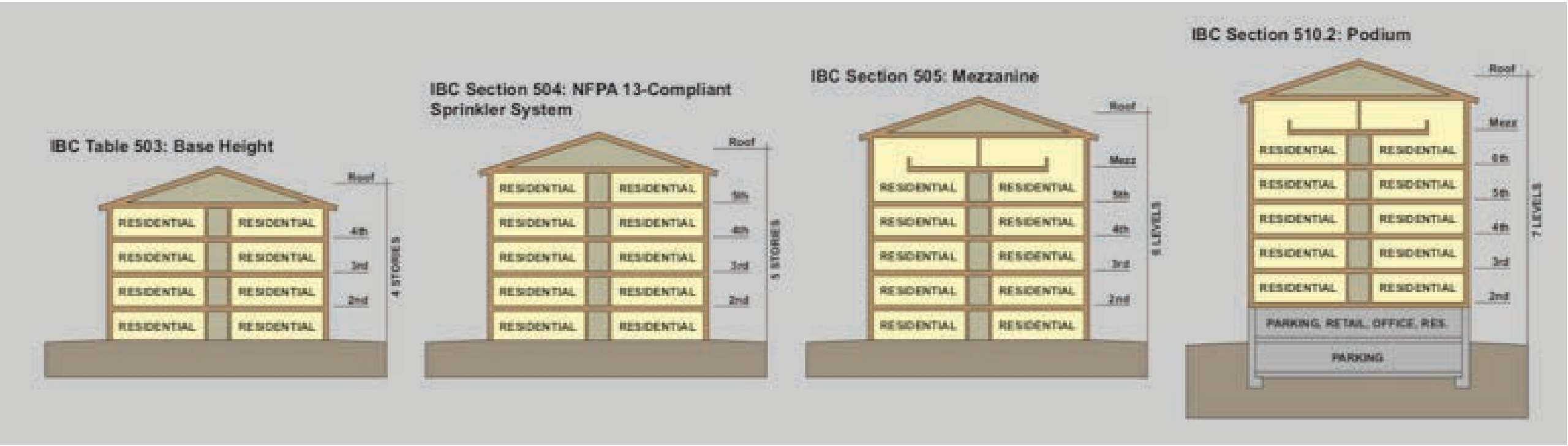
The Evolution of Mid-Rise Design: Code Changes = New Opportunities

Archie Landreman

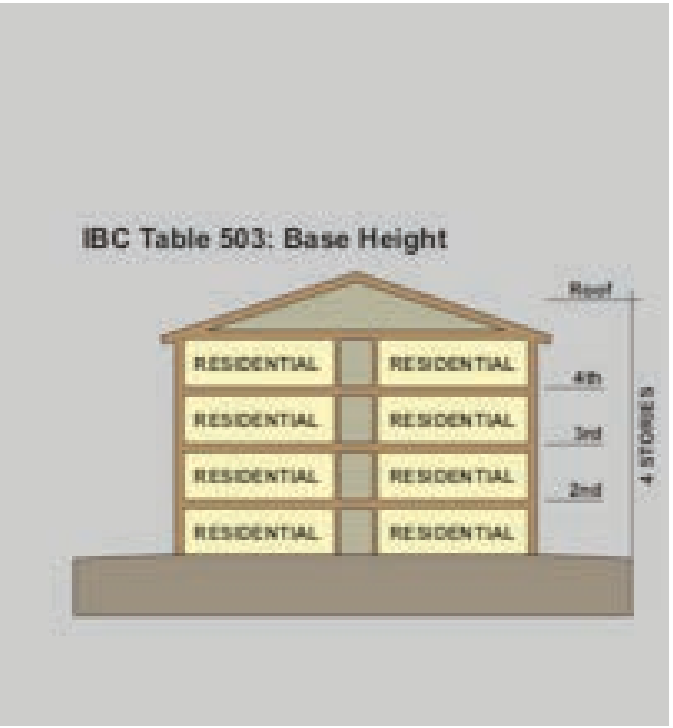
WoodWorks – Wood Products Council

Credit: Greg Folkins

Evolution of Mid-Rise



Evolution of Mid-Rise



Type V Construction

4 Stories

108k SF Total Building

Type V Buildings

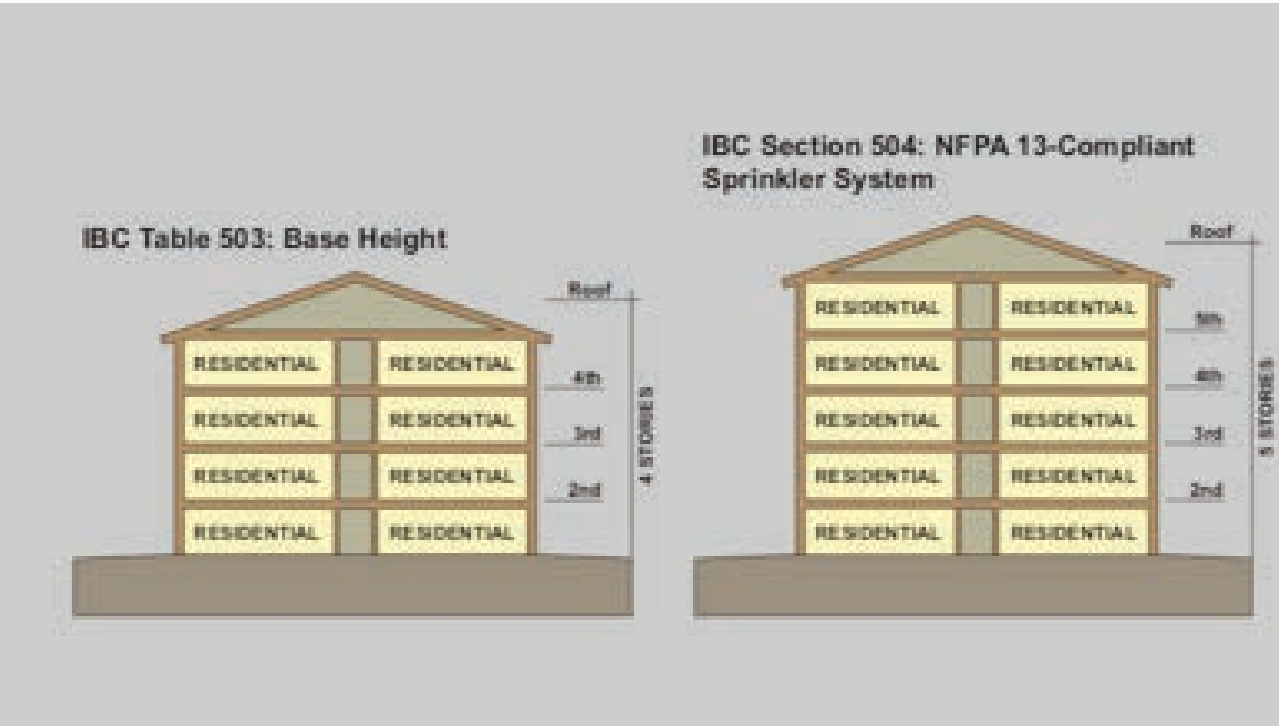
Multi-family

Restaurants

Retail

Office

Evolution of Mid-Rise



Type V Construction

4 Stories

108k SF Total Building

Type III Construction

5 Stories

216k SF Total Building

Type III Buildings

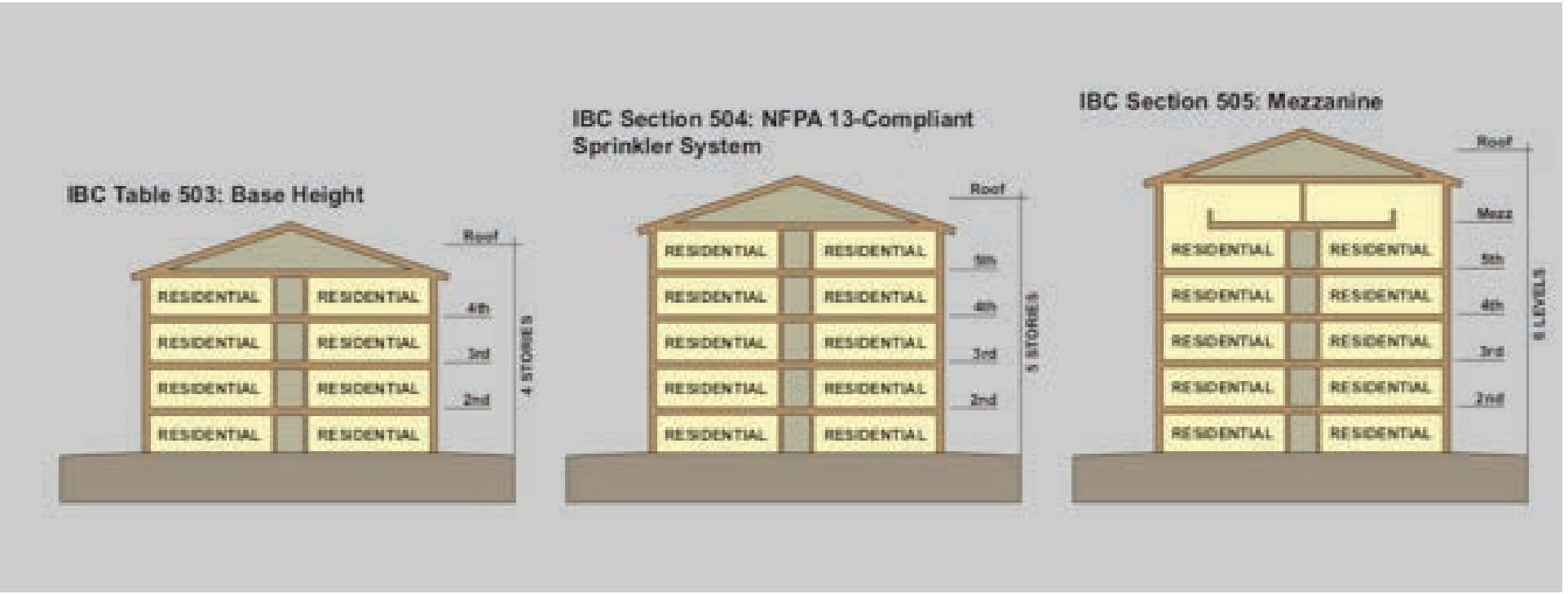
Multi-family

K-12/Higher Ed

Hospitality

Office

Evolution of Mid-Rise



Type V Construction

4 Stories

108k SF Total Building

Type III Construction

5 Stories

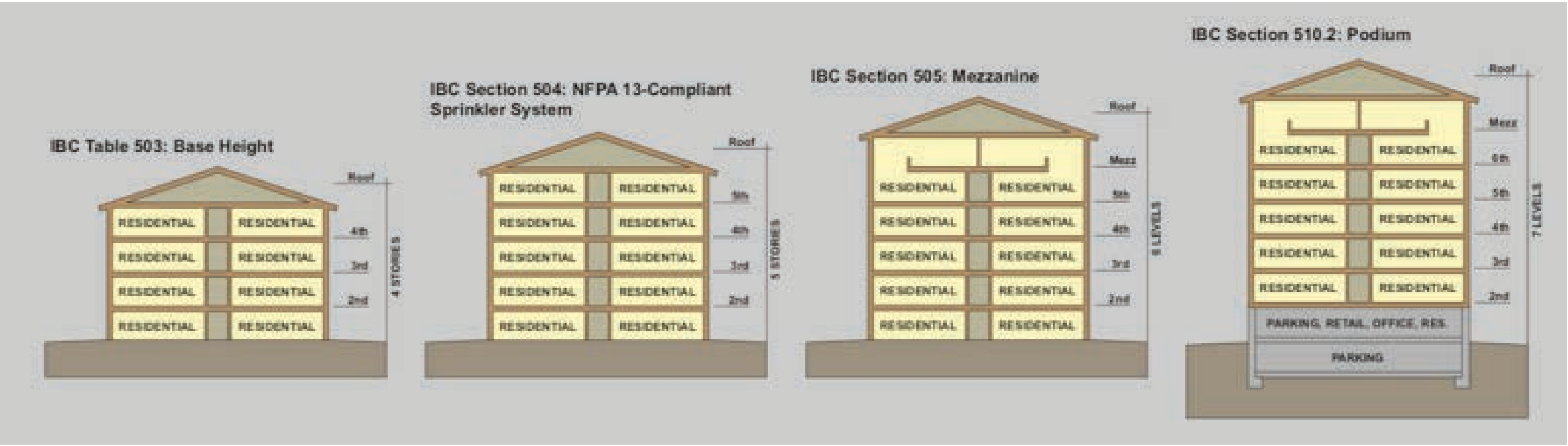
216k SF Total Building

Add a mezzanine – not counted as a floor if conditions are met

Marselle Condos, Seattle, WA

5 stories for Residential + Mezzanine + Multi-Story Podium

Evolution of Mid-Rise



Type V Construction

4 Stories

108k SF Total Building

Type III Construction

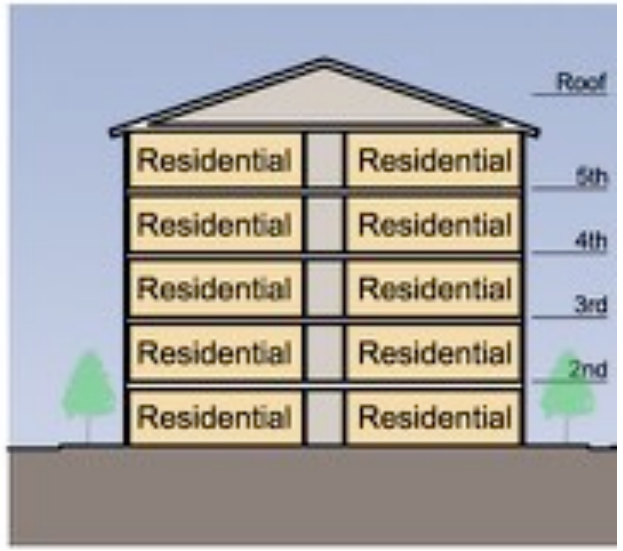
5 Stories

216k SF Total Building

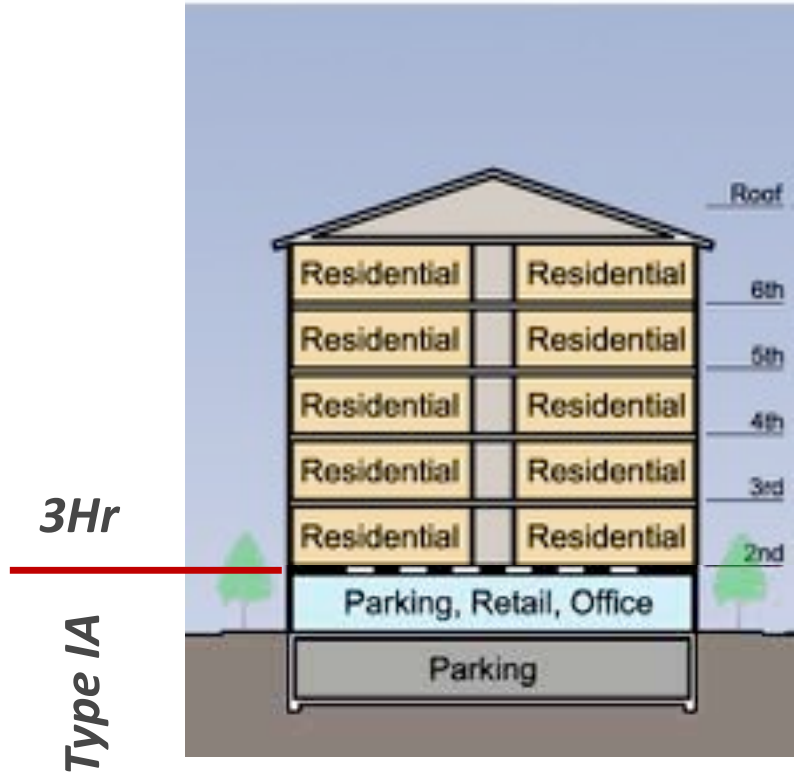
Add a mezzanine – not counted as a floor if conditions are met

5 story residential on top of multi-story podium

IBC Podium Provisions



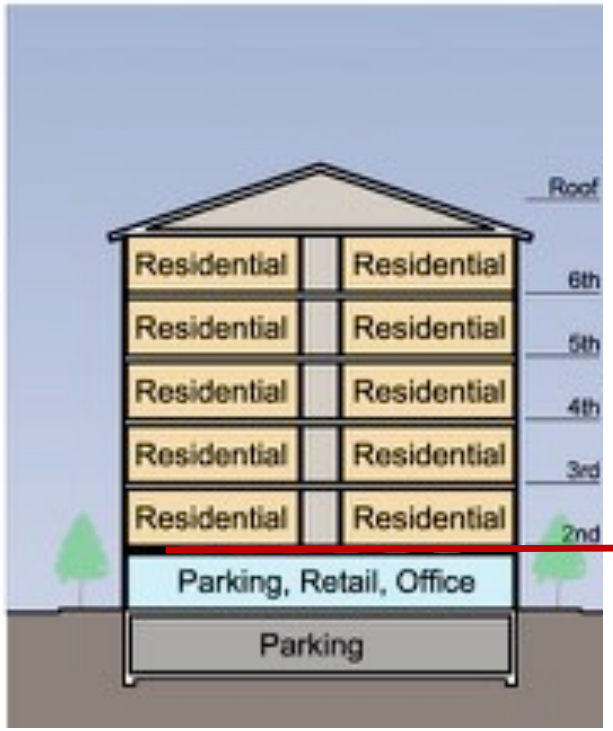
5 story Type III Building



5 story Type III Building
On Top of a Type IA Podium

Special Provisions for Podiums in IBC 2012 510.2
Increases allowable stories… not allowable building height

Evolution of IBC Mixed-Use Podium



3Hr

Type IA

IBC	2006	2009	2012	2015
Section	509.2	509.2	510.2	510.2
Upper Occupancy	A, B, M, R or S			
Lower Occupancy	S-2 Parking	A, B, M, R or S-2 Parking		Any Except H
Podium Height	1 Story			No Restriction

IBC Provisions for Mixed-Use podium have been evolving.

2015 IBC allows multiple podium stories above grade.

Basements

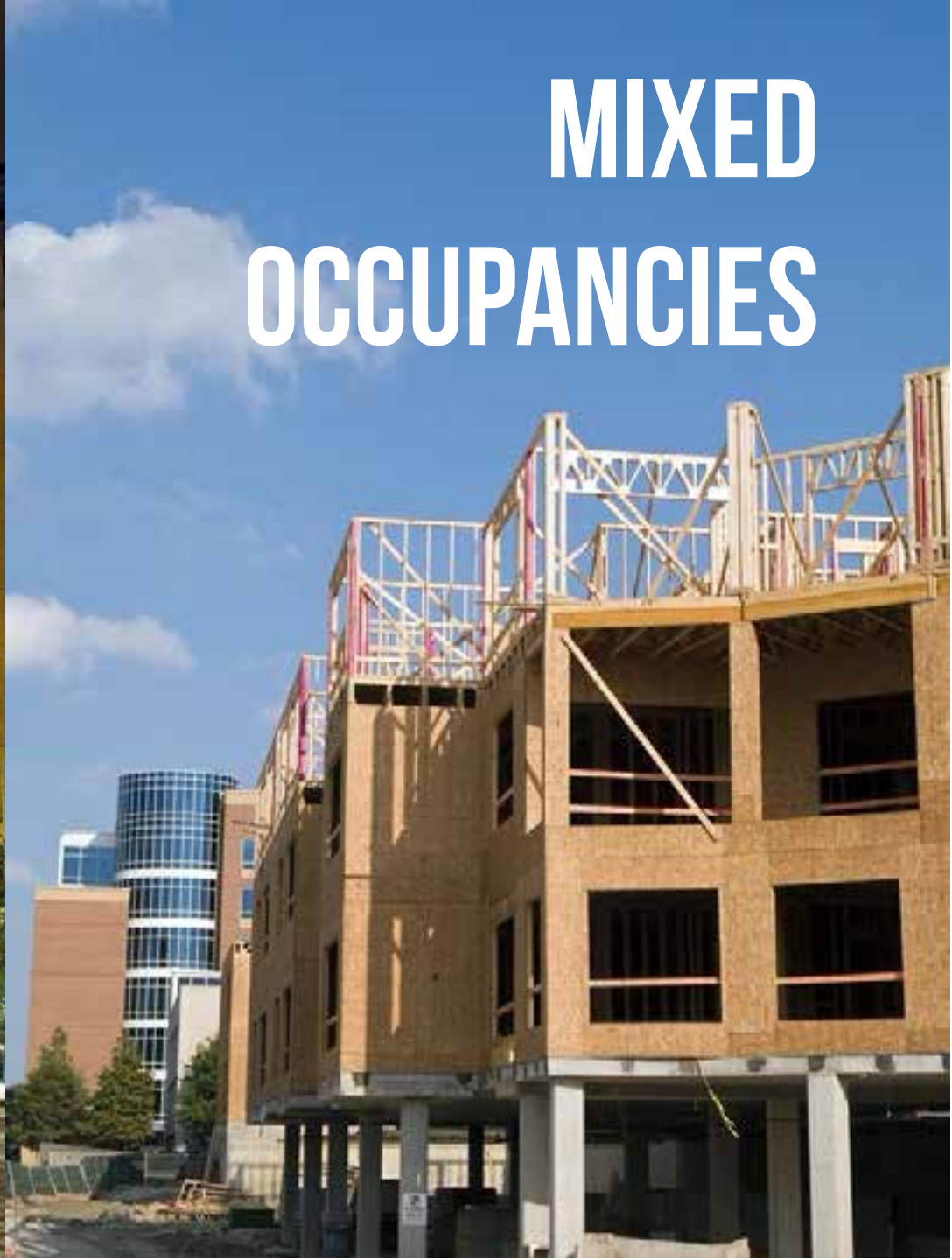
IBC 506.4 & 506.5: A single basement is not included in the total allowable building area if it doesn't exceed the area permitted for a building with no more than one story above grade plane.

Basement is defined as that where the finished surface of the floor next above is:

- Less than 6 feet above grade plane or
- Less than 12 feet above the finished ground level at any point

Fashion Valley, CA
AvalonBay Communities

MIXED OCCUPANCIES



BUILDING CONFIGURATION OPTIONS

MANY BUILDINGS UTILIZE A HIGHER CONSTRUCTION TYPE THAN NECESSARY DUE TO TRADITIONAL PRACTICE. THIS CAN HAVE AN IMPACT ON FIRE RATINGS, MATERIALS AND ULTIMATELY COST.

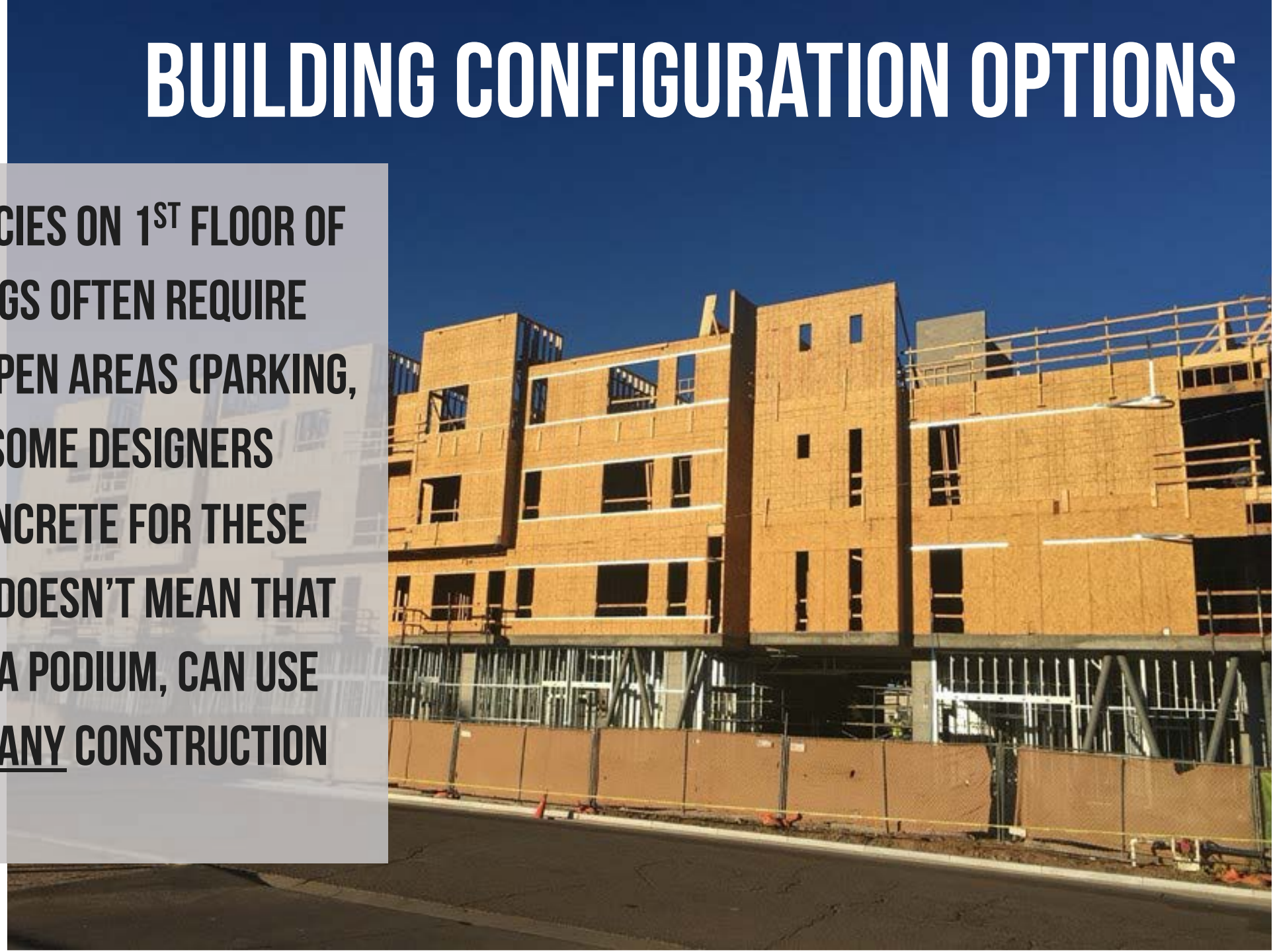
MIXED OCCUPANCY BUILDINGS

IBC 508

START WITH UNSEPARATED OCCUPANCIES, USING SPECIAL PROVISIONS AND/OR OTHER SPECIAL DESIGN ALLOWANCES AS NEEDED. WORK UP FROM THERE.

BUILDING CONFIGURATION OPTIONS

MIXED-USE OCCUPANCIES ON 1ST FLOOR OF RESIDENTIAL BUILDINGS OFTEN REQUIRE LONGER SPANS FOR OPEN AREAS (PARKING, RETAIL, ASSEMBLY). SOME DESIGNERS CHOOSE STEEL OR CONCRETE FOR THESE LONGER SPANS. THIS DOESN'T MEAN THAT IT HAS TO BE A TYPE IA PODIUM, CAN USE THESE MATERIALS IN ANY CONSTRUCTION TYPE (IBC 602.1.1)



SPECIAL PROVISIONS

IBC 510.2

5 STORY MIXED-USE POSSIBILITIES

4 STORIES OF TYPE V
OVER 1 STORY PODIUM

PHOTO CREDIT: GABLES RESIDENTIAL

5 STORIES OF TYPE III

SPECIAL PROVISIONS

IBC 510.2

6 & 7 STORY MIXED-USE POSSIBILITIES

5 STORIES OF TYPE III
OVER 1 STORY PODIUM

5 STORIES OF TYPE III
OVER 2 STORY PODIUM

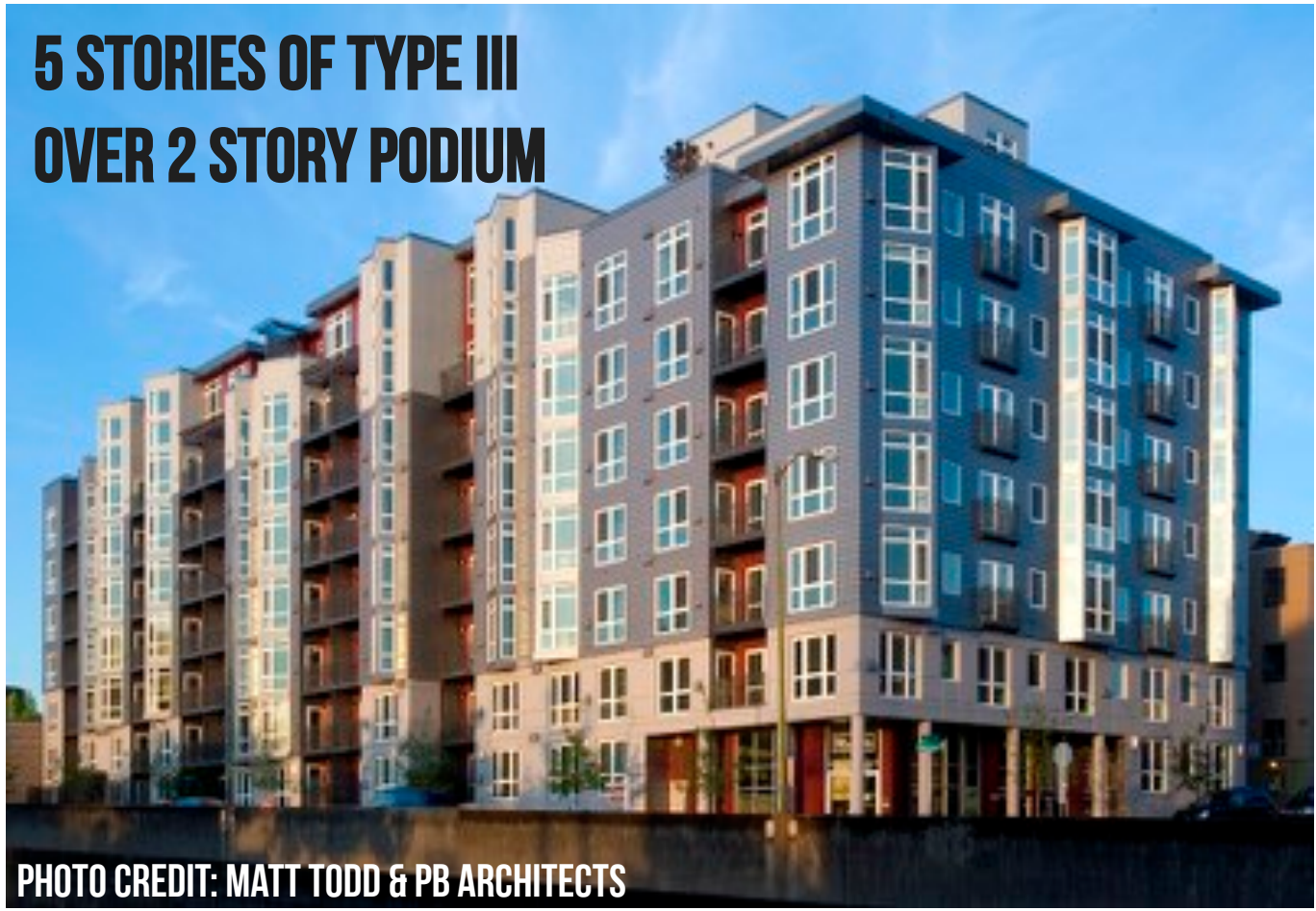


PHOTO CREDIT: MATT TODD & PB ARCHITECTS

SPECIAL PROVISIONS

IBC 510.2

7 STORY MIXED-USE POSSIBILITIES

6 STORIES OF TYPE IIIA OR IV
OVER 1 STORY PODIUM

IMAGE CREDIT: MICHAEL GREEN ARCHITECTS/HINES GROUP

SMALL ASSEMBLY SPACES

IBC 303.1.1 & 303.1.2

Small Assembly Spaces:

- A building or tenant space used for assembly purposes with an occupant load of less than 50 persons shall be classified as a Group B occupancy.

Example: small cafe

Small Assembly Spaces Accessory to Other Occupancies:

- Occupant load less than 50 persons or less than 750 sf in area - can be classified as a Group B occupancy or as part of main occupancy

Examples:

- Conference room in office building
- Fitness center in hotel

ROOFTOP DECKS

IBC 503.1

Many mixed use buildings, especially apartment buildings, are implementing occupiable roof top decks, either for individual use or as a gathering space

No current code sections clearly discuss this except for basic exit provisions but several design routes have been used

Typically these spaces do not have a roof and therefore aren’t classified as stories per the definition of a story (IBC 202)

ROOFTOP DECKS

IBC 503.1

Occupied Roofs Code Development

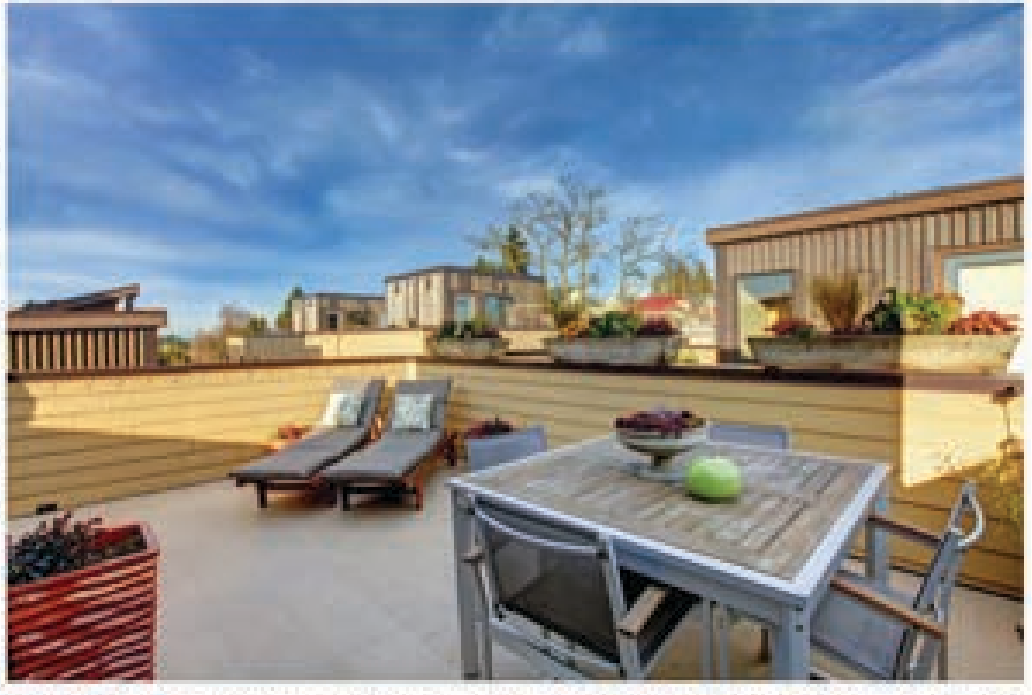
2012 IBC section 1021 contains exit provisions for occupied roofs

2015 IBC clarified egress requirements for occupied roofs (IBC 1006.3)

2018 IBC further recognizes occupied roofs. 2018 IBC provisions:

302.1: Occupied roof classified as occupancy it most closely resembles
503.1.4: Permitted to be used as an occupied roof if the occupancy of the roof is an occupancy that is permitted by code for the story immediately below the roof. Area of the occupied roofs is not required to be included in the building area. Further exceptions for sprinklered buildings exist

Does an occupied rooftop/roof deck need to be included in allowable building size (height and area) calculations?



Occupied rooftops are becoming common in multi-family and commercial buildings as building designers and owners seek to increase marketability by offering amenities such as roof decks. In most cases, these roof decks are open and uncovered with half height walls/parapets around their perimeter. However, some or all of the roof deck space may also be enclosed by full height walls and a roof covering. In both scenarios, questions that often arise include whether the roof deck needs to be considered as a separate story and how the occupancy and area contribute when evaluating height and area requirements based on a specific construction type.

Code language regarding this topic continues to evolve. Under the 2012 and 2015 IBC, some feel that the relevant code provisions leave room for interpretation. As such, a design team may choose to consult with the Authority Having Jurisdiction (AHJ) regarding what he or she deems acceptable. Code changes set for inclusion in the 2018 IBC further clarify provisions on this topic (see below).

In the meantime, following is a summary of how designers in the U.S. have successfully implemented occupied roof decks in their projects without including them in the tota

http://www.woodworks.org/ask-an-expert/

Roof Decks without Roof Coverings

IBC 2012 Table 503 and IBC 2015 Table 504.4 provide limitations on allowable number of stories in a given building. However, per

View All Expert Tips

Project Assistance

Our technical experts offer free project support from design through construction, on issues ranging from allowable heights and areas to structural design, lateral systems and fire- or acoustical-rated assemblies.

Get Assistance >

Ask an Expert

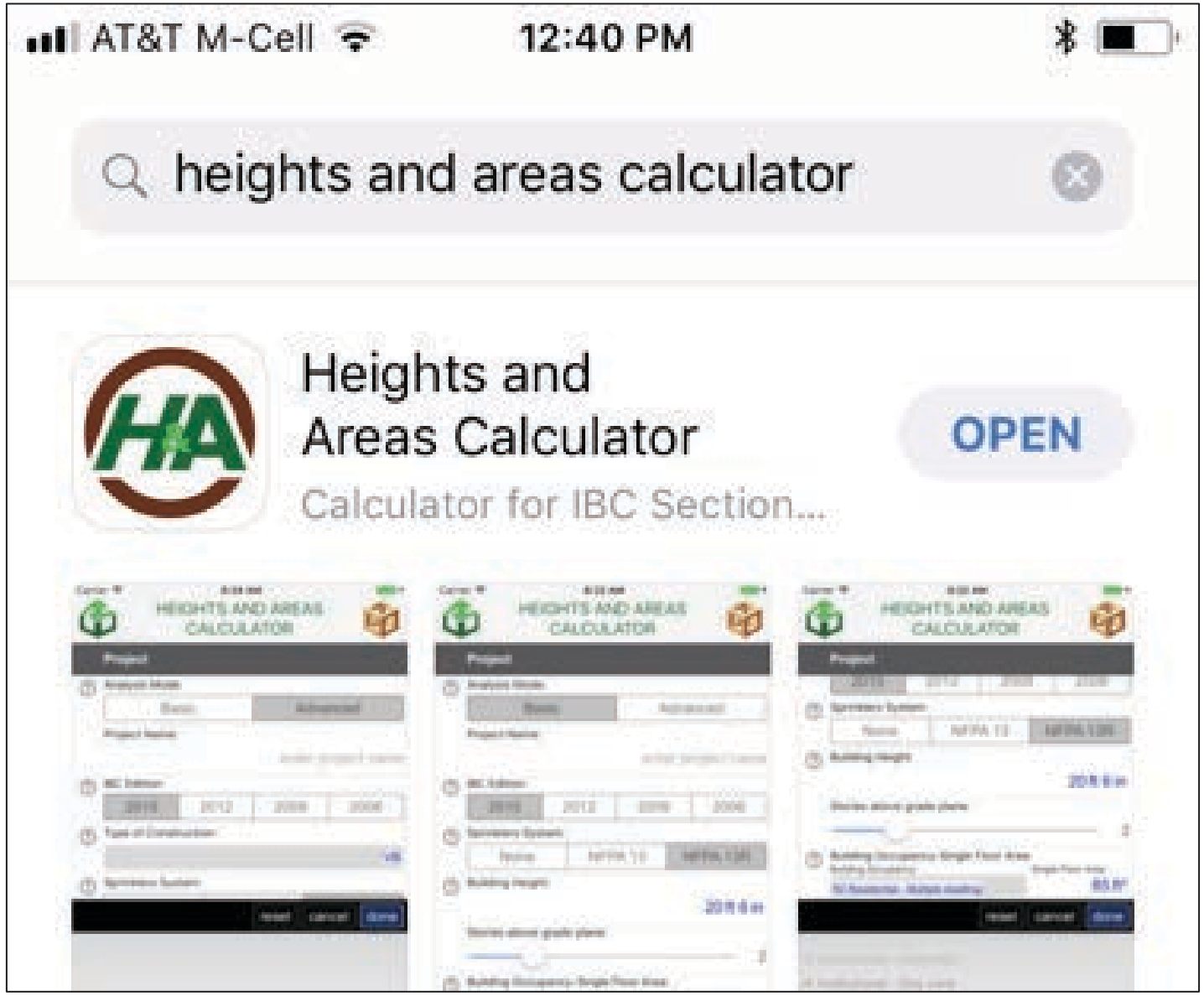
Q: When is blocking/bracing within wood-frame walls required? What is considered adequate bracing for wood wall studs in their weak axis?

A: Wood studs used in light-frame wall construction may require horizontally-oriented blocking for a number of reasons—including blocking at shear panel edges, fire blocking, and buckling restraint when subject to axial loads. Structural Blocking Purposes Blocking to Reduce Stud Slenderness Ratio Section 3

Learn More
Have a question? Email Us >

Feature Project

WoodWorks/AWC H&A Calculator



https://www.awc.org/codes-standards/calculators-software/heights-areas

Savings Can be Found in the Details

Shafts, Stairs, Partitions & More

Stair, Elevator & MEP Shafts

If the building can be framed with wood, the shafts can be framed with wood

Shaft Wall Savings – Case Study

Switch to Wood Framed Shaft Walls Saves Project $176,000

- Gala at Oakcrest, Euless, TX
- 4 Story, 135,000 sf multi-family building
- 2 Elevator Shafts, 3 Stair Shafts, all originally designed in masonry – project was otherwise all wood framed
- Initial estimates were total of $266,000 for all 5 shafts
- Team switched to wood shafts, cut $176,000 from cost and at least 3 weeks from schedule

Source: Gardner Capital Construction, project General Contractor & Developer

Mass Timber Shaft Walls

Photo: Alex Schreyer

Photo: Lendlease

Shaft Wall Resource

Code provisions, detailing options, project examples and more for light-frame wood and mass timber shaft walls

Free resource at woodworks.org

WoodWorks
WOOD PRODUCTS COUNCIL

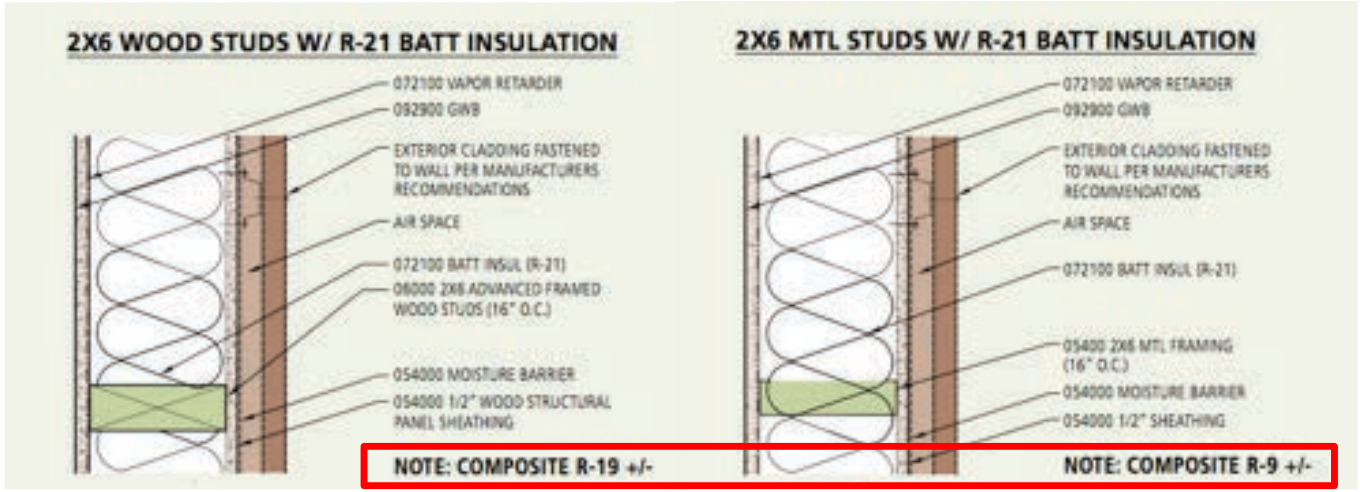
Shaft Wall Solutions
For Wood-Frame Buildings

Wood Within Podium Level(s)

Credit: WoodWorks

FRTW is permitted in non-bearing, non-rated exterior walls in types I & II (IBC 603.1)

Thermal/building envelope benefits, as well as consistent exterior wall detailing



Source: Mahlum Architects

Wood Within Podium Level(s)

Credit: WoodWorks

2021 IBC allows stairs below the podium to be framed with wood if building above podium is type III, IV or V

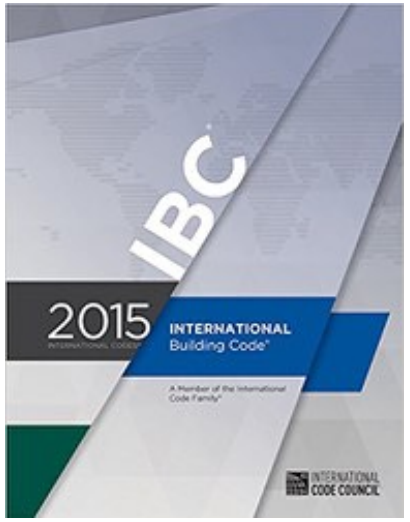
What Will The Future Bring?

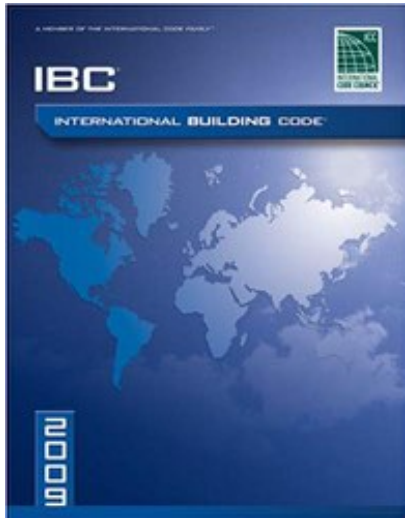
Tall Wood in the US

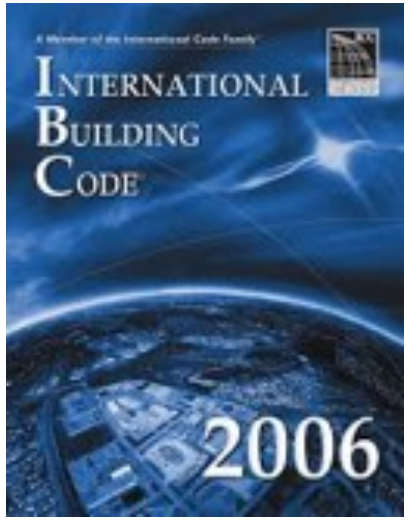
IBC 2021

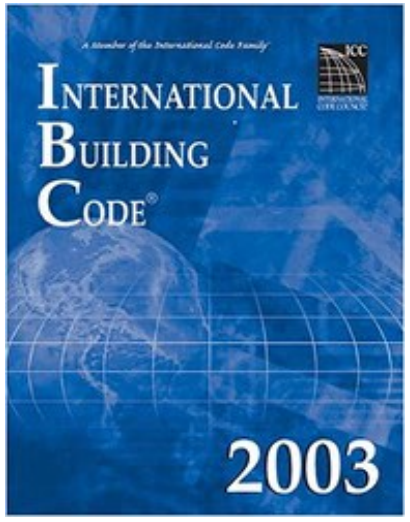
ICC INTERNATIONAL CODE COUNCIL®

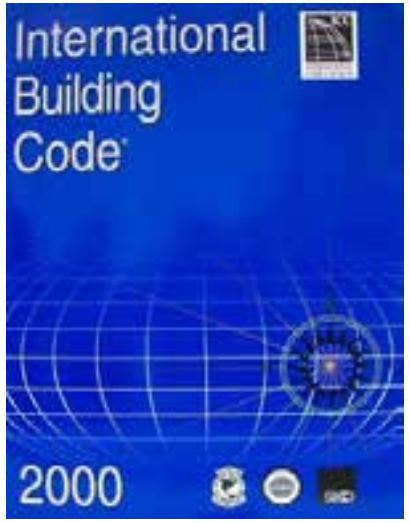
3 YEAR CODE CYCLE











U.S. TALL WOOD
DEVELOPMENT AND CHANGES

In December 2015, the ICC Board established the ICC Ad Hoc Committee on Tall Wood Buildings. Objectives:

1. Explore the building science of tall wood buildings
2. Investigate the feasibility, and
3. Take action on developing code changes for tall wood buildings.

TALL WOOD APPROVED!

Unofficial results posted Dec 19, 2018

Final votes ratified Jan 31, 2019

AWC: Tall Mass Timber code changes get final approval

Dec 19, 2018

LEESBURG, VA. – The International Code Council (ICC) has released the unofficial voting results on code change proposals considered in 2018, including passage of the entire package of 14 tall mass timber code change proposals. The proposals create three new types of construction (Types IV-A, IV-B and IV-C), which set fire safety requirements, and allowable heights, areas and number of stories for tall mass timber buildings. Official results are expected to be announced during the first quarter of 2019. The new provisions will be included in the 2021 *International Building Code* (IBC).

"Mass timber has been capturing the imagination of architects and developers, and the ICC result means they can now turn sketches into reality. ICC's rigorous study, testing and voting process now

2021 IBC Introduces 3 new tall wood construction types:

IV-A, IV-B, IV-C

Previous type IV renamed type IV-HT

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV				TYPE V	
	A	B	A	B	A	B	A	B	C	HT	A	B

Type IV-C

Credit: Susan Jones, atelierjones

Photos: Baumberger Studio/PATH Architecture/Marcus Kauffman

Type IV-C Protection vs. Exposed

IV-C

Credit: Susan Jones, atelierjones

Credit: Kaiser+Path, Ema Peter

All Mass Timber surfaces may be exposed

Exceptions: Shafts, concealed spaces, outside face of exterior walls

Type IV-C Height and Area Limits

Credit: Susan Jones, atelierjones

Occupancy	# of Stories	Height	Area per Story	Building Area
A-2	6	85 ft	56,250 SF	168,750 SF
B	9	85 ft	135,000 SF	405,000 SF
M	6	85 ft	76,875 SF	230,625 SF
R-2	8	85 ft	76,875 SF	230,625 SF

Areas exclude potential frontage increase

In most cases, Type IV-C height allowances = Type IV-HT height allowances, but add'l stories permitted due to enhanced FRR

Type IV-C area = 1.25 * Type IV-HT area

Type IV-B

Credit: Susan Jones, atelierjones

Credit: LEVER Architecture

Type IV-B Protection vs. Exposed

IV-B

Credit: Susan Jones, atelierjones

Credit: Kaiser+Path

NC protection on all surfaces of Mass Timber except limited exposed areas

~20% of Ceiling or ~40% of Wall can be exposed, see code for requirements

Type IV-B Height and Area Limits

Credit: Susan Jones, atelierjones

Occupancy	# of Stories	Height	Area per Story	Building Area
A-2	12	180 ft	90,000 SF	270,000 SF
B	12	180 ft	216,000 SF	648,000 SF
M	8	180 ft	123,000 SF	369,000 SF
R-2	12	180 ft	123,000 SF	369,000 SF

Areas exclude potential frontage increase

In most cases, Type IV-B height & story allowances = Type I-B height & story allowances

Type IV-B area = 2 * Type IV-HT area

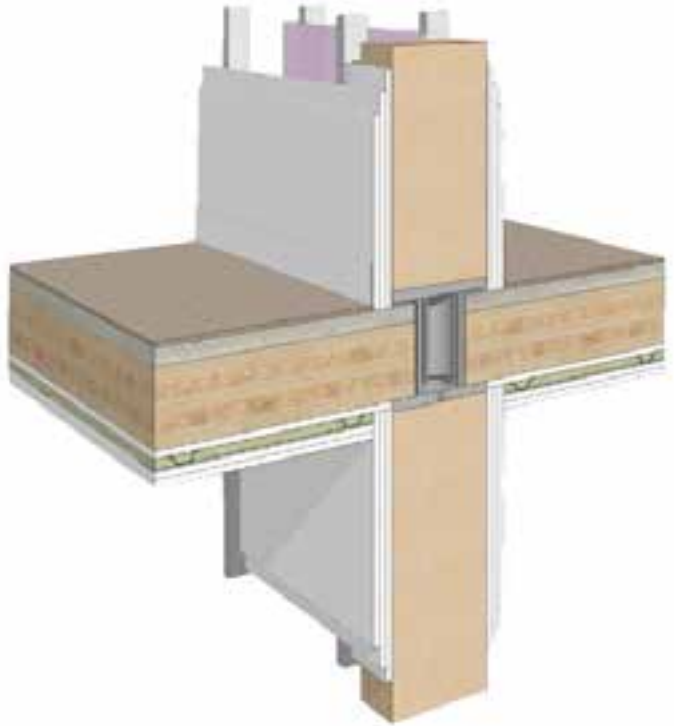
Type IV-A

Credit: Susan Jones, atelierjones

Photos: Structurlam, naturally:wood, Fast + Epp

Type IV-A Protection vs. Exposed

Credit: Susan Jones, atelierjones



Credit: Acton Ostry Architects, Fast + Epp

100% NC protection on all surfaces of Mass Timber

Type IV-A Height and Area Limits

Credit: Susan Jones, atelierjones

Occupancy	# of Stories	Height	Area per Story	Building Area
A-2	18	270 ft	135,000 SF	405,000 SF
B	18	270 ft	324,000 SF	972,000 SF
M	12	270 ft	184,500 SF	553,500 SF
R-2	18	270 ft	184,500 SF	553,500 SF

Areas exclude potential frontage increase

In most cases, Type IV-A height & story allowances = 1.5 * Type I-B height & story allowances

Type IV-A area = 3 * Type IV-HT area

THE MID-RISE EVOLUTION

QUESTIONS?

This concludes The American Institute of Architects Continuing Education Systems Course

Archie Landreman

WoodWorks – The Wood Product Council

Archie@woodworks.org

Copyright Materials