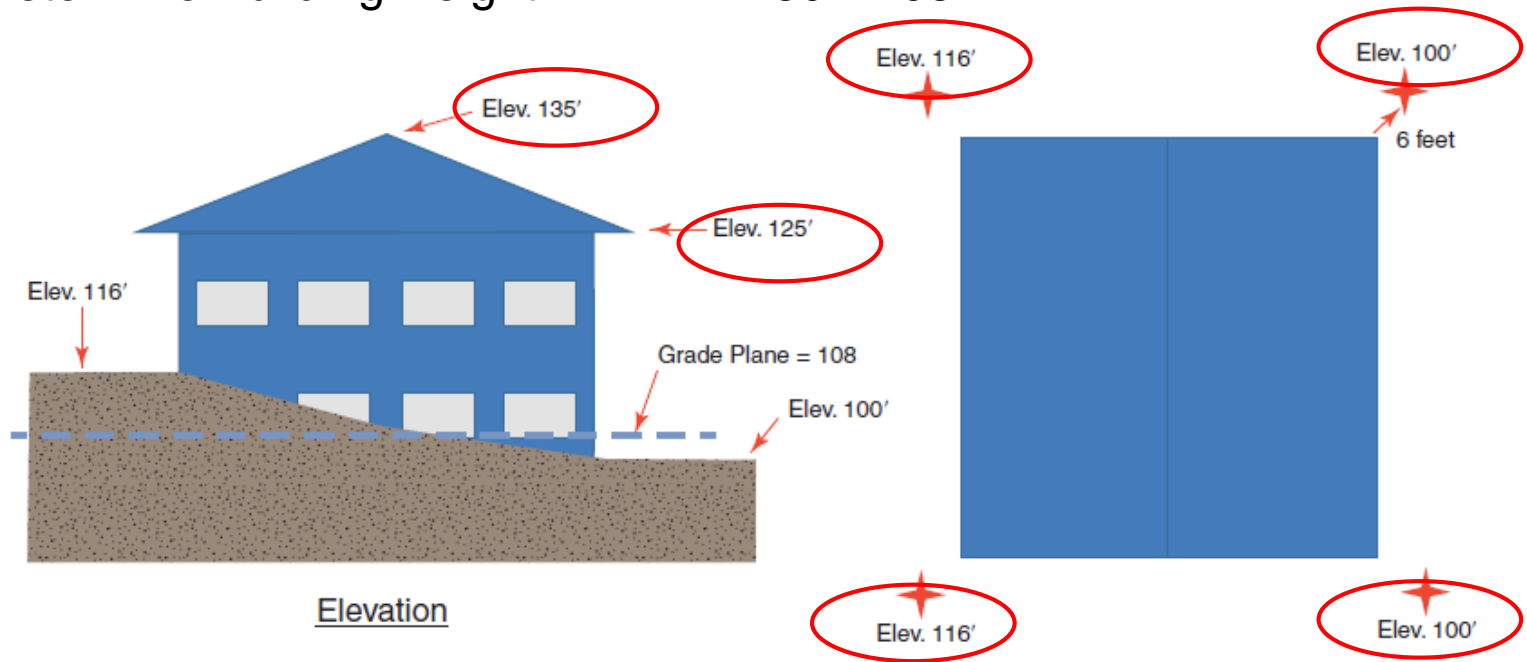
$$100 + 100 + 116 + 116 = 432$$
$$432 \div 4 = \mathbf{108'}$$

Determine Average Roof Height

$$125 + 135 = 260$$
$$260 \div 2 = \mathbf{130'}$$

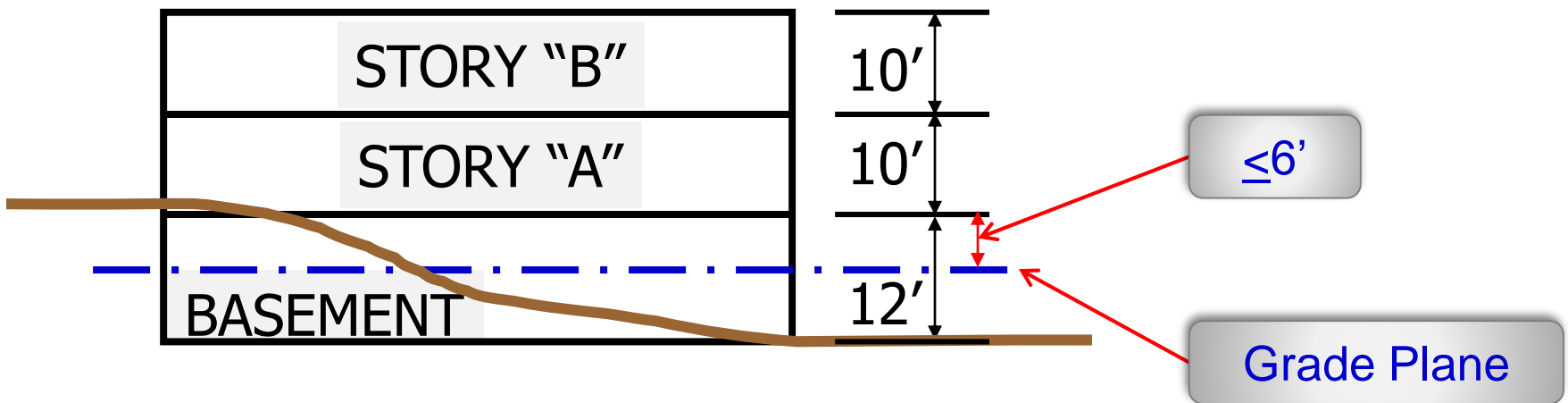
Determine Building Height

$$130 - 108 = \mathbf{22'}$$

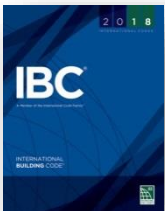


Stories Above Grade Plane

- Determine Grade Plane
- Determine if bottom story is basement

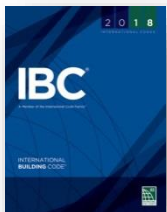


The bottom story is a basement because the floor of Story "A" is $\leq 6'$ above grade plane



Automatic Fire Sprinkler Systems

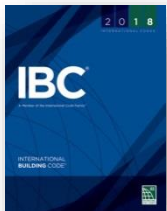
- NFPA 13
 - Designed for building protection
 - Sprinklers required in all rooms of a building
- NFPA 13R
 - Designed for occupant protection
 - Limited to residential uses <4 stories and <60 feet in height
 - Sprinklers can be omitted from concealed combustible spaces and small closets and restrooms
- NFPA 13D
 - Designed for occupant protection
 - Limited to 1- and 2-family dwellings



Allowable height in stories

(based on IBC Table 504.4)

Occupancy classification	Type of construction									
	See footnotes	Type I		Type II		Type III		Type IV	Type V	
		A	B	A	B	A	B	HT	A	B
A-2	NS	UL	11	3	2	3	2	3	2	1
	S	UL	12	4	3	4	3	4	3	2
B	NS	UL	11	5	3	5	3	5	3	2
	S	UL	12	6	4	6	4	6	4	3
M	NS	UL	11	4	2	4	2	4	3	1
	S	UL	12	5	3	5	3	5	4	2
R-2 ^h	NS	UL	11	4	4	4	4	4	3	2
	S13R	4	4	4					4	4
	S	UL	12	5	5	5	5	5	4	3



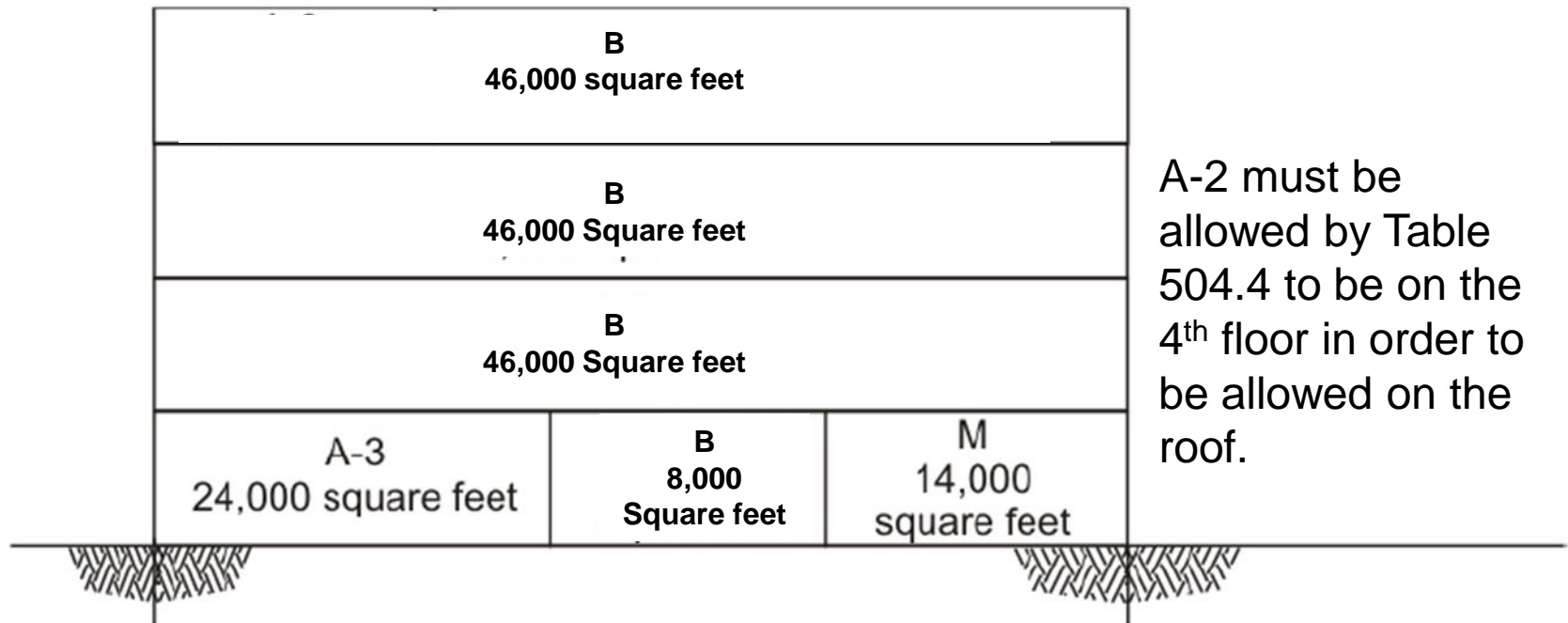
Allowable Height in Stories

- A roof or portion thereof can be used as an occupied roof provided the occupancy of the roof is an occupancy allowed by Table 504.4 for the story immediately below.
- The area of the roof does not add to the building area regulated by Section 506.



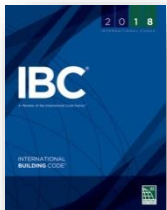
Allowable Height in Stories

A-2 occupancy on roof



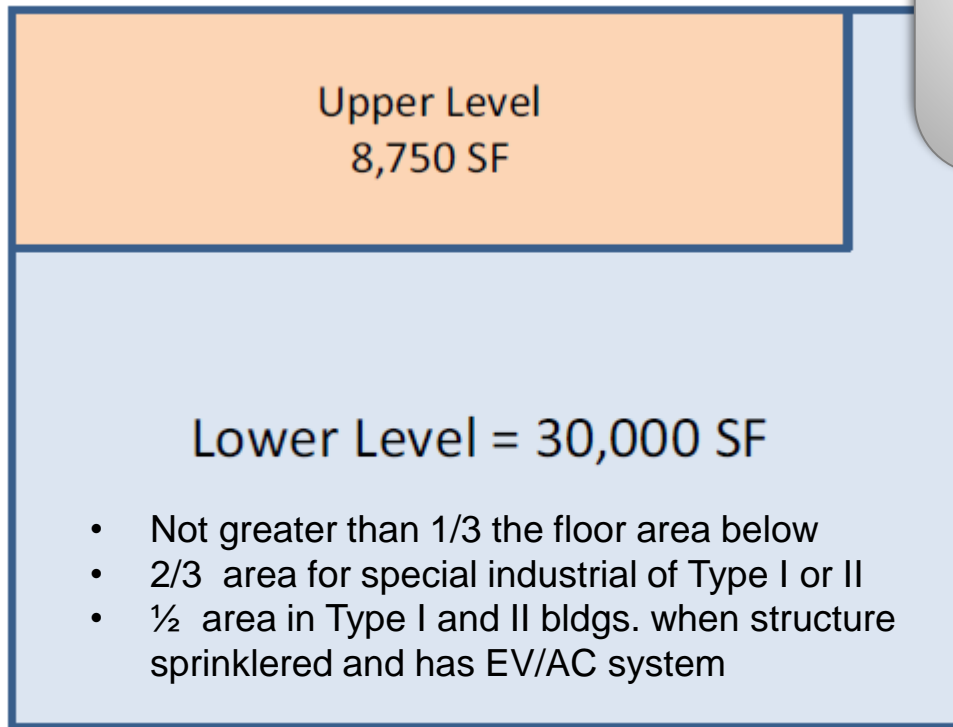
A-2 must be allowed by Table 504.4 to be on the 4th floor in order to be allowed on the roof.

For SI: 1 square foot = 0.0929 m².



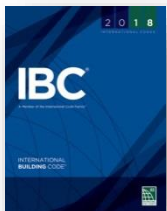
Building Height

A mezzanine does not count as a story when evaluating building height.



If area below upper level is not enclosed
 $8,750/30,000 = 0.30$
Upper level considered a mezzanine

If area below upper level is enclosed
 $8,750/22,500 = 0.39$
Upper level considered a second story



Allowable Area Equations

- $A_a = A_t + (NS \times I_f)$ --- Single occupancy, one-story

A_a = Allowable Area

A_t = Tabular Allowable Area (NS, S1, or S13R)

$NS \times I_f$ = Nonsprinklered Tabular area x **Frontage Increase**

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

I_f = **Frontage Increase**

F = Building Perimeter fronting public way or open space 20 feet or more

P = Perimeter of entire building

W = Width of open space or Public Way (per Section 506.3.2)

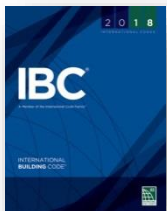
- $W = (L1 \times w1 + L2 \times w2 + L3 \times w3 + L4 \times w4) / F$

W = Width of open space or public way (weighted average)

L = Length of portion of exterior wall

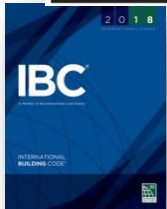
w = width (≥ 20 feet) of public way or open space associated with exterior wall

F = Building perimeter fronting public way – open space 20 feet or more



Allowable building area factor (IBC Table 506.2) (At = NS, S1, S13R, 13D or SM as applicable) in square feet

Occupancy classification	Type of construction									
	See Footnotes	Type I		Type II		Type III		Type IV	Type V	
		A	B	A	B	A	B	HT	A	B
A-2	NS	UL	UL	15500	9500	14000	9500	15000	11500	6000
	S1	UL	UL	62000	38000	56000	38000	60000	46000	24000
	SM	UL	UL	46500	28500	42000	28500	45000	34500	18000
B	S	UL	UL	37500	23000	28500	19000	36000	18000	9000
	S1	UL	UL	150000	92000	114000	76000	144000	72000	36000
	SM	UL	UL	112500	69000	85500	57000	108000	54000	27000
M	NS	UL	UL	21500	12500	18500	12500	20500	14000	9000
	S1	UL	UL	86000	50000	74000	50000	82000	56000	36000
	SM	UL	UL	64500	37500	55500	37500	61500	42000	27000
R-2 ^h	NS	UL	UL	24000	16000	24000	16000	20500	12000	7000
	S13R									
	S1	UL	UL	96000	64000	96000	64000	82000	48000	28000
	SM	UL	UL	72000	48000	72000	48000	61500	36000	21000



Area Increase for Frontage

Equation 5-5

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

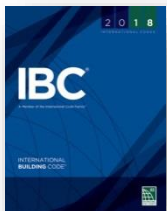
where:

I_f = Area increase due to frontage

F = Building perimeter that fronts on a public way or open space $\geq 20'$ wide

P = Perimeter of entire building

W = Width of public way or open space in accordance with §506.3.2





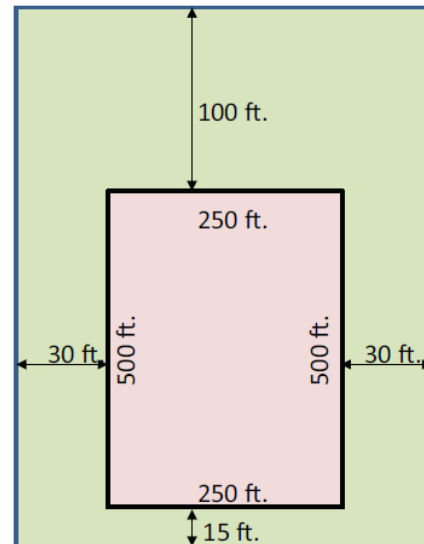
Area Increase for Frontage – Equation 5-5

- P = Perimeter of building
- F = Building perimeter that fronts on a public way or open space ≥ 20 feet wide
- W = Width of public way or open space
- $I_f = [F/P - 0.25] \times W/30$

1500'

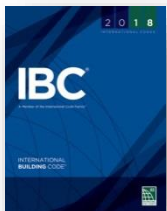
1250'

30'



$$I_f = \left[\frac{1250}{1500} - 0.25 \right] \times \frac{30}{30}$$

$$I_f = 0.58\%$$



Allowable Area – Equation 5-1

$$A_a = \{A_t + [NS \times I_f]\}$$

where:

A_a = Allowable building area per story (ft²)

A_t = Tabular allowable area factor in accordance with Table 506.2

NS = Tabular allowable area factor in accordance with Table 506.2 for nonsprinklered building

I_s = Area increase factor due to frontage as calculated in accordance with §506.3



Allowable Area for Frontage

- Given:
 - Single story with single occupancy

Actual area = 125,000

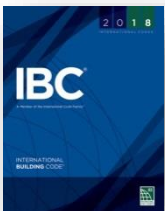
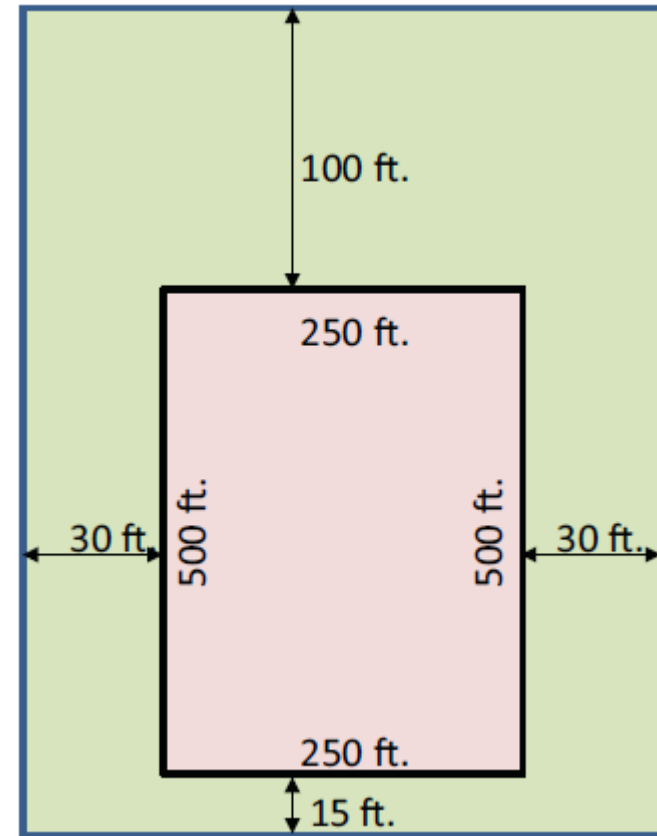
$$A_a = A_t + (NS \times I_f)$$

$$A_a = 112,500 + (37,500 \times 0.58)$$

$$A_a = 112,500 + 21,375$$

$$A_a = 134,250$$

Building Area is OK



Single Occupancy, Multi-story

- $A_a = [A_t + (NS \times I_f)] \times \underline{S}_a$

A_a = Allowable building area per story (ft²)

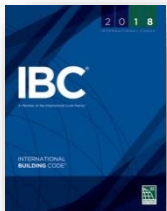
A_t = Tabular allowable area factor in accordance with Table 506.2

NS = Tabular allowable area factor in accordance with Table 506.2 for nonsprinklered building

I_f = Area increase factor due to frontage as calculated in accordance with Section 506.3

\underline{S}_a = Actual number of stories above grade plane, not to exceed 3.

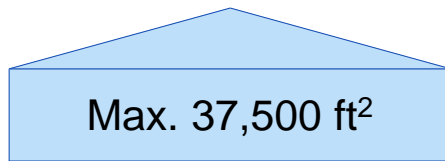
[For buildings sprinklered throughout by a NFPA 13R system, actual number of stories above grade plane not to exceed 4.]



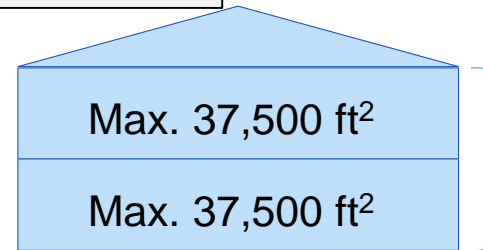


Floor Area in Multi-story Buildings

Group B Office – Nonsprinklered
Type IIA construction
Area per Story from Table 506.2 = 37,500 ft²

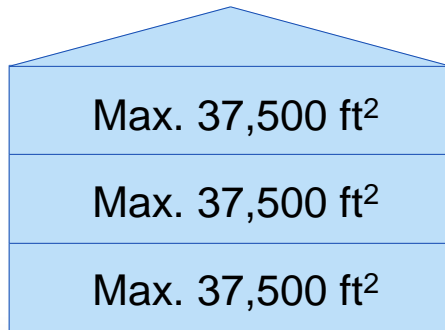


1-story building



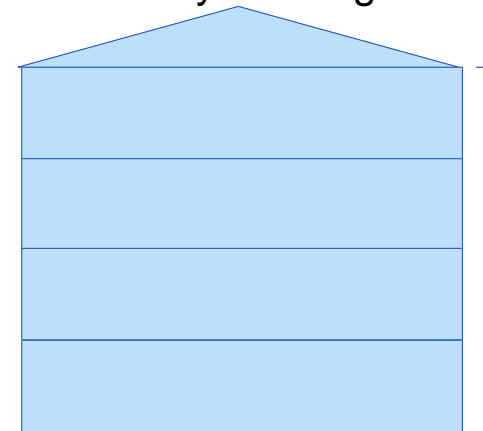
2-story building

Max.
 $37,500 \times 2 =$
75,500 ft²



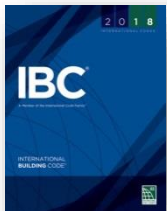
3-story building

Max.
 $37,500 \times 3 =$
112,500 ft²



4-story building

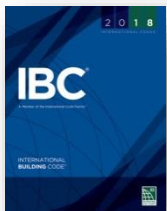
Max.
 $37,500 \times 3 =$
112,500 ft²



Interior Dimensions

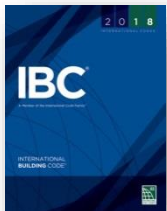


- Habitable rooms
 - Room width ≥ 7 feet
 - Exception allows kitchens to provide a > 3 feet clear passageway
 - Ceiling height $\geq 7'-6''$
 - Barrier required to protect occupants from objects protruding into clear height
- Egress path
 - Ceiling height $\geq 7'-6''$
 - Door height $\geq 7'-6''$
 - Door width $\geq 32''$





Need discussion or group activity here.





Chapter 6

Special Uses and Considerations

Multi-use Buildings – Separated Occupancies

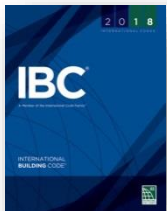
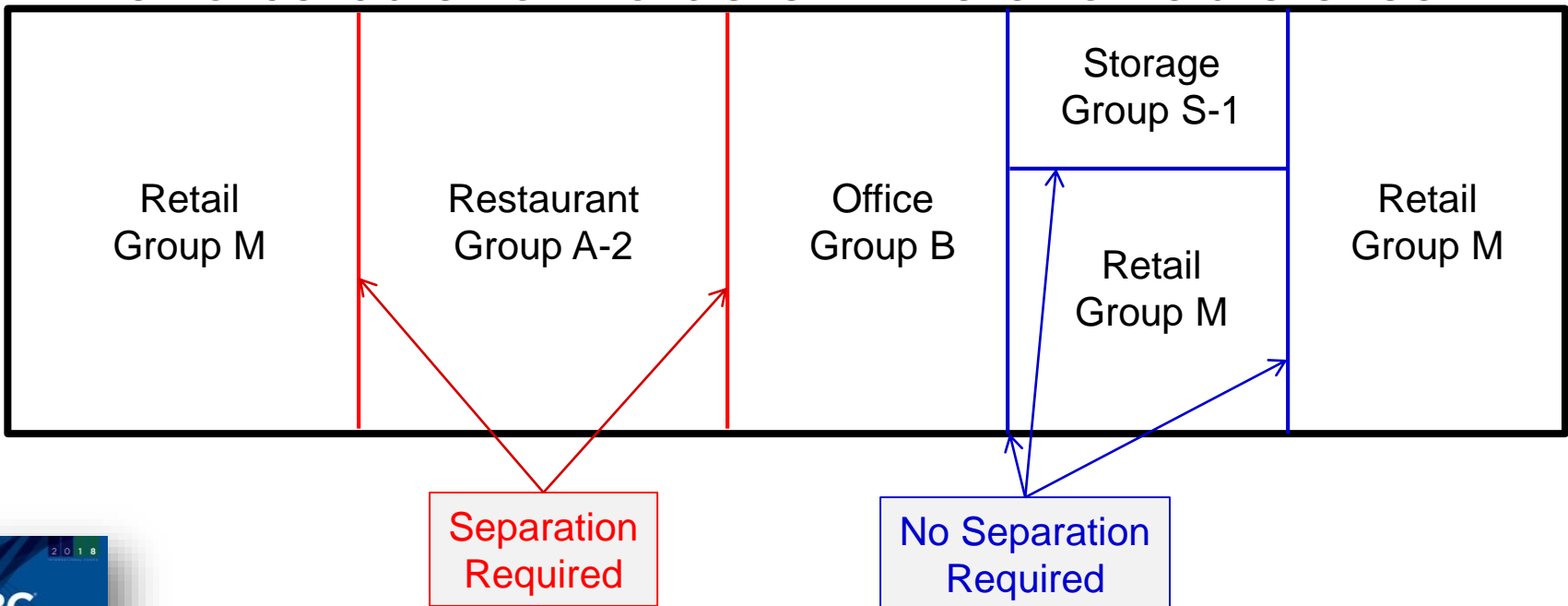
Table 508.4

Required Separation of Occupancies (hours)

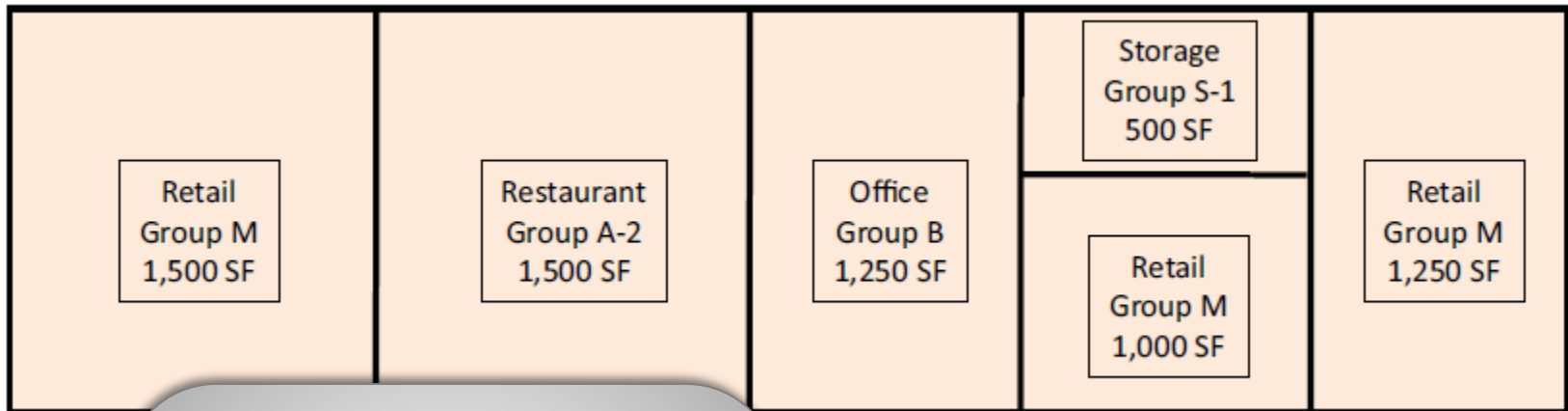
Occupancy	A, E		I-1 ^a , I-3, I-4		I-2		R ^a		F-2, S-2 ^b , U		B ^e , F-1, M, S-1		H-1		H-2		H-3, H-4,		H-5	
	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
A ^d , E	N	N	1	2	2	NP	1	2	N	1	1	2	NP	NP	3	4	2	3	2	NP
I-1 ^a , I-3, I-4	-	-	N	N	2	NP	1	NP	1	2	1	2	NP	NP	3	NP	2	NP	2	NP
I-2	-	-	-	-	N	N	2	NP	2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

Multi-use Buildings – Separated Occupancies

- Designer's option
- Separation based on Table 508.4
- Ratio calculation to determine allowable area



Multi-use Buildings – Separated Occupancies



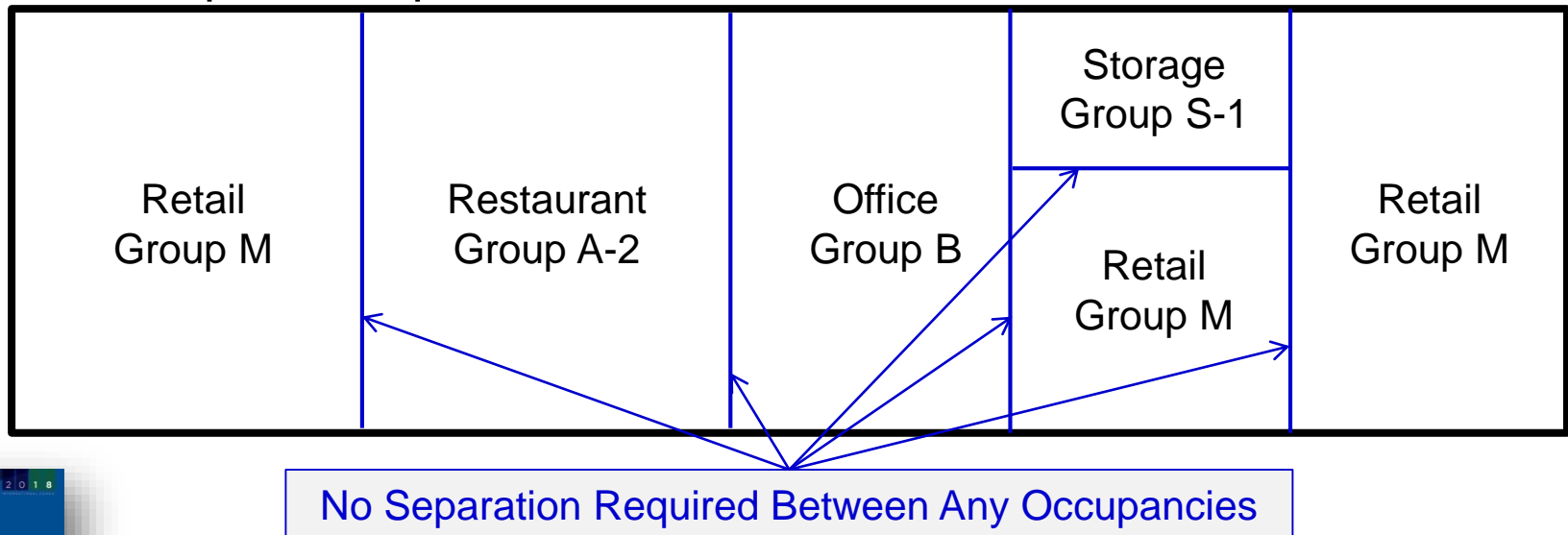
Given:
 Above mixed occupancy building
 One Story
 Type VB Construction
 No Fire Sprinklers
 No Frontage Increase
 Allowable Areas
 Group A-2 = 6,000 SF
 Group B = 9,000 SF
 Group M = 9,000 SF
 Group S-1 = 9,000 SF

Evaluate Allowable Area:
 Rao Calculation
 Group A-2 $1,500/6,000 = 0.25$
 Group B $1,250/9,000 = 0.14$
 Group M $3,750/9,000 = 0.42$
 Group S-2 $500/9,000 = 0.05$
 Total Ratio 0.86



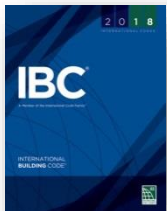
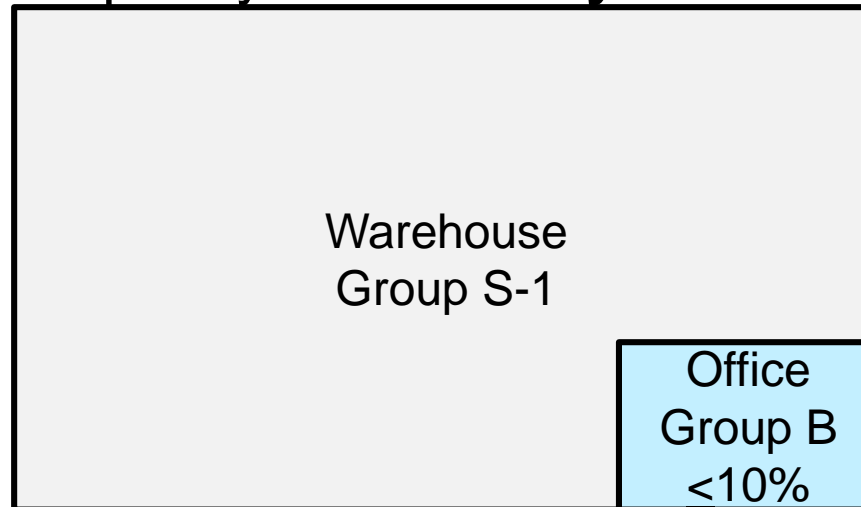
Multi-use Buildings – Nonseparated Occupancies

- Most restrictive requirement of each occupancy is applied to entire building
 - Height
 - Area
 - Chapter 9 requirements



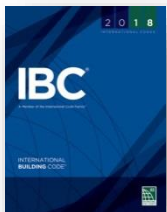
Multi-use Buildings – Accessory Occupancies

- **Subsidiary** occupancy to main use of building
- **Aggregate area** accessory occupancy <10% of floor area/story
- not exceed **nonsprinklered tabular area** for accessory occupancy
- **Allowable height & stories** cannot exceed Table 504
- Accessory occupancy **individually classified**



Multi-use Buildings – Incidental Uses

- Uses and occupancies within a building which are incidental to the main operation
- Protection is required for incidental accessory occupancies identified in Table 509
 - Fire-rated construction; or
 - Fire sprinklers
- When the fire sprinkler option is used, the room must be constructed to resist the passage of smoke

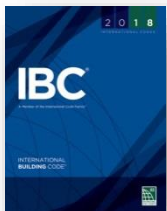
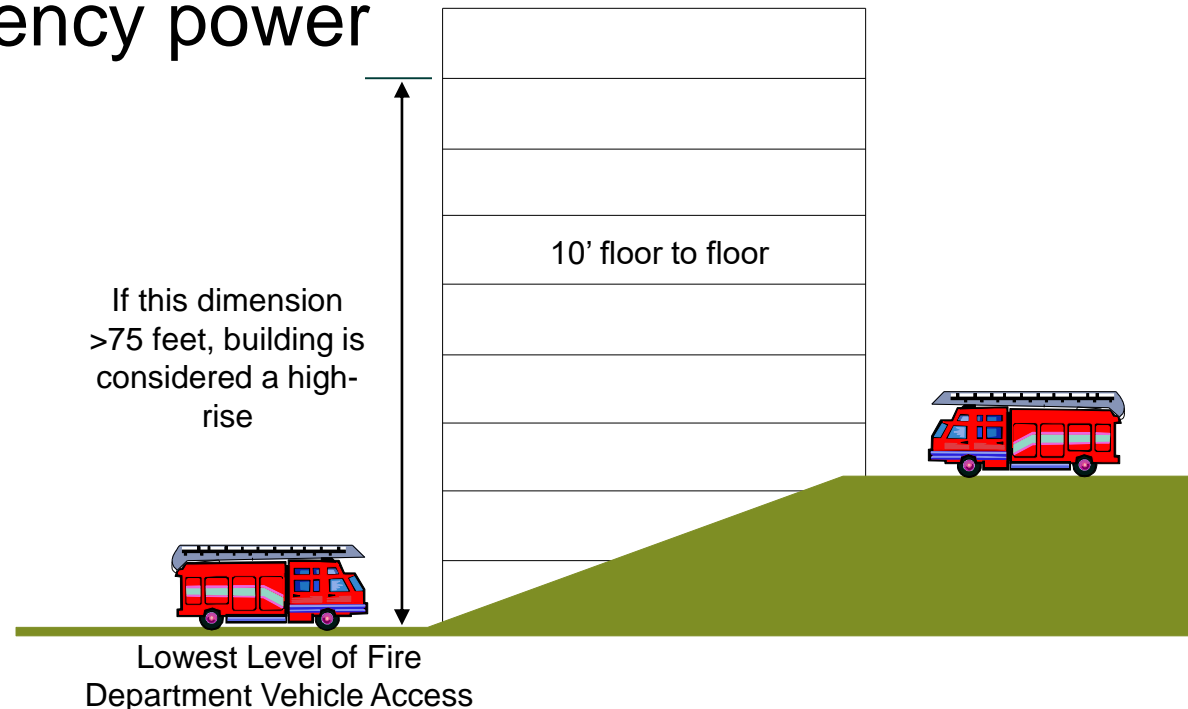


Multi-use Buildings – Incidental Uses

ROOM OR AREA	SEPARATION AND/OR PROTECTION
Furnace room where any piece of equipment is over 400,000 Btu per hour input	1 hour or provide automatic sprinkler system
Rooms with boilers where the largest piece of equipment is over 15 psi and 10 horsepower	1 hour or provide automatic sprinkler system
Refrigerant machinery room	1 hour or provide automatic sprinkler system
Hydrogen cut-off rooms, not classified as Group H	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies
Incinerator rooms	2 hours and automatic sprinkler system
Paint shops, not classified as Group H, located in occupancies other than Group F	2 hours; or 1 hour and provide automatic sprinkler system
In Group E occupancies, laboratories and vocational shops, not classified as Group H	1 hour or provide automatic sprinkler system
In Group I-2 occupancies, laboratories not classified as Group H	1 hour or provide automatic sprinkler system
In ambulatory care facilities, laboratories not classified as Group H	1 hour or provide automatic sprinkler system
Inn Group 1-2, laundry rooms over 100 square feet	1 hour
Group I-3 cells and Group I-2 patient rooms equipped with padded surfaces	1 hour
Group I-2 waste and linen collection rooms	1 hour
In Group I-2, physical plant maintenance shops	1 hour
In ambulatory care facilities or Group I-2 occupancies, waste and linen collection rooms with containers that have an aggregate volume of 10 cubic feet or greater	1 hour
In other than ambulatory care facilities and Group I-2 occupancies, waste and linen collection rooms over 100 square feet	1 hour or provide automatic sprinkler system
In ambulatory care facilities or Group I-2 occupancies, storage rooms greater than 100 square feet	1 hour
Stationary storage battery systems having an energy capacity greater than the threshold quantity specified in Table 1206.2 of the IFC	1 hour in Group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies

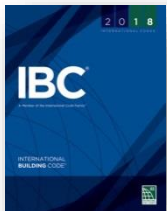
High-rise Buildings

- Smokeproof enclosure for stairways
- Smoke detection in elevator lobbies
- Standby/emergency power
- Fire alarm
- Sprinklers
- Standpipes



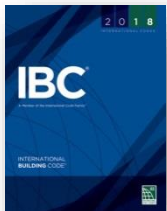
High-rise Buildings

- Additional stairway required in high-rise > 420 feet other than Group R-2
- Fire service access elevator when a floor level >120 feet above LLFDVA
- Method of smoke removal
 - Operable windows, OR
 - Mechanical system
- Egress path marking



Atriums

- Fire sprinklers required throughout building
- Smoke-control system to provide a safe path of egress
- Areas adjacent to the atrium are protected with a minimum of 1-HR fire-resistance-rated walls

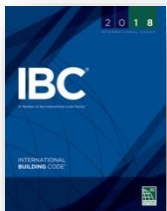


Garages

- Private garages
- Parking garages
 - Enclosed parking garage
 - Mechanical ventilation
 - Fire sprinklers required
 - Open parking garage
 - Natural ventilation
 - Type I, II or IV construction

Group U
 $\leq 1,000 \text{ ft}^2$
Serving residential units

Group S-2
Serving public or private
parking use



Repair Garages

- IFC defines a Repair Garage as:
 - “A building, structure, or portion thereof used for servicing or repairing motor vehicles.”
 - Solvents
 - Vehicle fluids
 - Type of fuel in vehicle
 - Gasoline, diesel
 - LPG, natural gas
 - Hydrogen, electric
 - Mechanical ventilation
- } Must stay below exempt amounts or classified Group H



Hazardous Materials

Maximum Allowable Quantities

- Excerpt from Table 307.1(1)
- Table 307.1(1)
- Maximum Allowable Quantity (MAQ) per Control Area of Hazardous Materials Posing a Physical Hazard^{a,j,m,n,p}

Material	Class	Group when the MAQ is Exceeded	Storage ^b			Use-Closed System ^b			Use-Open Systems ^b	
			Solid Lbs. (cubic feet)	Liquid Gallons (pounds)	Gas Cubic Feet at NTP	Solid Lbs. (cubic feet)	Liquid Gallons (pounds)	Gas Cubic Feet at NTP	Solid Lbs. (cubic feet)	Liquid Gallons (pounds)
Combustible liquid ^{c,i}	II, IIIA, IIIB	H-2 or H-3	N/A	120 ^{d,e}	N/A	N/A	120 ^d	N/A	N/A	30 ^d
		NA	N/A	330 ^{d,e} 13,200 ^{e,f}	N/A	N/A	330 ^d 13,200 ^f	N/A	N/A	80 ^d 3,300 ^d
Oxidizer	4	H-1	1 ^g	(1) ^{e,g}	N/A	0.25 ^g	(0.25) ^g	N/A	0.25 ^g	(0.25) ^g
	3 ^k	H-2 or H-3	10 ^{d,e}	(10) ^{d,e}	N/A	2 ^d	(2) ^d	N/A	2 ^d	(2) ^d
	2	H-3	250 ^{d,e}	(250) ^{d,e}	N/A	250 ^d	(250) ^d	N/A	50 ^d	(50) ^d
	1	NA	4,000 ^{e,f}	(4,000) ^{e,f}	N/A	4,000 ^f	(4,000) ^f	N/A	1,000 ^d	(1,000) ^f

Hazardous Materials

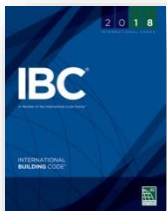
Maximum Allowable Quantities

- Read the Footnotes
- Table 307.1(1)
- Maximum Allowable Quantity (MAQ) per Control Area of Hazardous Materials Posing a Physical Hazard, *j, m, n, p*

Material	Class	Group when the MAQ is Exceeded	Storage ^b			Use-Closed System ^b			Use-Open Systems ^b	
			Solid Lbs. (cubic feet)	Liquid Gallons (pounds)	Gas Cubic Feet at NTP	Solid Lbs. (cubic feet)	Liquid Gallons (pounds)	Gas Cubic Feet at NTP	Solid Lbs. (cubic feet)	Liquid Gallons (pounds)
Combustible liquid ^{c,i}	II, IIIA, IIIB	H-2 or H-3 NA	N/A	120 ^{d,e} 330 ^{d,e} 13,200 ^{e,f}	N/A	N/A	120 ^d 330 ^d 13,200 ^f	N/A	N/A	30 ^d 80 ^d 3,300 ^d
Oxidizer	4 3 ^k 2 1	H-1 H-2 or H-3 H-3 NA	1 ^g 10 ^{d,e} 250 ^{d,e} 4,000 ^{e,f}	(1) ^{e,g} (10) ^{d,e} (250) ^{d,e} (4,000) ^{e,f}	N/A	0.25 ^g 2 ^d 250 ^d 4,000 ^f	(0.25) ^g (2) ^d (250) ^d (4,000) ^f	N/A	0.25 ^g 2 ^d 50 ^d 4,000 ^d	(0.25) ^g (2) ^d (50) ^d (1,000) ^f

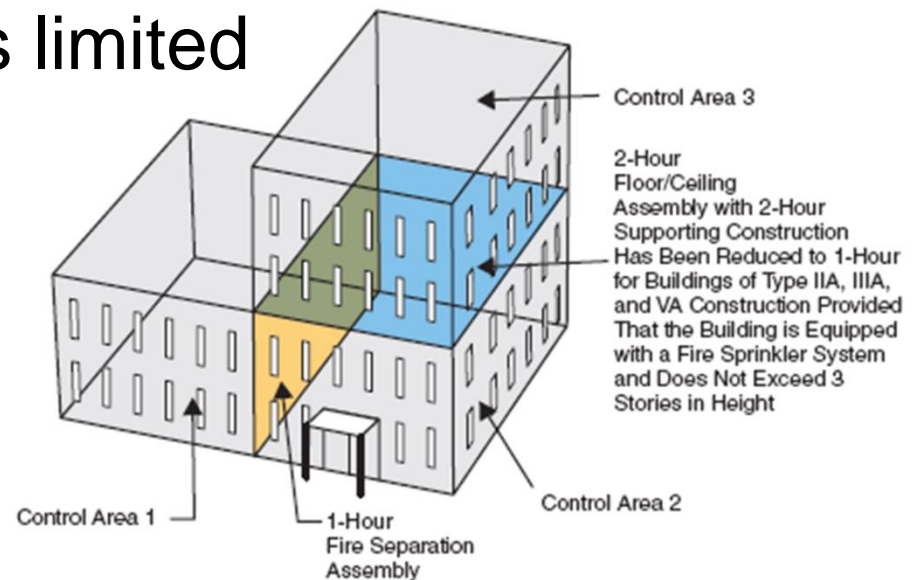
Footnotes to Table 307.1(1)

- b – Aggregate quantity shall not exceed storage
- d – Increase 100 percent for automatic sprinkler system
- e – Increase 100 percent stored in approved storage cabinets, day boxes, gas cabinets, gas rooms or exhausted
- f – Not limited in automatic sprinkler buildings
- g – Allowed only in buildings equipped throughout with an *automatic sprinkler system*

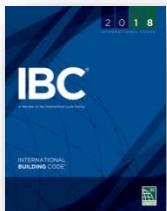


Control Areas

- Control Areas are NOT considered an H occupancy
- Up to MAQ in each control area
- Number of control areas limited
- Table 414.2.2



The fire-resistance rating of floor assemblies supporting control areas in some buildings is now permitted to be 1 hour.

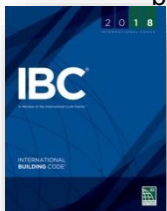


Control Areas

**TABLE 414.2.2
DESIGN AND NUMBER OF CONTROL AREAS**

STORY		Percentage of the Maximum Allowable Quantity per Control Area ^a	Number of Control Areas per Floor	Fire-resistance Rating for Fire Barriers in Hours ^b
Above grade plane	Higher than 9	5	1	2
	7-9	5	2	2
	6	12.5	2	2
	65	12.5	2	2
	4	12.5	2	2
	3	50	2	1
	2	75	3	1
	1	100	4	1
Below grade plane	1	75	3	1
	2	50	2	1
	Lower than 2	Not Allowed	Not Allowed	Not Allowed

- Percentage shall be of the maximum allowable quantity per control area shown in Tables 307.1(1) and 307.1(2), with all increases allowed in the notes to those tables.
- Separation shall include fire barriers and horizontal assemblies as necessary to provide separation from other portions of the building



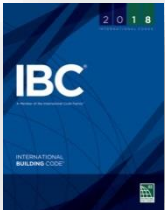


Allowable Quantity

- Given: A 1-story building to be used for the storage of toluene, (Class IC flammable liquid)
- Building is sprinklered throughout and is one control area
- Problem: Determine the MAQ using the requirements in Table 307.1(1)

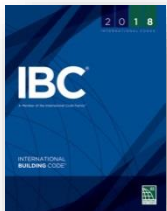
Tabular MAQ = 120
 Footnote d = 100% increase
 $120 \times 2 = 240$ gallons/control area
 Footnote e = 100% increase
 $240 \times 2 = 480$ gallons/control area

Material	Class	Group when the MAQ is Exceeded	Storage ^b			Use-Closed System ^b			Use-Open Systems ^b	
			Solid Lbs. (cubic feet)	Liquid Gallons (pounds)	Gas Cubic Feet at NTP	Solid Lbs. (cubic feet)	Liquid Gallons (pounds)	Gas Cubic Feet at NTP	Solid Lbs. (cubic feet)	Liquid Gallons (pounds)
Flammable liquid ^c	IB and IC	H-2 or H-3	N/A	120 ^{d,e}	N/A	N/A	120 ^d	N/A	N/A	30 ^d



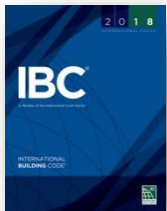
Live/Work Units

- Classified as R-2
- Floor area \leq 3,000 square feet
- Non-residential portion \leq 50 percent of floor area
- Commercial portion on 1st floor
- \leq 5 workers or employees



Healthcare Occupancies

- Classified as Group I occupancies
- Code official needs to know
 - Time that people are in the building receiving care.
 - Level of care that the person is receiving
 - Whether people are capable of responding to an emergency situation on their own



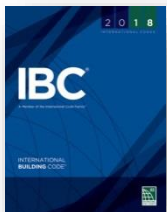
Healthcare Occupancies

- Group I-1 occupancies are those where more than 16 persons live on a 24-hour basis
 - Examples include assisted living facilities, halfway houses, alcohol and drug centers, group homes and congregate care facilities



Healthcare Occupancies

- Group I-2 occupancies are buildings that are used for medical care on a 24-hour basis for more than five people
 - Condition 1 includes those buildings where nursing and medical care are provided.
 - Condition 2 includes those facilities where emergency care, surgery, obstetrics or in-patient stabilization units for psychiatric or detoxification are provided.



Ambulatory Health Care Facilities

- Facilities that provide medical, surgical, psychiatric, nursing or similar care on less than a 24 hour basis to individuals who are not capable of self-preservation
- Classified as B
- Fire sprinklers required
- Smoke-protected compartments
 - when $>10,000$ square feet





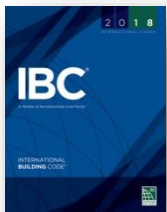
Module II – Building Planning

1. Classify the following occupancies:

- High School Group E
- Hospital Group I-2
- Business office in a high-rise Group B
- Warehouse storing plastic cups Group S-1

2. In Type IIA construction what is the minimum fire-resistance rating for interior walls?

1-HR
IBC Table 601; Workbook Table 4-1





Module II – Building Planning

3. T F The maximum height of a building is controlled by type of construction type, occupancy classification, and the installation of fire sprinklers.

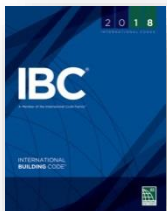
True

IBC Table 504.4; Workbook Table 5-2

4. What is the allowable area for a non-sprinklered Group M occupancy of Type IIIB construction without any increases for frontage?

12,500 square feet

IBC Table 506.2; Workbook Table 5-2

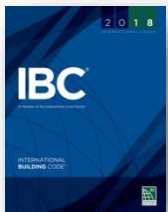




Module II – Building Planning

5. A building with multiple occupancies can be designed using which of the following methods?
- A. Accessory occupancies
 - B. Non-separated mixed use occupancies
 - C. Separated mixed use occupancies
 - D. A combination of all of the above

D
IBC §508.1



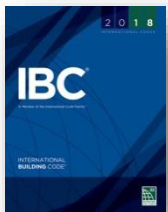


Module II – Building Planning

6. T F Hazardous materials are only allowed in Group H occupancies?

False

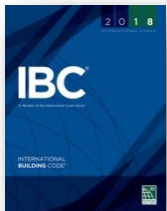
Hazardous materials can be found in nearly all occupancies, but the quantities are limited. When the quantity of hazardous materials exceeds the Maximum Allowable Quantity per Control Area, then the occupancy is classified as Group H.



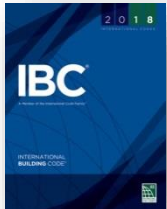


Building Planning Practice

- Any questions regarding the practice?



Questions and Answers

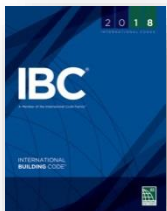




Final Reflection

This slide will help the you to reflect on the day and what they will take back to the job and apply.

- **What?** What happened and what was observed in the training?
- **So what?** What did you learn? What difference did this training make?
- **Now what?** How will you do things differently back on the job as a result of this training?



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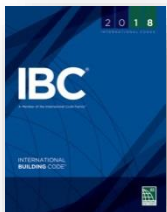
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