

New Code Allowances for Six Story Wood Construction in Seattle

Presented by:

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



Course Description

In 2018, the 2015 Seattle Building Code was amended to allow, for the first time on a prescriptive basis, six-story wood-frame multi-family projects in Type III construction. This presentation will provide an overview of the new code provisions and related design topics. Intended for engineers, architects and building officials who want to better understand the associated opportunities for the use of wood in a variety of building types, this session will explore current building code allowances, examples of projects that have utilized the new provisions, and examples of other common building code interpretations by the City. Occupied roof decks, podiums and parking structures will also be reviewed in the context of wood-frame multi-family buildings.

Learning Objectives

1. Discuss the history of podium buildings and the 2018 IBC Changes.
2. Identify building size and use parameters for wood-frame construction for a variety of building types.
3. Discuss recent amendments to the 2015 Seattle Building Code that affect the design of multi-family wood structures.
4. Highlight examples of projects that have incorporated approved building code alternatives.

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The History of Podium Buildings

Woodworks Northwest Design Symposium

Samir Mokashi, Principal Analyst, Code Unlimited

June 19, 2019



**WOOD
CONSTRUCTION
COST & TIMELINE
BENEFITS
TYPE III IV & V**

**5-STORY
WOOD W/
NFPA 13
SPRINKLERS**



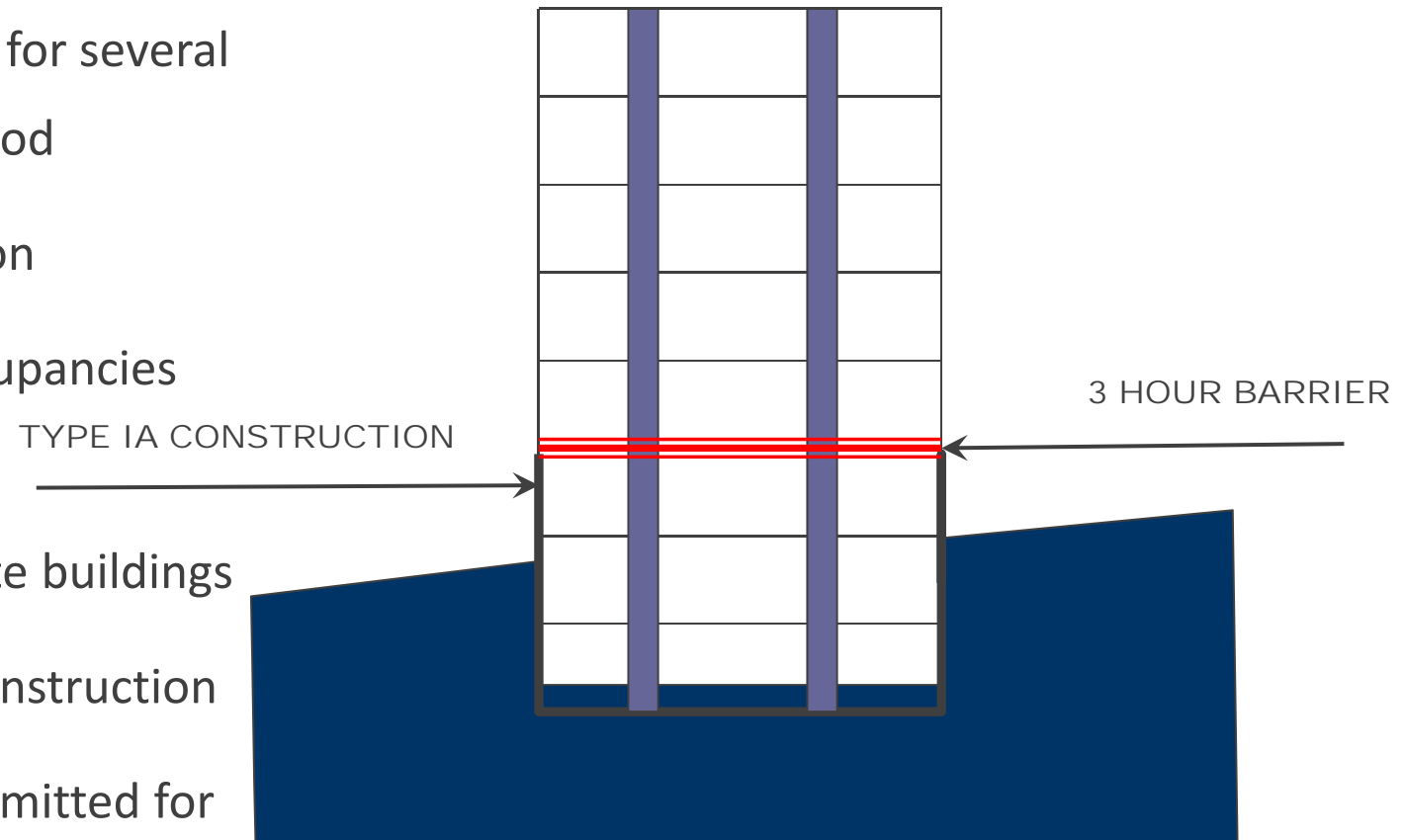
**5-STORY
WOOD OVER
1-STORY
CONCRETE**

5-STORY
WOOD OVER
2-STORY
CONCRETE



THE HISTORY OF PODIUM BUILDINGS - UBC

- Podium buildings has been in the UBC for several decades but did not permit 5 story wood
- Required a 3-hour horizontal separation
- Limited to apartments & business occupancies above and parking garage below
- Considered the two structures separate buildings
- Lower building had to be of Type IA construction
- Limited the building height to that permitted for the least protected type of construction



HISTORY OF PODIUM BLDGS – CITY OF SEATTLE

- Seattle started the 5 story wood over 1 story type IA trend in 1982 SBC
 - Allowed 25% to be mixed use retail
- 1991 SBC allowed A3 < 300 OL above the podium and allowed A3 + Office + Retail below if sprinklered.
 - Prompted by change in Land Use Code that allowed street front retail.
- 1994 SBC allowed 2 stories below 3HR & allowed Type VA height measured from the top of the lid, on sloping sites if whole building is sprinklered.
- SBC 03, 06, 09, 12, and 15 continued to evolve in parallel to the IBC provisions
- 2015 SBC limits No. of stories to 7max from base IBC
- 2018 IBC and 2021 IBC are still chasing SBC



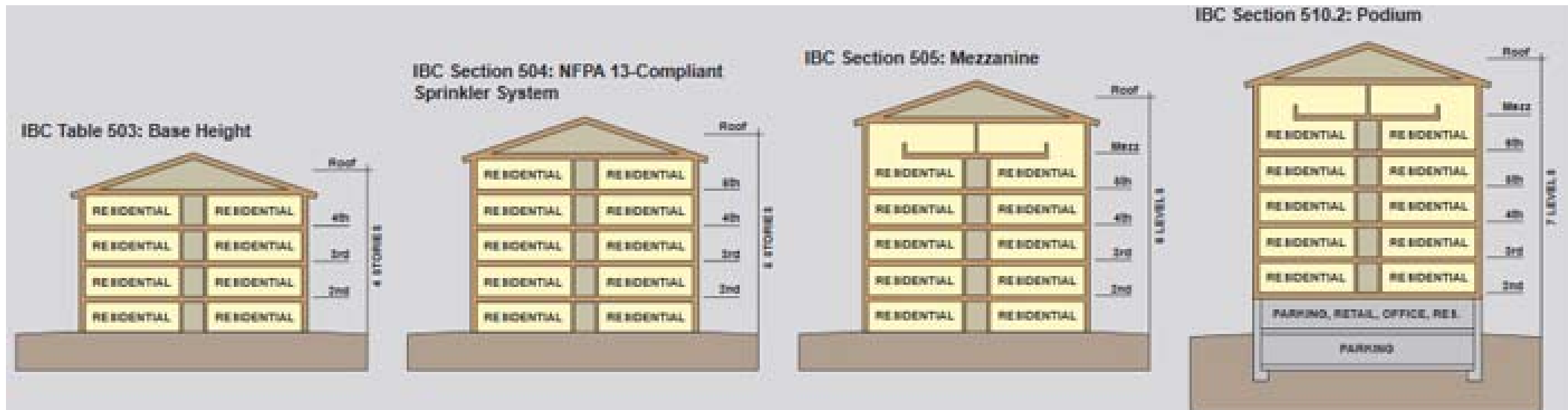
HISTORY OF PODIUM BLDGS – CITY OF PORTLAND

- Portland followed Seattle but limited 5 story to R2 occupancies.
- Limited Area to 12,000 SF above the podium. This commonly required fire walls to meet the developer ROI
- Limited the building height to 75ft max
- Allowed combustible wood construction in exterior walls
- Driven by cost of construction, limited availability of parking, Real Estate market competition, and use of Seattle provisions for building code appeals

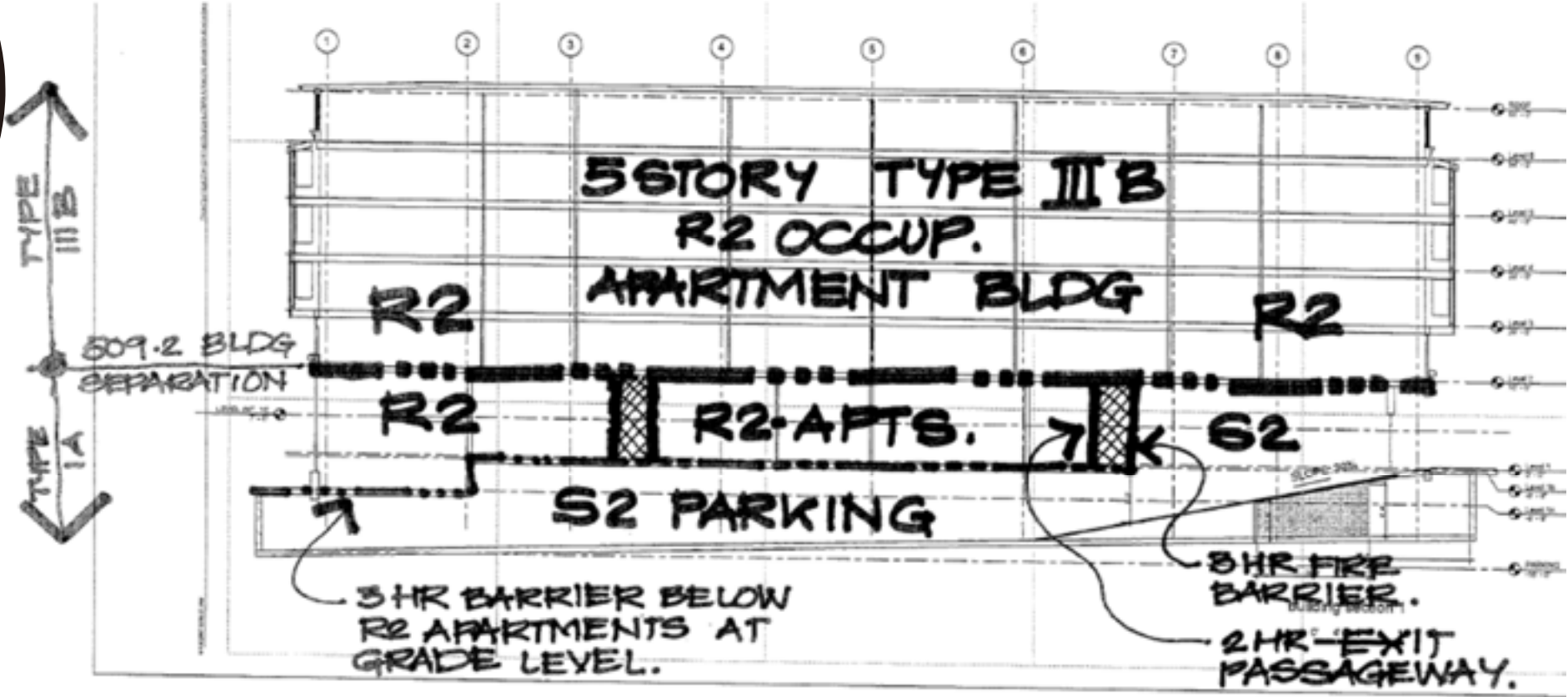


THE RATIONALE FOR PODIUM BUILDINGS - IBC

- Type IA is the highest construction type
- Type IA podium is equivalent to being on ground
- Height above the grade plane increases risk, therefore, height limit
- Protection for exit stairs to allow safe egress to level of discharge
- Limitations on occupancies below the 3 hour barrier in early editions, removed in 2015

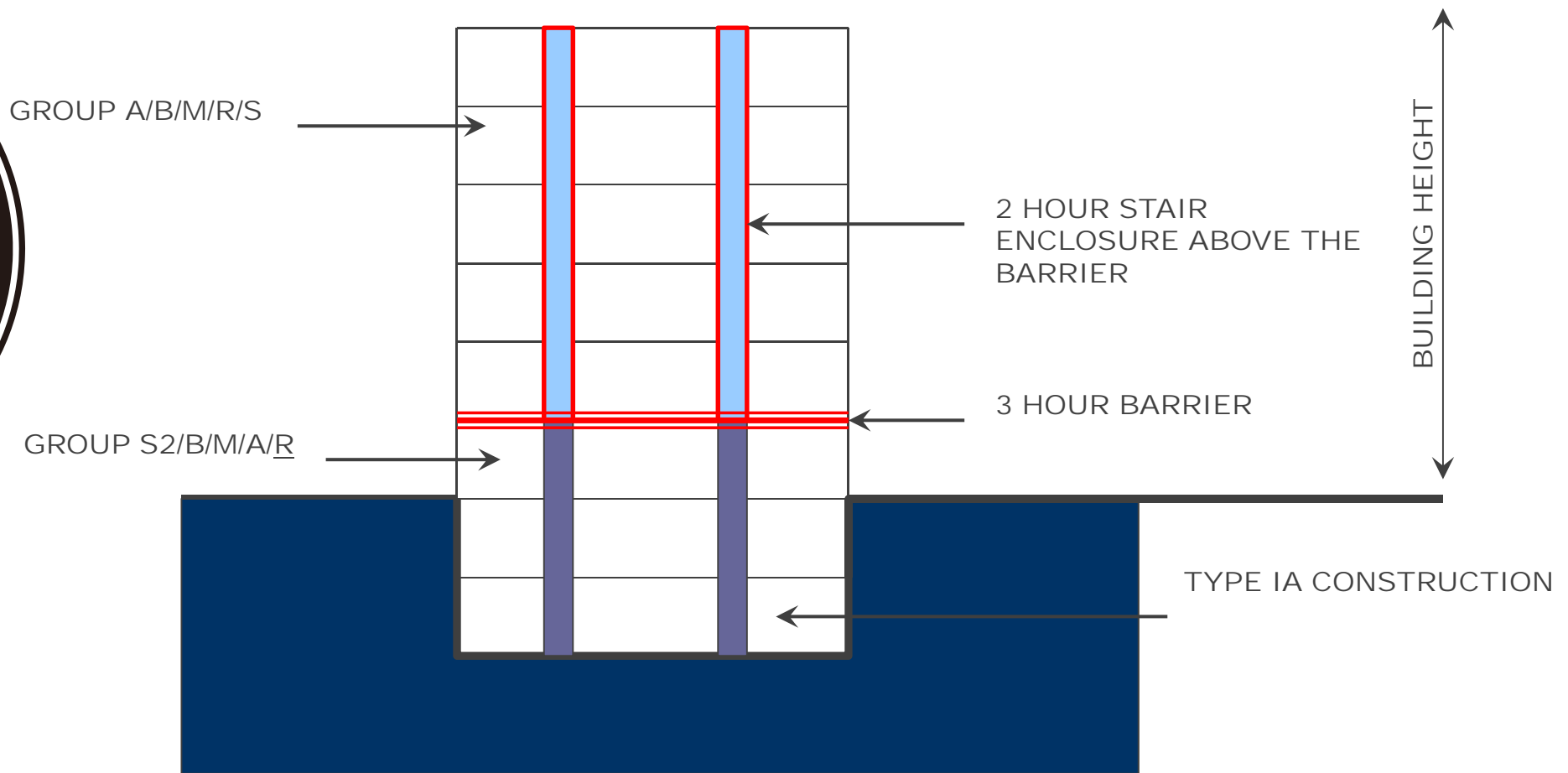


**EARLY
YEARS IBC
2000
-
2006**



**R Occupancies not permitted below the 3-hour barrier.
Type IA only one story above grade.**

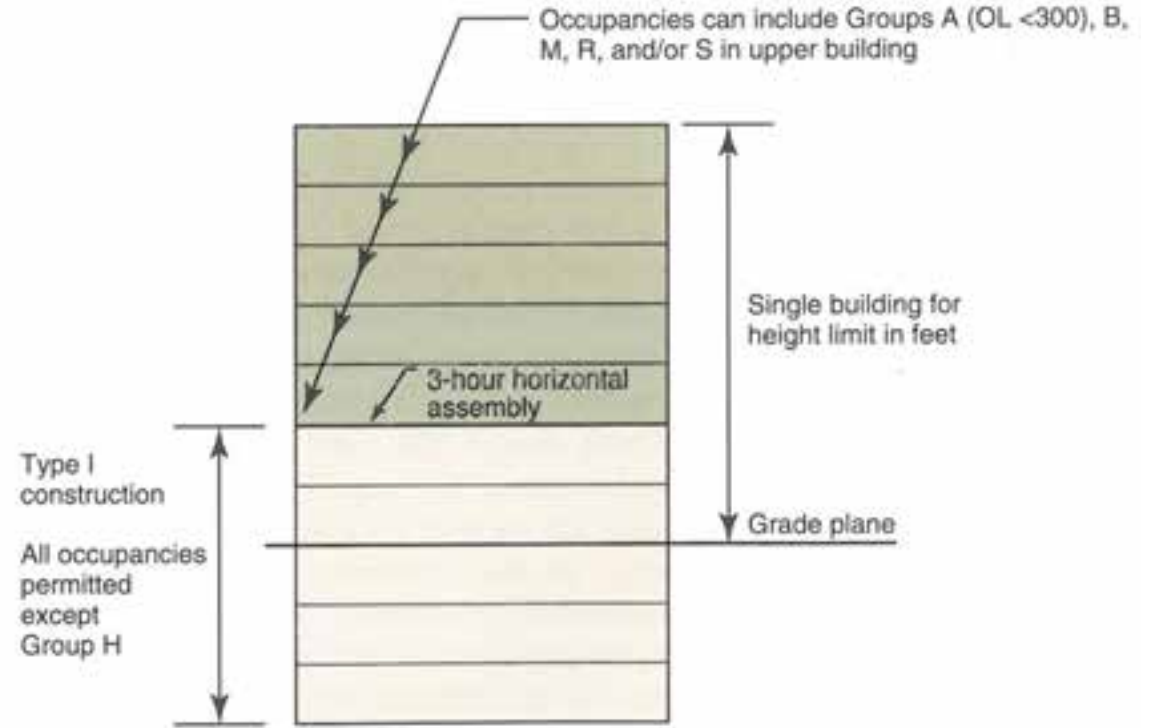
**2009 IBC
ALLOWS
R BELOW
THE 3HR
BARRIER**



A, B, M, & R Occupancies permitted below the 3-hour barrier.

2015 IBC MULTISTORY PODIUM

2012 IBC	2015 IBC	SUBJECT	SUMMARY OF CHANGE
§510.2	§510.2	Horizontal Building Separation	Multiple stories of Type IA construction (and occupancies except Group H) now permitted below the 3-hour horizontal separation



2018 IBC allows 3HR barrier to be vertical
2021 IBC will allow wood stairs to continue below the 3 hour podium separation when in 3HR enclosure

Height and Area Limits for Wood Construction by Occupancy

Woodworks Northwest Design Symposium

Cheryl Burwell, SE, Seattle Department of Construction & Inspections

June 19, 2019

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Light-framed Wood Construction

Height and Number of Stories*

Type	IIIA	IIIB	VA	VB
<i>Height (ft)</i>	85	75	70	60
A-2 & A-3	4	3	3	2
B	6	4	4	3
M	5	3	4	2
R-1 & R-2	5	5	5	3

*Building equipped throughout with NFPA13 sprinkler system, Seattle Building Code

Heavy Timber Construction

Height and Number of Stories*

Type	IV HT	IV A	IV B	IV C
<i>Height (ft)</i>	85	270	180	85
A-2 & A-3	4	18	12	6
B	6	18	12	9
M	5	12	8	6
R-1 & R-2	5	18	12	8

*Building equipped throughout with NFPA13 sprinkler system, Seattle Building Code

Type IIIA vs. VA Construction – SBC Ch. 6

Interior Walls

- Any material permitted by code

Exterior Bearing Walls

- Type IIIA → 2 hr
- Type VA → 1 hr

Exterior Walls

- Type IIIA → Noncombustible material or fire-retardant-treated wood (2 hr rated walls or less)
- Type VA → Any materials permitted by code

Structural Challenges for Height Increase

With increased height comes increased shear wall demands

- Adding a floor results in added mass and wind surface area
- Lateral forces for seismic and wind increase
- Shear walls need to increase in strength and stiffness

Modern residential designs

- Fewer exterior shear walls or none at all
- Extensive roof decks heavy landscaping
- Overturning demands can exceed wood compression studs and concrete supporting slab limits at holdowns

Seattle Building Code Amendment – 6 Over 2

Woodworks Northwest Design Symposium

Ardel Jala, PE, Seattle Department of Construction & Inspections

June 19, 2019

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PROCESS – HOW DID WE GET HERE?

HALA Committee Findings

Wood frame construction is the most cost effective new buildings for housing

Built to 75' with 5 stories of wood construction above two-story concrete base

Unable to maximize potential for new housing in 85' zones due to cost effectiveness

Additional fire and life safety protections are also required for structures 75' tall and above

Recommendation: Request code changes to reduce construction cost and maximize heights



PROCESS – HOW DID WE GET HERE?

Charrette (January 2017)

- Developers, architects, engineers, fire and building code officials
- Facilitated discussion re: issues, mitigation
- Result: concepts based on existing code allowance

HALA Committee & CCAB review

City Council & Mayor (2x)



Photo by Jon Siu

SEATTLE BUILDING CODE

Key Fire- & Life-Safety Principles

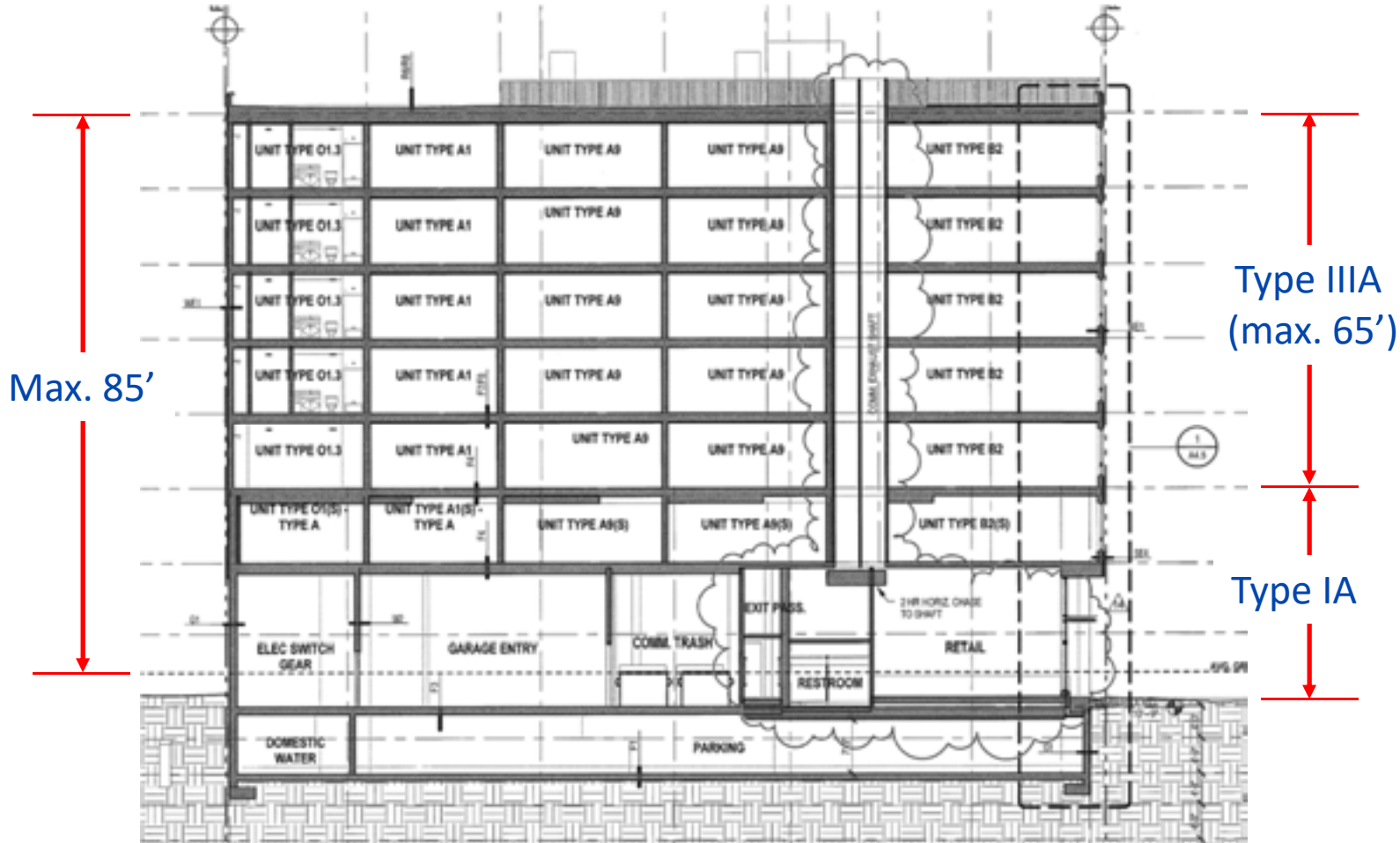
- Early Warning
- Suppression
- **Containment**
- **Structural Protection**
- Egress



Photo by Dennis Richardson

TYPICAL 5 OVER 2 (or 3) PODIUM BUILDING

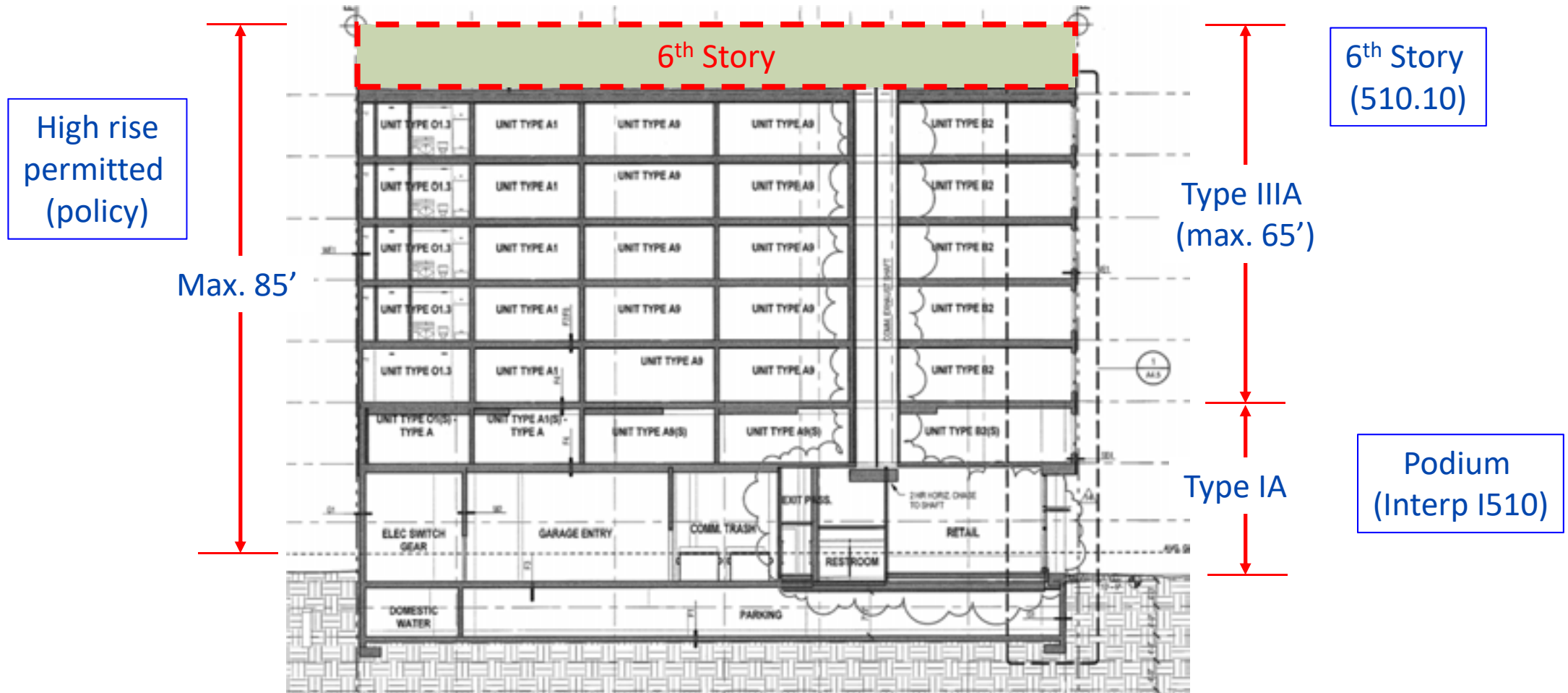
High rise prohibited
(510.2#9)



5th Story
(510.10)

Podium
(Interp I510)

6 OVER 2 PODIUM BUILDING - Allowances



SBC 510.1 General Provisions

510.1 General. The provisions in Sections 510.2 through 510.10 shall permit the use of special conditions that are exempt from, or modify, the specific requirements of this chapter regarding the allowable building heights and areas of buildings based on the occupancy classification and type of construction, provided the special condition complies with the provisions specified in this section for such condition and other applicable requirements of this code. The provisions of Sections 510.2 through 510.7 are to be considered independent and separate from each other.

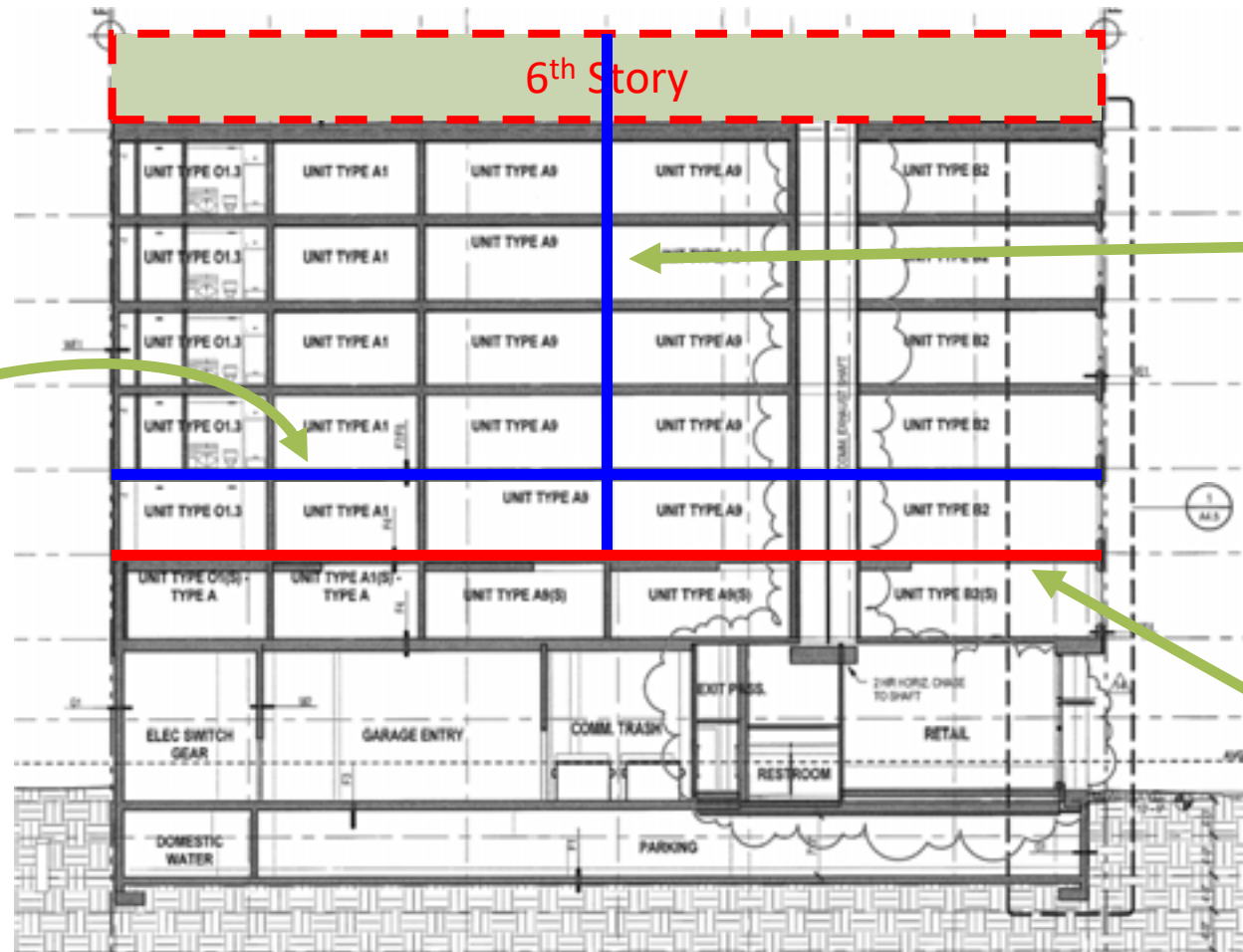
Interpretation I510: Sections 510.2 through 510.7 are not permitted to be used in combination with each other. Sections 510.8 through 510.10 are permitted to be used in combination with Section 510.2.

SBC 510.10 - Limitations

510.10 Group R-2 buildings of Type IIIA construction. The height limitation for buildings of Type IIIA construction in Group R-2 shall be increased to six stories where all of the following conditions are met:

1. The first story of Type IIIA construction is separated from stories above with a horizontal assembly having a fire-resistance rating of not less than 2 hours.
2. All stories of Type IIIA construction greater than 6,000 gross square feet shall be subdivided into compartments, by 2-hour fire-resistance rated fire walls, with areas of not more than 12,000 gross square feet.
3. Each compartment shall have an enclosed exit ~~access~~ stairway, and a standpipe in accordance with Section 905.

6 OVER 2 PODIUM BUILDING - Compartmentation



2-hr horiz ass'y
abv 1st wood
story (510.10, #1)

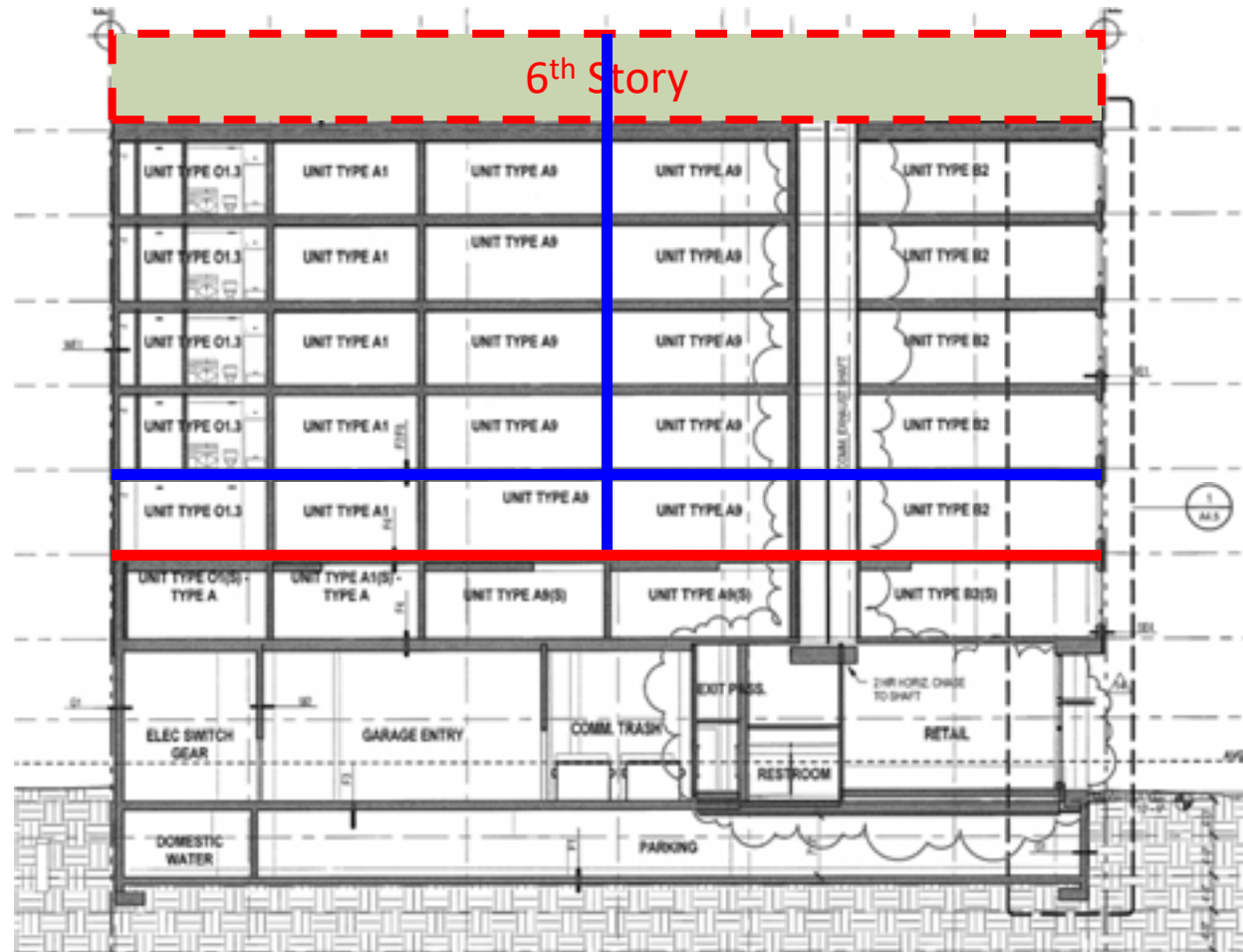
2-hr fire wall
if >6000 sf; max
12000 sf comptmt
(510.10, #2)

Enclosed exit
stair & standpipe
in ea comptmt
(510.10, #3)

3-hr podium
slab

6 OVER 2 PODIUM BUILDING – Exit Protection

Enclosed exit stair & standpipe in ea comptmt (510.10, #3)



Pressurized stairs if >6 stories abv exit discharge (510.2, #11)

SBC 510.10 - Limitations

4. Unprotected vertical openings, including unenclosed exit access stairways, shall not penetrate floor/ceiling assemblies between stories of Type IIIA construction or between stories of Type IIIA and Type IA construction.
5. Mezzanines shall not be allowed in any story of the Type IIIA construction.

SBC 510.10 - Limitations

6. The maximum total design dead load shall be 50 psf for all roof areas above the sixth story of Type IIIA construction.

Note: The dead load shall be calculated as specified in Chapter 2 and Section 1607.12.3.1.

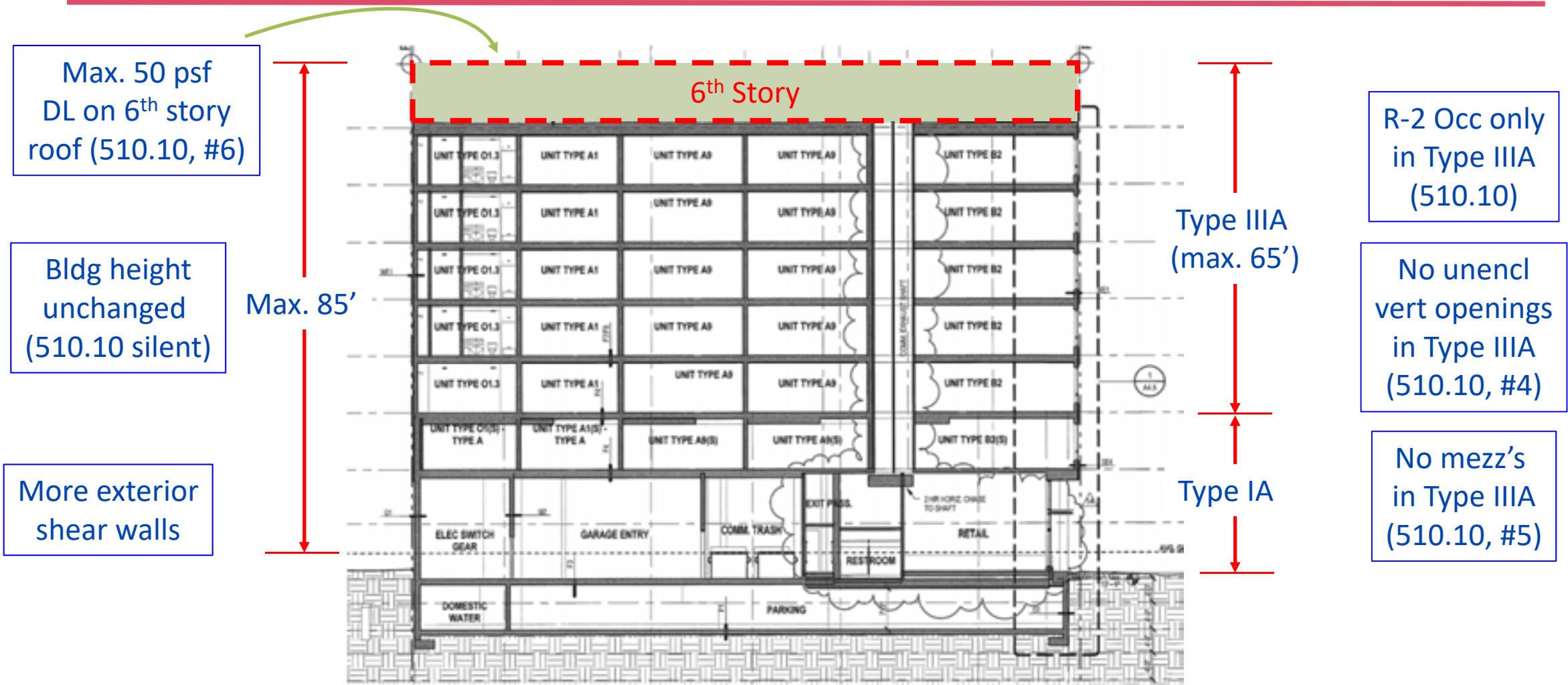
Note: The maximum total design dead load of 50 psf is permitted to be applied over the entire roof area above the sixth story of Type IIIA construction.

SBC 510.10 – Item #6

- SBC 510.10 item #6 limits dead loads at the 6th story to 50 psf – for example dead loads from the roof structure; landscaping and mechanical equipment.
- This note clarifies that the structural engineer may design the lateral system for a maximum total load based on 50 psf over the entire roof area.
- Gravity framing must still be designed to account for concentrated and area specific loading.



6 OVER 2 PODIUM BUILDING - Summary



Max. 50 psf DL on 6th story roof (510.10, #6)

Bldg height unchanged (510.10 silent)

More exterior shear walls

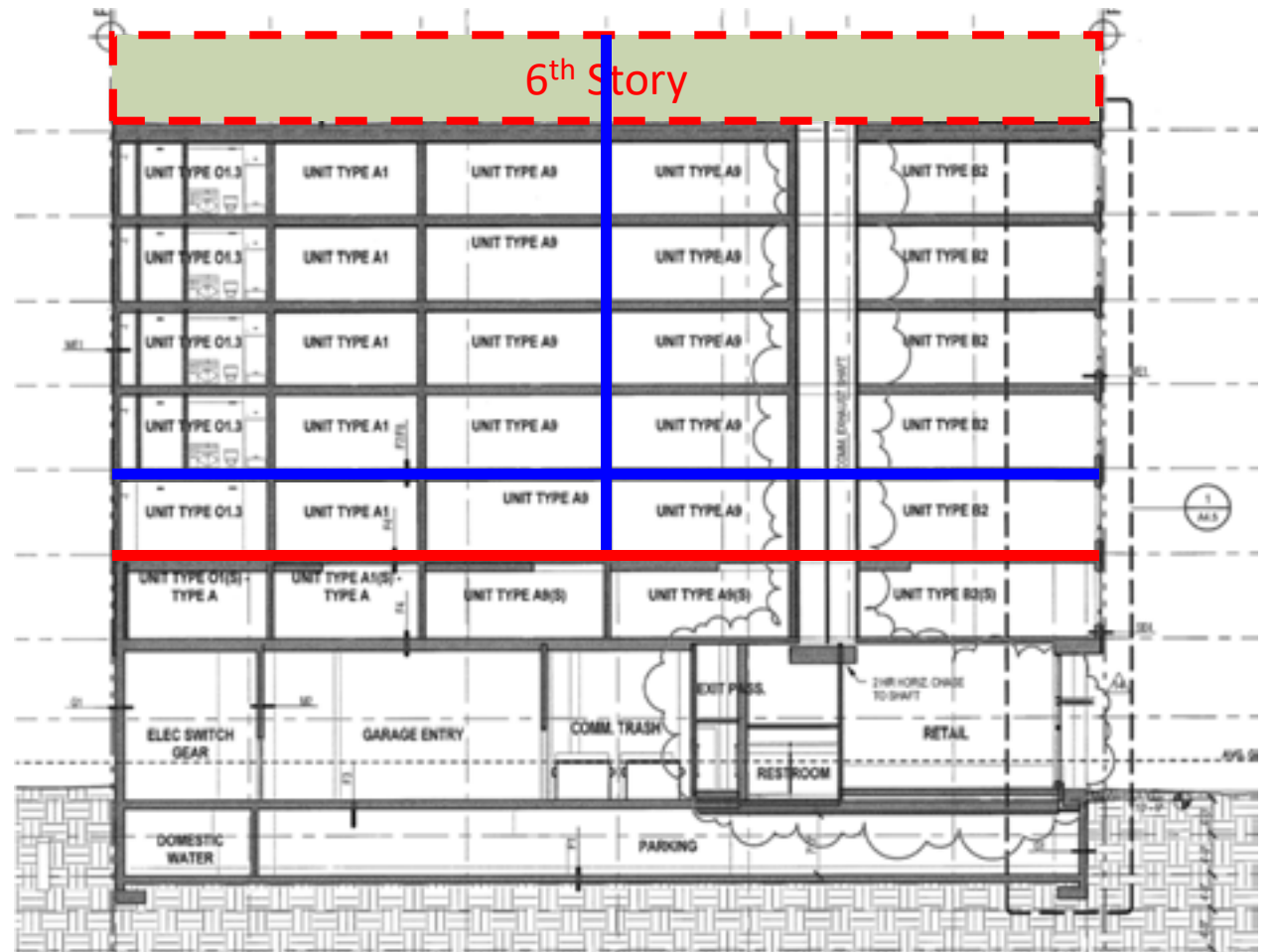
R-2 Occ only in Type IIIA (510.10)

No unencl vert openings in Type IIIA (510.10, #4)

No mezz's in Type IIIA (510.10, #5)

When did this go into effect?

This code change was
adopted
July 23, 2018



How large can my building get before I need a 3rd stair?

SBC 510.10 Item #2 states: “All stories of Type IIIA construction greater than 6,000 gross square feet shall be subdivided into compartments, by 2-hour fire-resistance rated fire walls, with areas of not more than 12,000 gross square feet.”

$\leq 6,000$ SF \rightarrow (1) compartment

$> 6,000$ SF and $\leq 24,000$ SF \rightarrow (2) compartments

$> 24,000$ and $\leq 36,000$ SF \rightarrow (3) compartments

High Rise

SBC 510.2 Item #9 states: “Occupied floors shall be not more than 75 feet above the lowest level of fire department vehicle access.”

If podium provisions prohibit high rise construction; how can I combine the new 510.10 provisions with 510.2 podium provisions and still take advantage of the Type IIIA 85’ height limit?

By policy, SDCI will waive SBC 510.2 #9 when combining 510.10 provisions with 510.2 provisions. The project must comply with SBC 403 high rise requirements

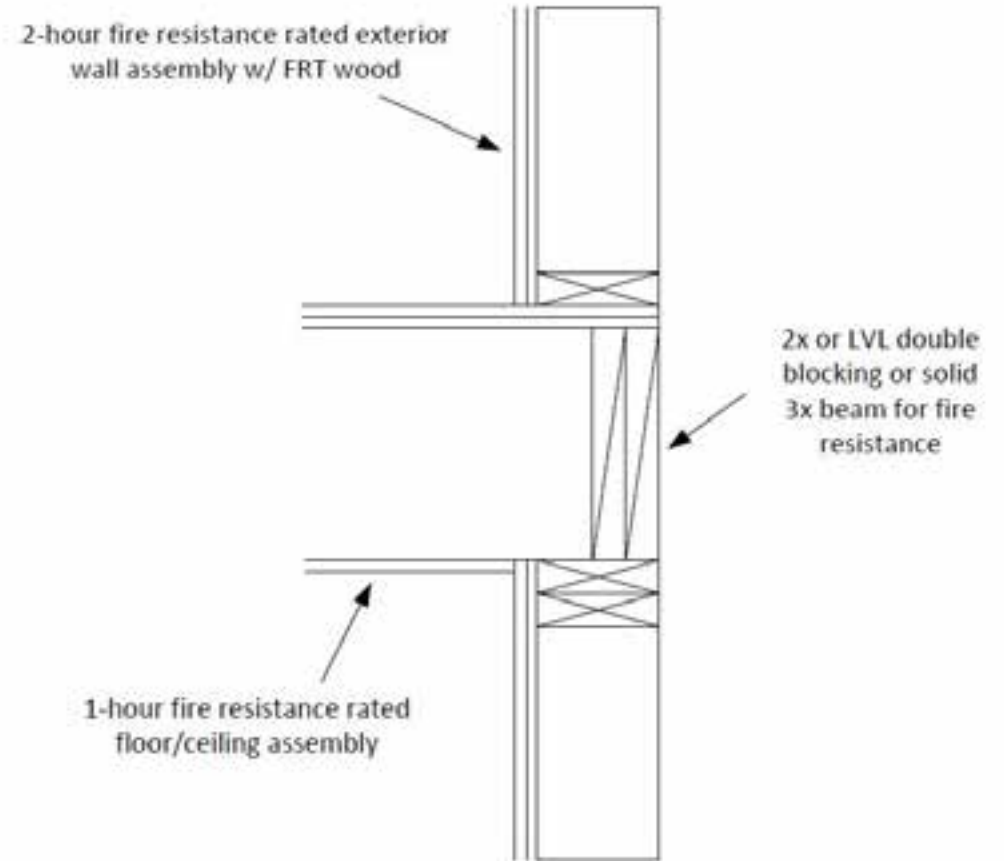
Are openings between the compartments required to be designed as horizontal exits?

Though compartments are separated by firewalls; being a firewall doesn't automatically require the openings between compartments to be horizontal exits. Egress requirements govern on whether the opening needs to be a horizontal exit.

Openings in firewalls shall comply with SBC 716.6. Openings are limited to 25% and must be protected with 90 min fire rated openings per SBC 716.5

Type III - Exterior wall requirements

- All exterior wall framing is required to be FRT.
- Exterior bearing walls in wood frame are 2-hour fire rated, otherwise refer to Table 602 for rating based on fire separation distance.
- A non-FRT (fire retardant treated) wood beam is acceptable at the exterior wall-to-floor intersection.



SBC 711.2.3 Rating of Supporting Construction

- All structural elements supporting the 2-hour fire rated horizontal floor assembly must be at least 2-hour fire rated.
- All structural elements supporting the 3 hour horizontal assembly must be at least 3-hour fire rating.



Doesn't SBC Table 706.4 require a 3 hr fire wall in an R-2 occupancy?

- SBC 510.10 Item #2 requires a 2-hour fire wall to separate compartments
- A 3-hour fire wall is not required per SBC Table 706.4



Can a penthouse structure exceed the 85' height limit?

Yes. Building height is the vertical distance from grade plane to the average height of the highest roof surface other than rooftop structures complying with Section 1510.



Can a penthouse structure exceed the 65' height limit per ASCE 7-10?

A project using the 6 over 2 provisions is still required to comply with ASCE 7-10 which has a 65' height limit for wood shear wall lateral systems.

A rooftop structure complying with SBC 1510.2 is not considered a story and is permitted to extend above the structural height limit.

The penthouse lateral system can be any lateral system permitted by ASCE 7-10. SDCI also permits the penthouse lateral system to be an extension of the main seismic force-resisting system from the highest occupied story.

See the [SDCI Code Interpretation on Structural Height per ASCE 7-10](#)

QUESTIONS?

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Successful Podium Structures & Alternatives

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June 19, 2019



THE EMERY APARTMENTS

- Next to Ross Island Bridge
- Limited Fire Dept Access on the bridge side
- Light rail tracks next to the building limits fire dept access
- 2-Story Type IA + 5-Story Type IIIB
- Permitted in 2012 prior to 2015 changes
- Maximizes floor area on a restricted site by encroaching on the public way



THE EMERY
APARTMENTS

TOTEM LAKE MALL

- Complex site with existing building
- 3-Hour Fire Wall at the (E) building
- 3-Hour Water Curtain at Open Garage
- 4-Story Type IA + 3 Story Type IIIA
- 1 Retail + 3-Story Open Pkg Gar + 3-Story Residential



MISSISSIPPI
&
FREMONT



- Complex section – 3 hour separation jogs
- 2-Story Type IA Podium
- Multiple Type IIIA buildings above the podium
- 7-Story total





17th &
PETTYGROVE

2-Story Type IA building
5 Story of Type IIIB above
High rise building due to slope

> QUESTIONS?

This concludes The American Institute
of Architects Continuing Education
Systems Course

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