BCS Building Consultation Services

NEBOEA Seminar
October 7-9, 2019
UMass, Amherst, MA

PODIUM BUILDINGS

What are they and how are they constructed?

Presented by Erik C. Wight, CBO

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6 Story Podium under construction

3

4

5

Learning Objectives

Learn	Learn key components of a podium building
Identify	Identify building code requirements related to podium buildings
Learn	Learn typical uses of podium buildings
Learn	Learn 2018 IBC code changes related to podium buildings

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WHAT'S A PODIUM BUILDING

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What a Podium Building?

- A unique type of building that permits 2 types of construction separated by a horizontal assembly (the Podium or Pedestal).
- Thus you have a building **below the PODIUM**
- And a building or buildings **above the Podium**
- Each building is permitted to be of a different Construction Type
- Essentially one building placed upon the other like a "Podium or Pedestal"

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WHO HAS SEEN IN THEIR JURISDICTION?

Why are we seeing more of them?

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6 Story Podium

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5 Story Podium

- Higher density
- Smaller lots

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Why the Prevalence

- Increased demand for multi-story mixed use and multi-residential structures.
- More cost effective than steel and concrete
- Allows for greater unit density (MA – 40B)
- Encourages the pedestrian environment

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Why the Prevalence

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Why the Prevalence

- Create private courtyards
- Integration of mixed uses within the building **:**
  CONVENIENCE

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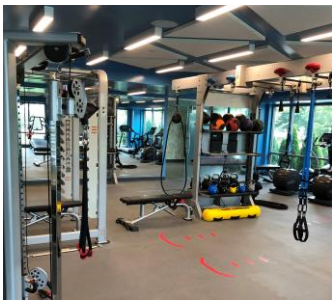

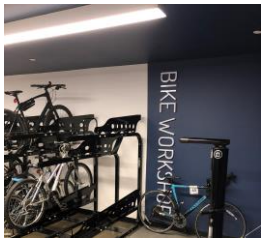

Lots of Amenities

- Gym
- Lounge
- Bike workshop

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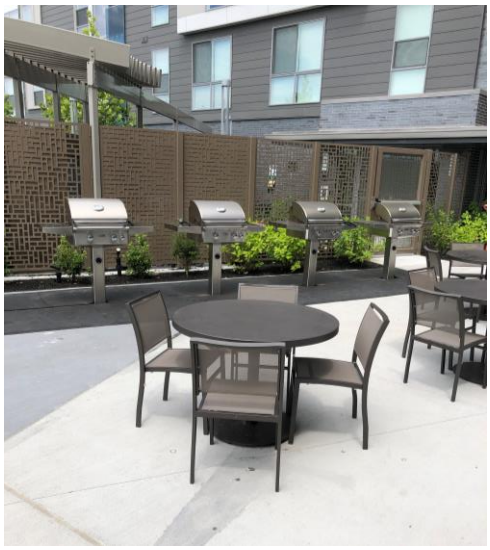

AMENITIES

OUTDOOR GRILLES

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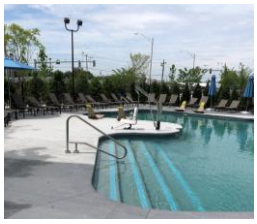

Amenities

- Dog Daycare
- Swimming Pools

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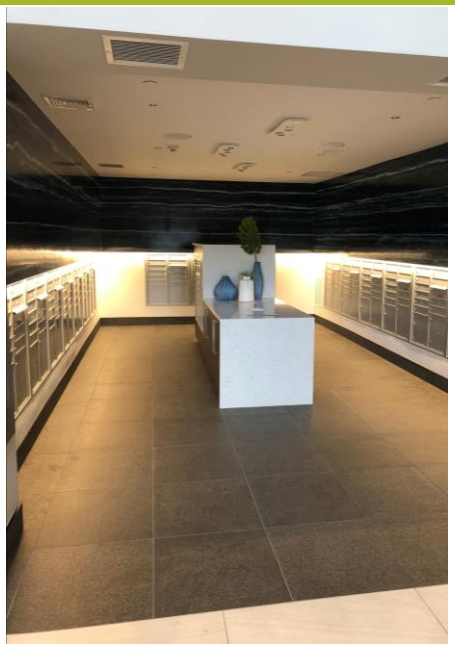

Why the Prevalence

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Key Components of a Podium Building

Podium slab – concrete slab acts as both structural floor and a transfer slab for the wood and/or light gauge steel frame construction above it.

Transfer slab – beam constructed out of concrete and steel reinforcements with a slab of concrete. Used to transfer floor loads to the support posts, pillars and walls below.

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PodiumSlab

Fire separation between occupancies

More design freedom as walls above don't need to line up with those below

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Precast hollow core concrete plank

Post Tension

Steel pan and CIP

Several types of podium slabs:

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Precast hollow core concrete plank

- Speed of erection
- Immediate safe platform
- 5000 PSI @28 days
- Topping concrete 3500 PSI (min 2 inches)
- Has a camber
- Fire rating 4.6 inches =2 hr FRR
- Sound rating (STC) 8 inch=51
- Impact Insulation Class (IIC) 8 inch with pad +carpet = 73

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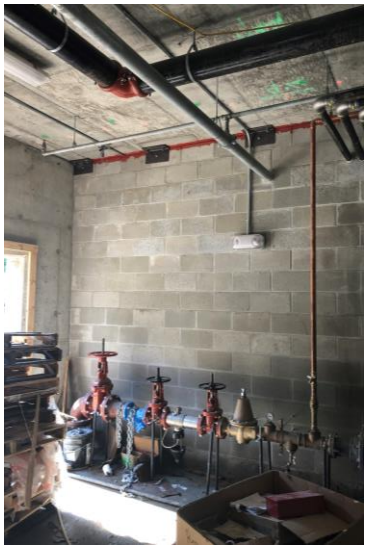

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Post Tension Slab

- Cast in place construction
- Permits a thinner slab (less excavation needed)
- Ability to balance loads
- Better crack resistance due to precompression
- Design flexibility (upper structure does not have to align with below slab.

26

Post Tension Slabs

- Encapsulated tendons ACI 423.7 (7 high-strength wire wound together and placed in a plastic duct).
- At ends tendons anchored and embedded in pockets in slab edge; cut then grouted to prevent corrosion.

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Post Tension Slabs

- **How do you avoid hitting the tendons when coring?**
- Exercise extreme care when coring holes!!

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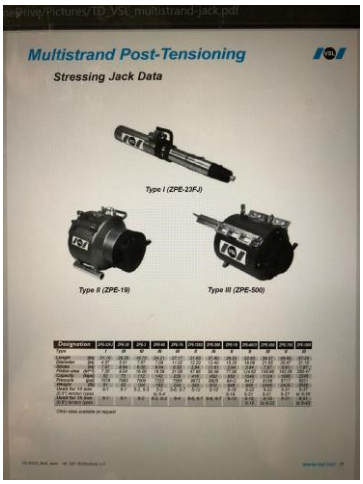

POST-TENSIONING INSTITUTE
Strength in Concrete

POST TENSION JACK

- Tendons pulled to 33,000 Lbs. (stretched 8 inches over 100 feet)

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Post Tension Slabs

- How do you avoid hitting the tendons?

- X-Ray
- Shop drawings
- Planning MEP coordination

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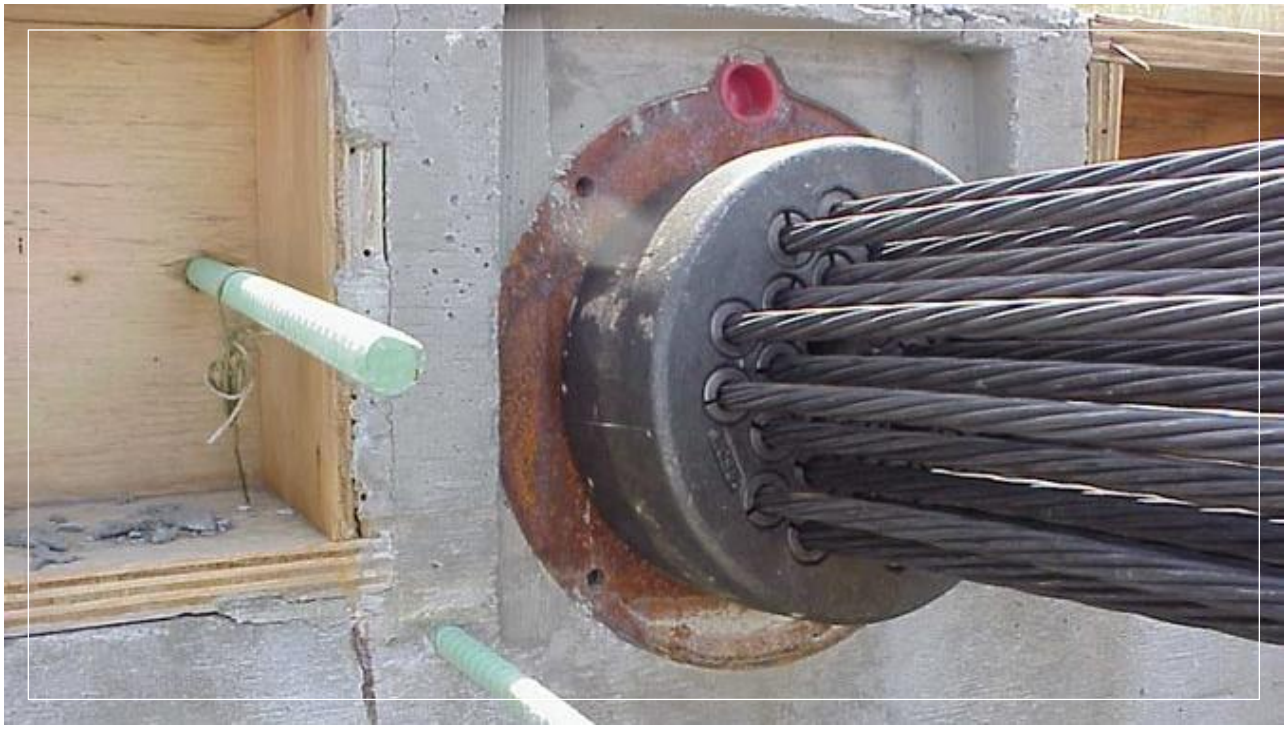

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post tensioning slab example

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Above Podium

- Typically either VA or IIIA construction
- VA (combustible/protected)
- IIIA(noncombustible-exterior walls; combustible –interior & roof /protected)
- Panelized walls generally used (less shrinkage)
- Shear walls

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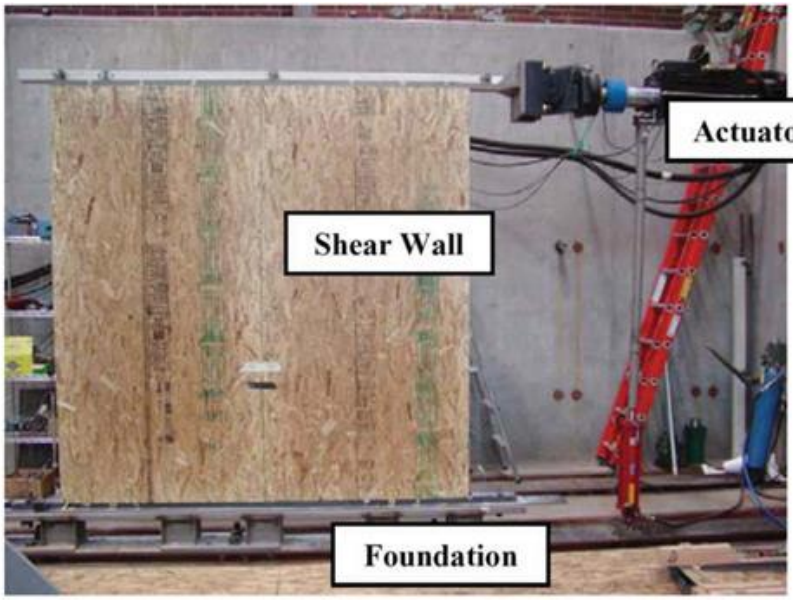

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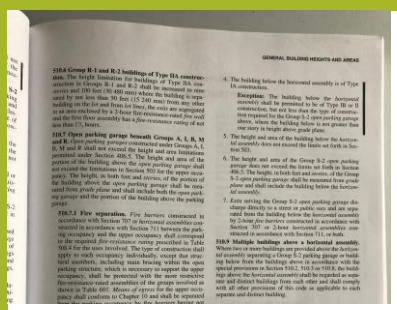

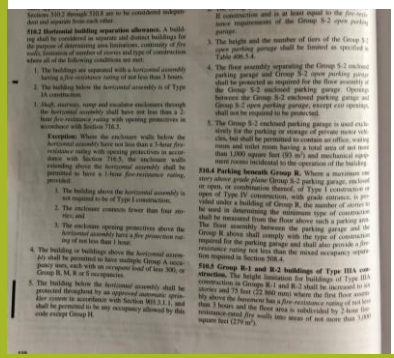

2015 IBC REQUIREMENTS

- Only 2 pages in the Code!
- Section 510
- Pages 110 & 111
- BUT A LOT PACKED IN THERE!!!!!!!!!!

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- **This seminar will focus on most common type of podium constructed under provisions of Sections 510.2 and 510.9**

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Lets Start

Section 510.1

This Section sets is own criteria that are **EXEMPT or MODIFY** allowable building heights & areas for occupancy group & construction type

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Section 510.1

Sections 510.2 – 510.8 are

INDEPENDENT & SEPARATE

from each other

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Section 510.2 Horizontal Building Separation Allowed

Creates separate Buildings for:

- Area
- Continuity of Fire Walls
- Number of Stories

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Section 510.2
Horizontal Building Separation Allowed

All criteria must be met to be considered separate buildings:

- **Only place in Code where this is permitted:**
- 3-hour FRR for horizontal separation (Podium):

Almost a horizontal firewall!

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Section 510.2
Horizontal Building Separation Allowed

- Shaft / Stairs / Ramp/ Escalator enclosures through horizontal assembly (PODIUM) ≥ 2hr FRR

*Exception can be 1 hr FRR when:

- Building > podium not require to be Type I
- Connects <4 stories
- Enclosure protectives above podium are 1 hour FRR

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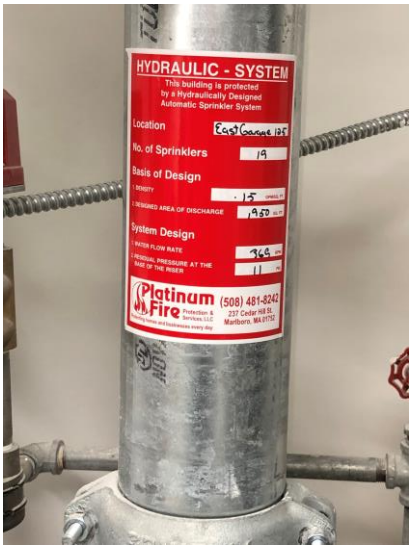

Section 510.2 Horizontal Building Separation Allowed

- Building under podium is **Type IA** construction and **sprinklered per NFPA 13**

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Use below podium can be any Use Group Occupancy

Except Group H Occupancy

Section 510.2 Horizontal Building Separation Allowed

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Section 501.2

- Occupancy Uses above podium:
- B
- M
- R
- S
- A (max occ. Load of 300 per building)

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Section 510.2

- Max. height (T504.3) for smaller allowable ht. from GRADE PLANE
- What is Grade Plane?

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Grade Plane

- A reference plane of average of finished grade sloping away from exterior walls
- Established by lowest points between building & lot line
- When lot line >6 ft from building then its measured at 6 ft out from building

Story Above Grade Plane

>6 ft above Grade Plane or
More 12 ft above finished ground level at any point

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Mezzanine

- Cannot be larger 1/3 of floor area of room located in
- Does not contribute to either building area or number of stories

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High Rise Building

- Building with occupied floor more than 75 ft (70 ft in MA) above lowest level of fire department vehicle access

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Table 601 FRR Building Elements (HRS)

Building Element	IA	IIIA	VA	WHY NOT IIB or VB?
Primary Structural Frame	3	1	1	0
Bearing Walls Exterior Interior	 3 3	 2 1	 1 1	 2 (IIIB) ; 0 (VB) 0 0
Non bearing walls Exterior Interior	 FSD 0	 FSD 0	 FSD 0	 FSD
Floor and assoc. 2ndary members	2	1	1	0 ; 0
Roof and assoc. 2ndary menbers	1 1/2	1	1	0; 0

50

Occupancy		Construction Type			
A, B, M, R, S	Sprinklered NFPA 13	IIIA	IIIB	VA	VB
		85	75	70	60

Table 504.3 Allowable Build. Ht.(FT)>GP

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Occupancy		Construction Type			
R-2	Sprinklered NFPA 13	IIIA	IIIB	VA	VB
# Stories		5	5	4	3

Table 504.4 Allowable number of Stories>GP

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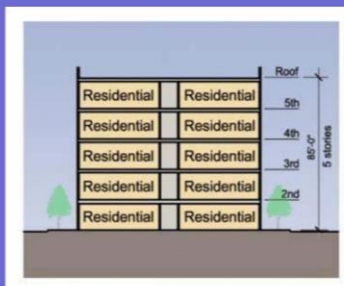
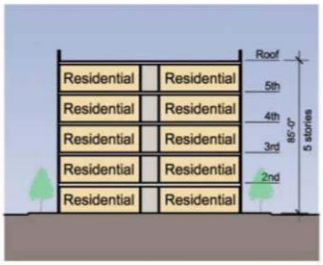


2012 – IBC
Type IIIA
Table 503 – 85' High
Table 503 – 5 Stories



2015 – IBC
Type IIIA
Table 504.3 – 85' High
Table 504.4 – 5 Stories

ALLOWABLE HT & STORIES IIIA CONSTRUCTION NO PODIUM

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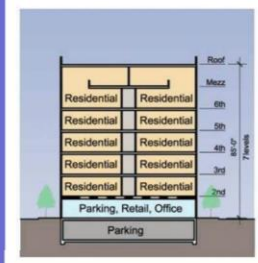
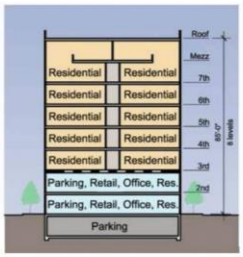


2012 – IBC
Basic Code Height – Table 5B
Sprinkler Increase – Section 506
Mezzanine – Section 507
Podium – Section 509.2
Separate Buildings for Area & Stories
Podium is Only One Story
Podium Type I Construction



2015 – IBC
Basic Code Height – Table 503
Sprinkler Increase – Section 504
Mezzanine – Section 505
Podium – Section 510.2
Separate Buildings for Area & Stories
Unlimited Number of Stories for Podium
Podium Type I Construction

ALLOWABLE HT & STORIES IIIA CONSTRUCTION PODIUM

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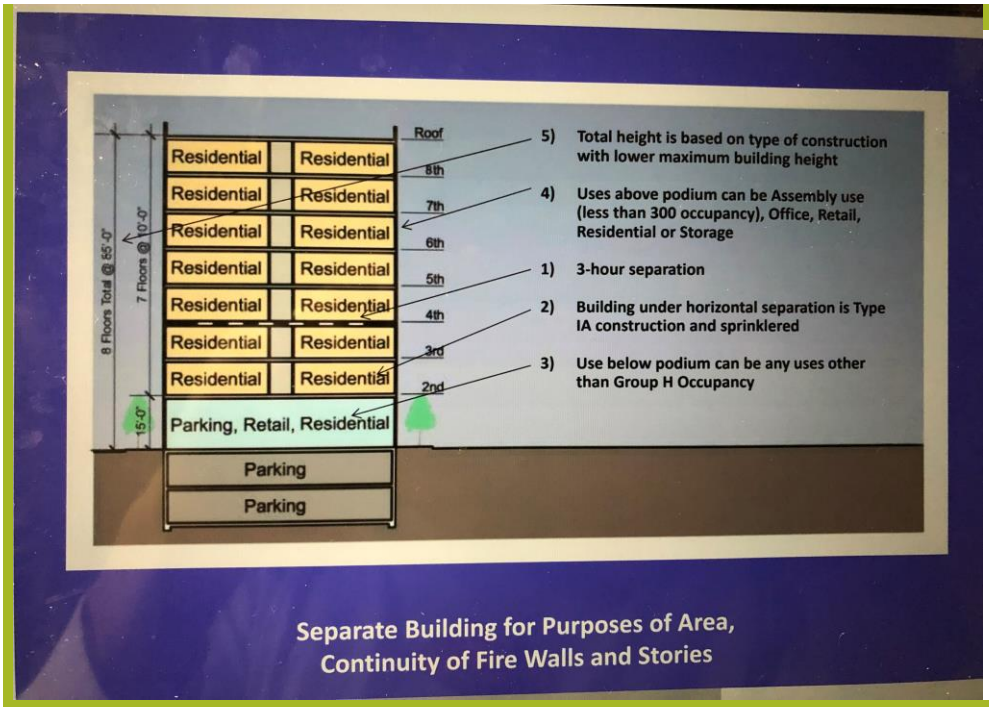
8 Floors Total @ 85'-0"
7 Floors @ 10'-0"
15'-0"
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Parking, Retail, Residential
Parking
Parking
Roof
8th
7th
6th
5th
4th
3rd
2nd
5) Total height is based on type of construction with lower maximum building height
4) Uses above podium can be Assembly use (less than 300 occupancy), Office, Retail, Residential or Storage
1) 3-hour separation
2) Building under horizontal separation is Type IA construction and sprinklered
3) Use below podium can be any uses other than Group H Occupancy
Separate Building for Purposes of Area, Continuity of Fire Walls and Stories

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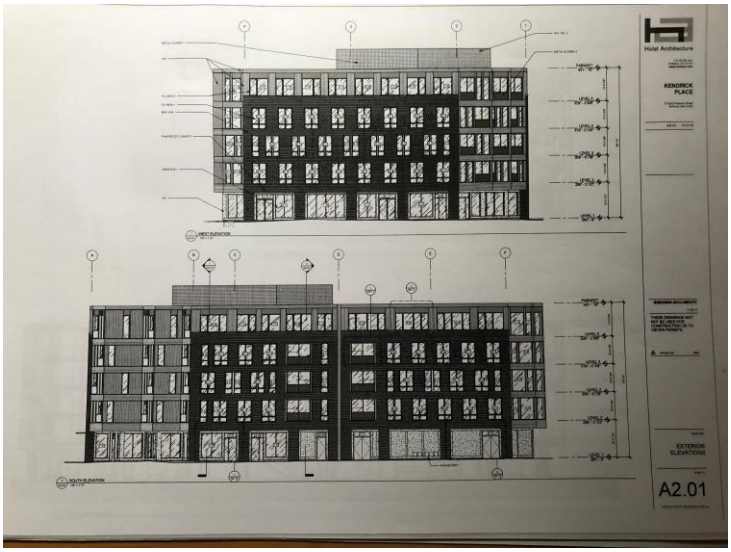
Hoist Architecture
KENDRICK PLACE
EXTERIOR ELEVATIONS
A2.01

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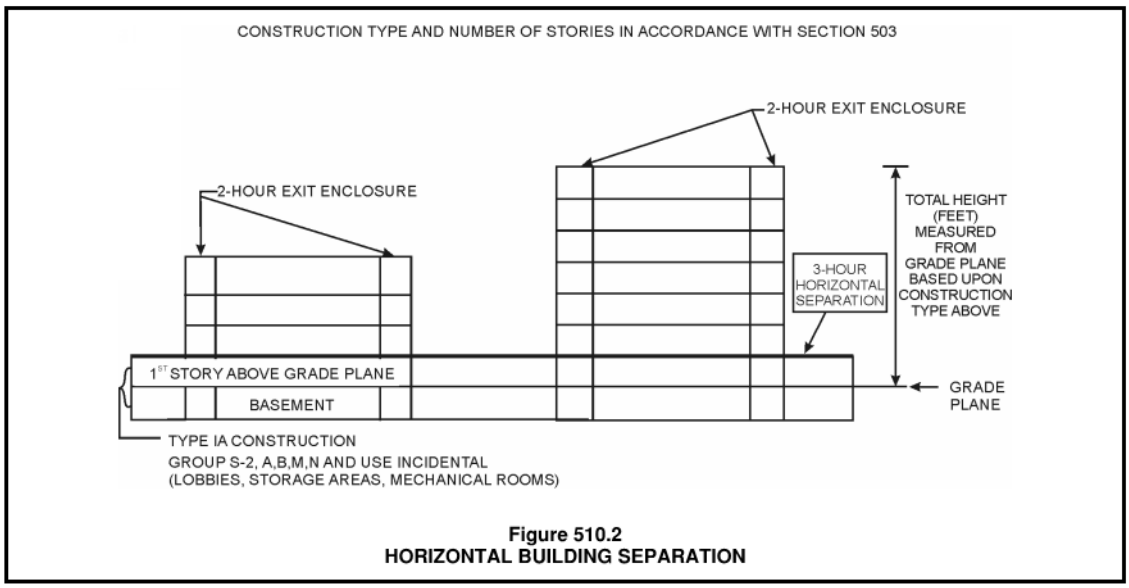

Figure 510.2
HORIZONTAL BUILDING SEPARATION

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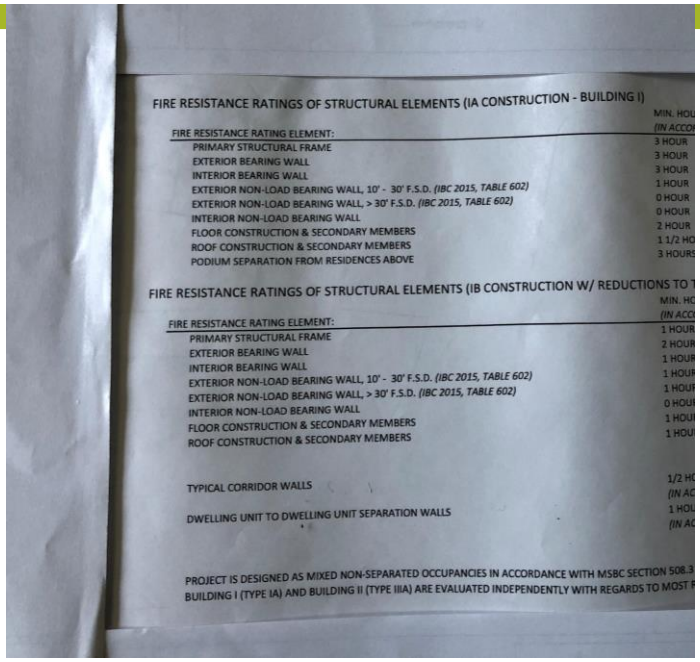

FIRE RESISTANCE RATINGS OF STRUCTURAL ELEMENTS (IA CONSTRUCTION - BUILDING I)

FIRE RESISTANCE RATING ELEMENT:	MIN. HOU (IN ACCO
PRIMARY STRUCTURAL FRAME	3 HOUR
EXTERIOR BEARING WALL	3 HOUR
INTERIOR BEARING WALL	3 HOUR
EXTERIOR NON-LOAD BEARING WALL, 10' - 30' F.S.D. *(IBC 2015, TABLE 602)*	1 HOUR
EXTERIOR NON-LOAD BEARING WALL, > 30' F.S.D. *(IBC 2015, TABLE 602)*	0 HOUR
INTERIOR NON-LOAD BEARING WALL	0 HOUR
FLOOR CONSTRUCTION & SECONDARY MEMBERS	2 HOUR
ROOF CONSTRUCTION & SECONDARY MEMBERS	1 1/2 HO
PODIUM SEPARATION FROM RESIDENCES ABOVE	3 HOURS

FIRE RESISTANCE RATINGS OF STRUCTURAL ELEMENTS (IB CONSTRUCTION W/ REDUCTIONS TO T

FIRE RESISTANCE RATING ELEMENT:	MIN. HO (IN ACC
PRIMARY STRUCTURAL FRAME	1 HOUR
EXTERIOR BEARING WALL	2 HOUR
INTERIOR BEARING WALL	1 HOUR
EXTERIOR NON-LOAD BEARING WALL, 10' - 30' F.S.D. *(IBC 2015, TABLE 602)*	1 HOUR
EXTERIOR NON-LOAD BEARING WALL, > 30' F.S.D. *(IBC 2015, TABLE 602)*	1 HOUR
INTERIOR NON-LOAD BEARING WALL	0 HOUR
FLOOR CONSTRUCTION & SECONDARY MEMBERS	1 HOUR
ROOF CONSTRUCTION & SECONDARY MEMBERS	1 HOUR
TYPICAL CORRIDOR WALLS	1/2 HO (IN AC
DWELLING UNIT TO DWELLING UNIT SEPARATION WALLS	1 HOU (IN AC

PROJECT IS DESIGNED AS MIXED NON-SEPARATED OCCUPANCIES IN ACCORDANCE WITH MSBC SECTION 508.3
BUILDING I (TYPE IA) AND BUILDING II (TYPE IIIA) ARE EVALUATED INDEPENDENTLY WITH REGARDS TO MOST R

TYPICAL FRR DATA

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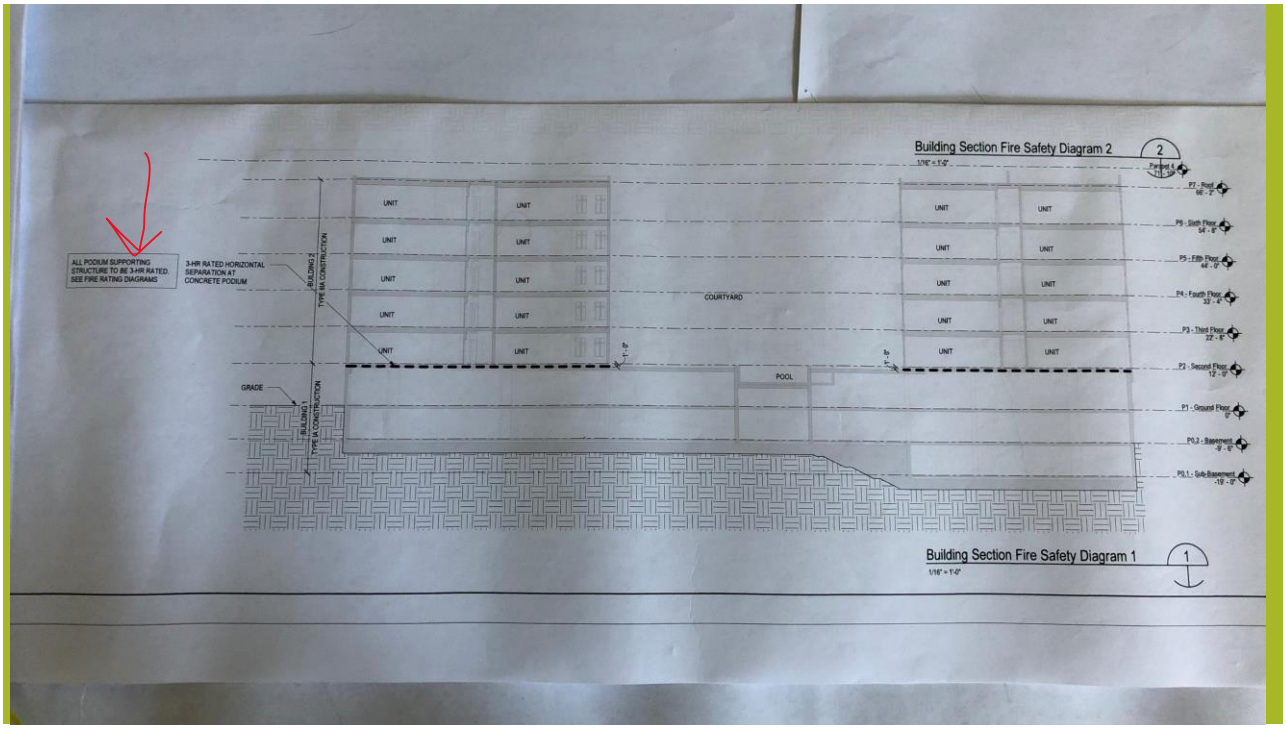

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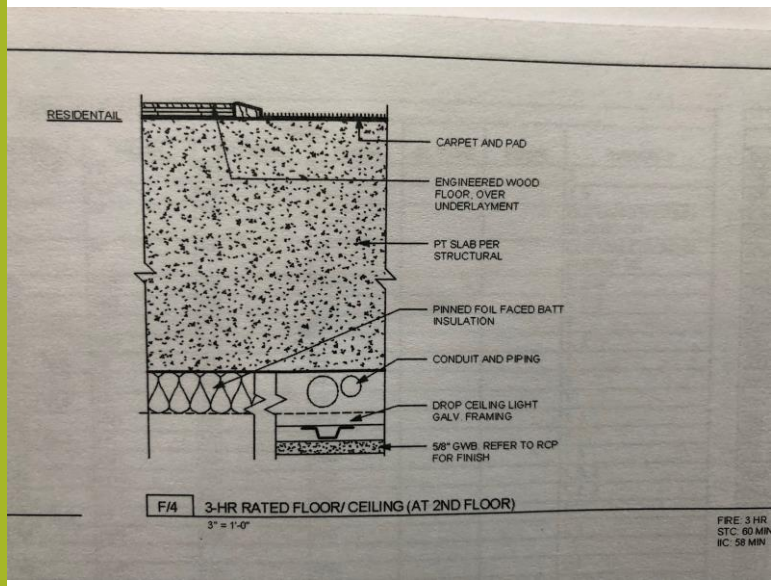

Is this acceptable as 3hr floor FRR assembly?

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Prescriptive	Section 721
Calculated :	Section 722
Concrete slab	
Pillars /columns	
Concrete beams	
Spray on fireproofing	

Confirming FRR

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PROJECT DATA

BUILDING DATA	5 STORY, 55, 494 SF
PROJECT NAME	KENDRICK PLACE
ADDRESS	57 EAST PLEASENT STREET, AMHERST MA
BUILDING CODE	8TH EDITION MASS STATE BUILDING CODE 780 CMR
BUILDING CODE	MASSACHUSETTS AAB521 CMR
ENERGY CODE	STRETCH ENERGY CODE
LOT SIZE	14,500 SF
PROPERTY ID	11C-266

MAXIMUM HEIGHT AND AREA

	FLOOR 1	FLOORS 2,3,4 & 5
CONSTRUCTION TYPE	1A	VA
OCCUPANCY	S2,R2,M,B & A	R2
SPRINKLERS	NFPA 13	NFPA 13
TABLE 503 -BASE ALLOWABLE	UL	12,000 SF PER STORY
SEC 506.3 - AREA MODS	N/A	+200% WITH SPRINKLERS (12,000 SF + 24,000 SF = 36,000 SF ALLOWED PER STORY)
PROPOSED FLOOR AREA	10,188 SF	12,025 SF
TOTAL GSF (EACH BUILDING)	58,286 SF	
TABLE 503 - ALLOWABLE HEIGHT	UL	3 STORIES / 50 FT
SEC 504.2 -HEIGHT & AREA INCREASE	HEIGHT INCREASE BY 20' OR 1 STORY W/ SPRINKLERS	
PROPOSED HEIGHT & STORY	55', 5 STORIES	

FIRE RESISTANCE FOR BUILDING ELEMENTS

PRIMARY STRUCTURAL FRAME	3 HOUR	1 HOUR
PRIMARY STRUCTURAL FRAME SUPPORTING ROOF ONLY	N/A	1 HOUR
BEARING WALLS	3 HOUR	1 HOUR
NON BEARING WALLS - INTERIOR	0 HOUR	0 HOUR
NON BEARING WALLS - EXTERIOR	PER TABLE 602	PER TABLE 602
FLOOR CONSTRUCTION	N/A	1 HOUR
ROOF CONSTRUCTION	N/A	1 HOUR
STAIR & CORRIDOR EXIT ENCLOSURE	2 HOUR	2 HOUR

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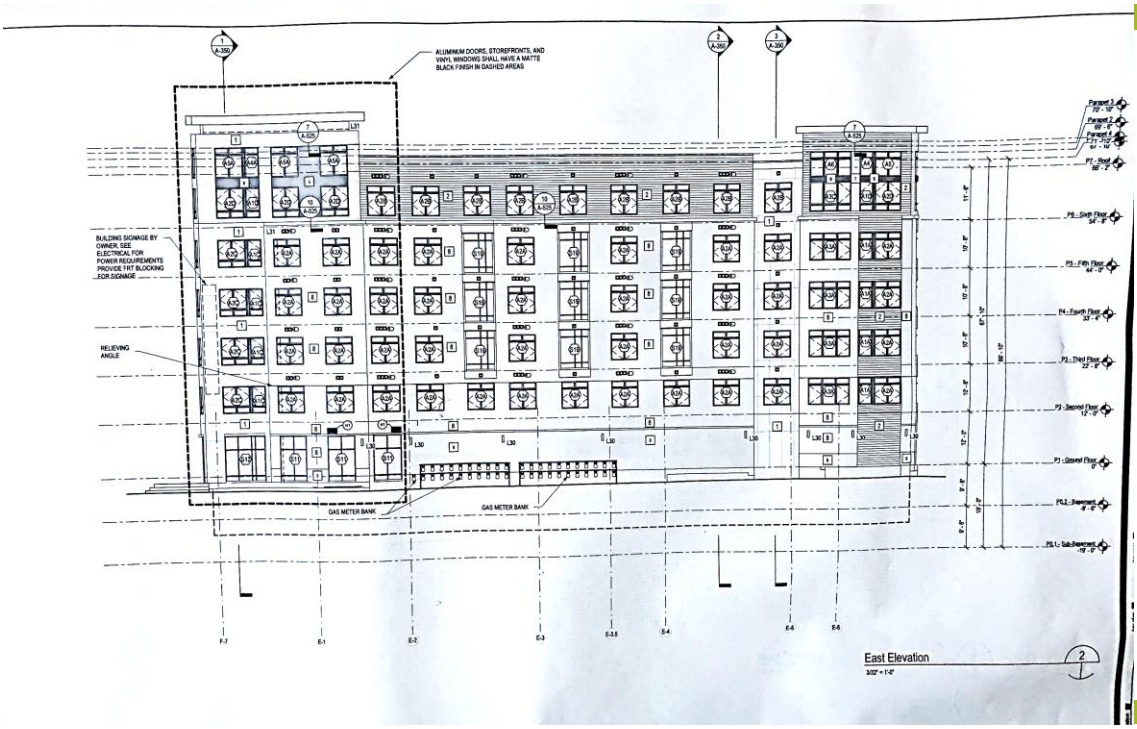

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Fire Retardant Treated Wood

- Permitted in exterior walls assemblies with 2hr FRR or less
- Section 2303.2
- Hardware to be galvanized or hot dipped

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- ASTM E84 or UL 723
- FS <25
- Exterior ASTM D2898 "Rain Test"
- Labeling

FIRE RETARDANT TREATED WOOD

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FRTW

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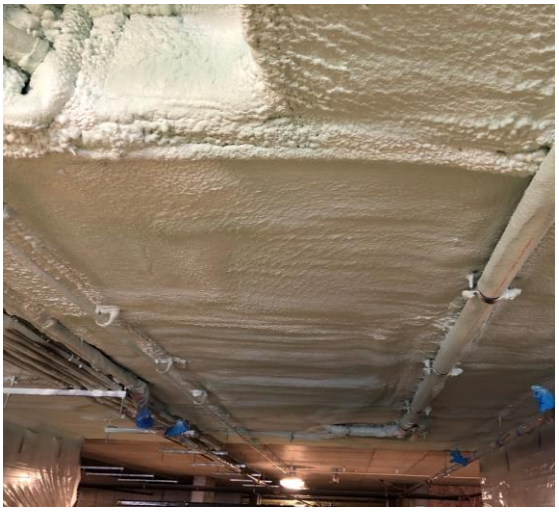

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Confirming FRR

- UL listed assemblies Section 703.3

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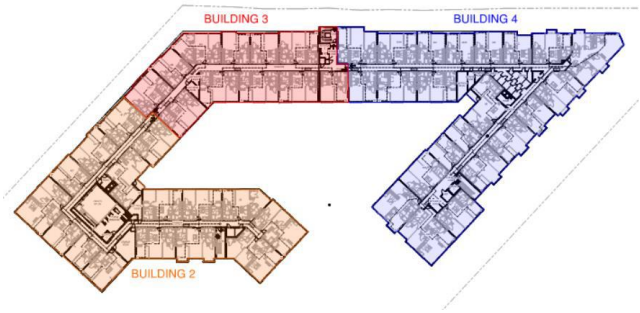

Multiple Buildings on Podium Slab

- **Section 510.9**
- **Permits firewalls in buildings above podium to terminate at the podium slab**
- **Creates separate buildings**

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- Fire doors separating 2 buildings in a podium

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Typical Uses of Podium Buildings

- Retail or Business with apartments above
- Parking garage with apartments above

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Typical Uses of Podium Buildings

Restaurants with apartments or offices above

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- 6 story Podium

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- 5 story podium

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- 5 story podium with fitness gym grade level

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- 5 story podium separated by 3 hr firewall to 5 story open parking garage

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HOW MANY STORIES IS THIS PODIUM?

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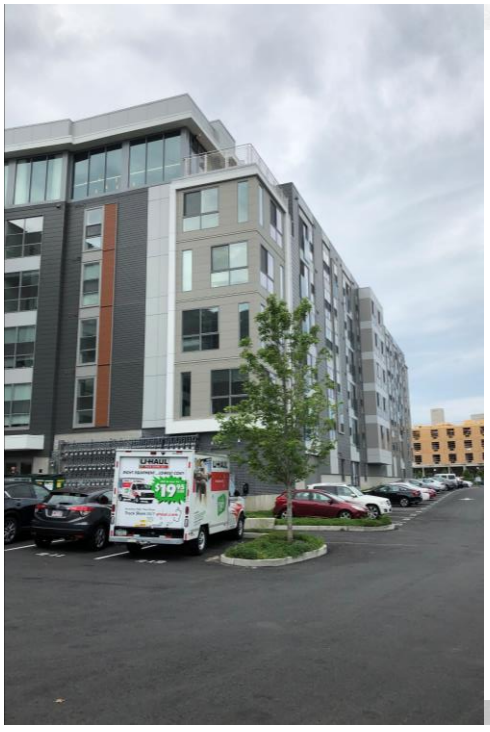

6 story Podium

Type of Construction?

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SPRAY ON FIREPROOFING

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MECHANICAL VENTING

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WATERPROOFING

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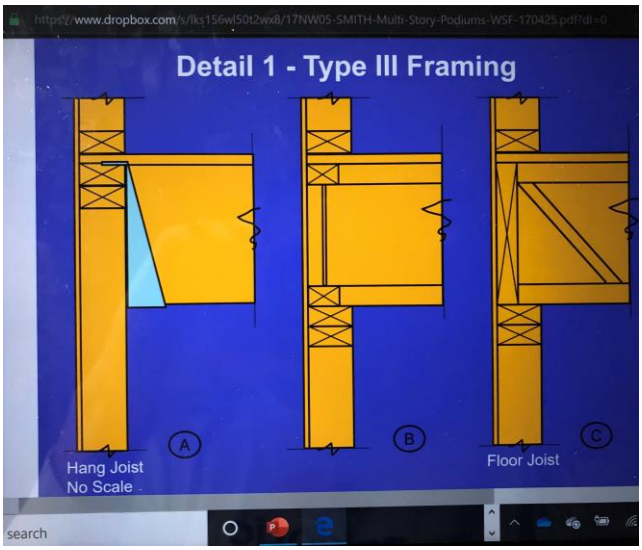

SHRINKAGE

86

HOLD DOWN

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DEMISING DETAILS

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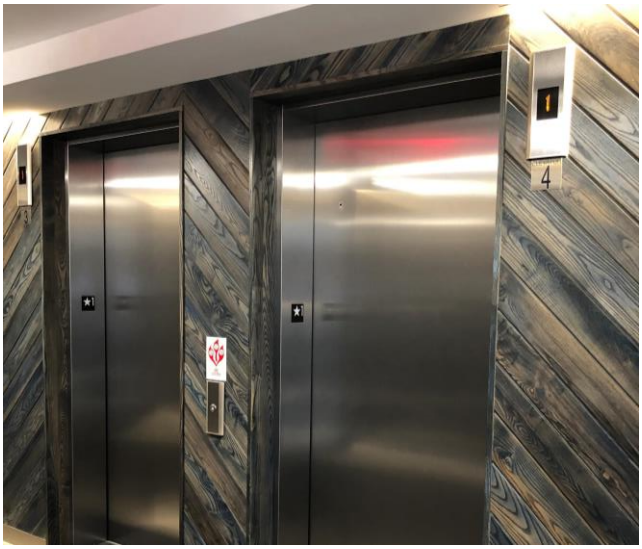

ELEVATORS

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FDC CONNECTION

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Gas
Bank

91

LOUNGE

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PUBLIC RESTROOM

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WATERPROOFING DETAILS

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WATERPROOFING PT SLAB WITH PARKING BELOW

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SPRAY ON FIREPROOFING

97

INTERIOR ENCLOSED STAIRS UNDER CONSTRUCTION

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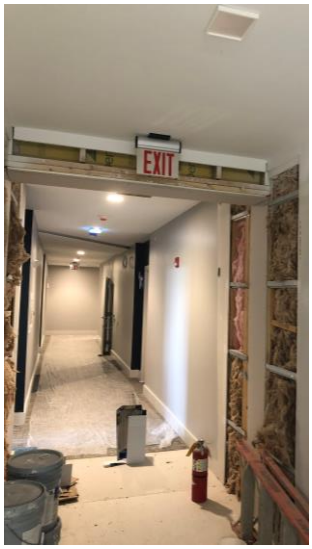

CORRIDOR UNDER CONSTRUCTION: EXIT SIGNAGE , FA HORN/ STROBE, FE

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BELOW GRADE PARKING GARAGE

100

ENCLOSED STAIRWAY SIGNAGE AND STANDPIPE

101

Below Grade Parking Garage

- Multiple pipe penetrations to address
- What systems should you be looking for?

102

Below Grade Parking Garage

- Multiple pipe penetrations to address
- What systems should you be looking for?
- **3 hr through penetration firestop system (ASTM E814or UL 1479)**

103

NAME THIS DEVICE?

104

CO / NO_2 DETECTOR GAS SENSOR TRANSMITTER

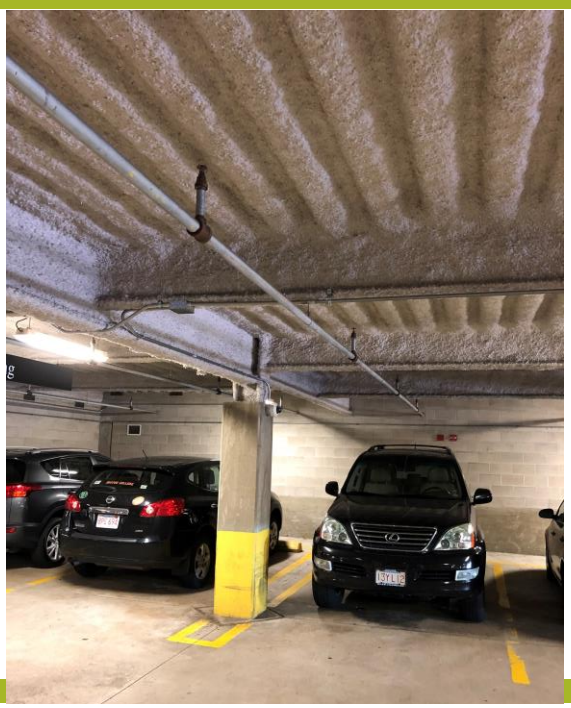
105

FD Knox Box & Video Intercom

106

107

Fireproofed deck & beams



108

109

Windows

- **Tempered safety glazing locations**
- **Opening limiting devices (ASTM 2090)**

110

Fastening Details

111

112

113

114

Detailing for floor/ceiling assembly

115

Enclosed stairs just above Podium slab

116

4 story
or
5 story

117

WHAT ABOUT BALCONIES?

Combustible or noncombustible ?

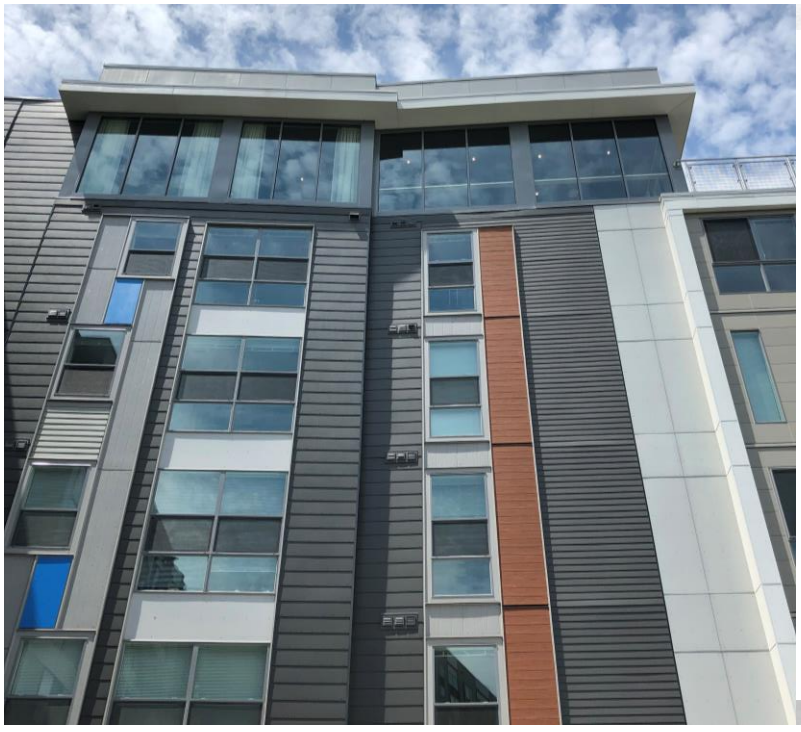
118

WHAT ABOUT BALCONIES?

Combustible or noncombustible ?

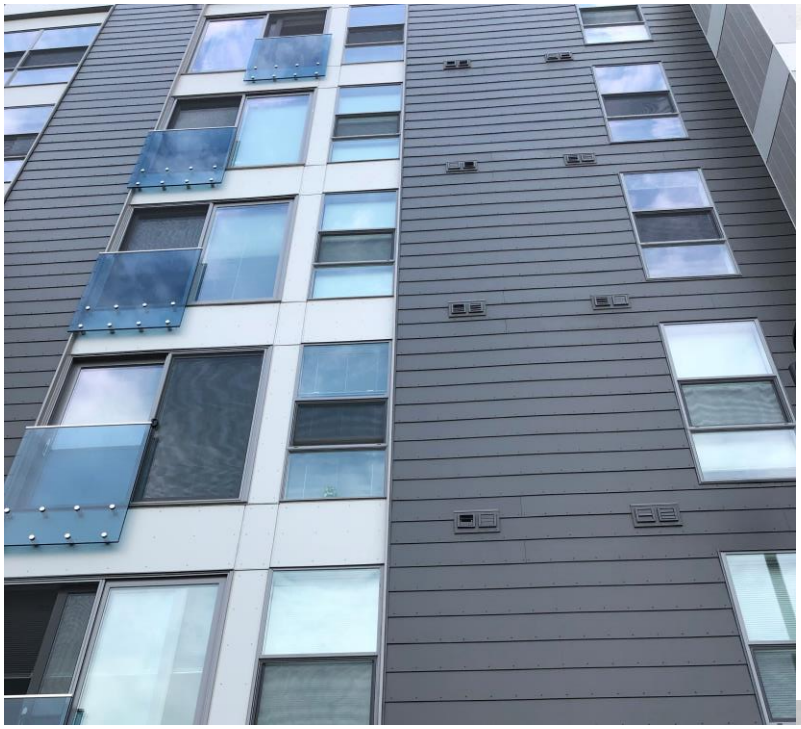
- **Permitted to be combustible with sprinkler coverage (Section 1406.3 exception #4)**

119



Vent Terminations

120



Juliet Balconies

121

Lots of Podiums under Construction

122

Mechanicals on Roof

What should you be looking for?

123

- Guardrails when within 10 feet of roof (2015 IMC 304.11)
- Or permanently attached fall arrest devices

(ANSI/ASSE Z 359.1)

124

Brief Overview of Other Special Provision of Section 510

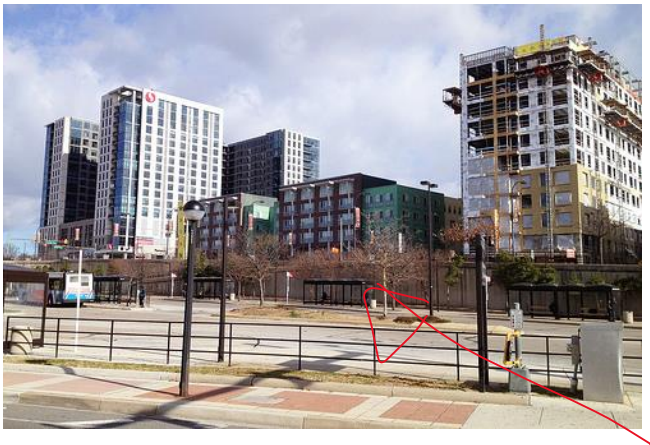
- Remember all these building MODIFY or Exempt HT & Area Tables!

125

Other Special Provisions (Section 510.3)

- Group S-2 Enclosed Parking Garage with Group S-2 Open Parking Garage above
- Type I or II ≥ FRR of open parking garage
- Ht & # tiers per Table 406.5.4
- Floor assembly protected as requiredof enclosed parking garage
- Opening between enclosed and open not required to be protected (except EXITS)
- Exclusively used as parking except max 1000 sq ft office/waiting rm/toilet

126



Other Special Provisions (Section 510.4)

- Section 510.4 Parking beneath Group R (limited to one story above grade for parking portion)
- Max one story >Grade
- S-2 (open or enclosed parking garage)
- Type I or IV
- Measure max. stories >PODIUM

127

Other Special Provisions (Section 510.5)

- Groups R-1 & R-2
- Construction Type IIIA
- 6 stories/75 ft
- 1st floor assembly 3hr FRR > Basement
- floor area divided into 3000 squ.ft areas by 2 hr firewalls)

128

Other Special Provisions (Section 510.6)

- Groups R1 & R2
- Construction Type IIA
- 9 stories/100ft
- building separated by ≥ 50 ft other building on lot and lot lines
- exits enclosed by 2 hr FRR firewall
- 1st floor assembly min 1 ½ hr FRR

129

Other Special Provisions (Section 510.7)

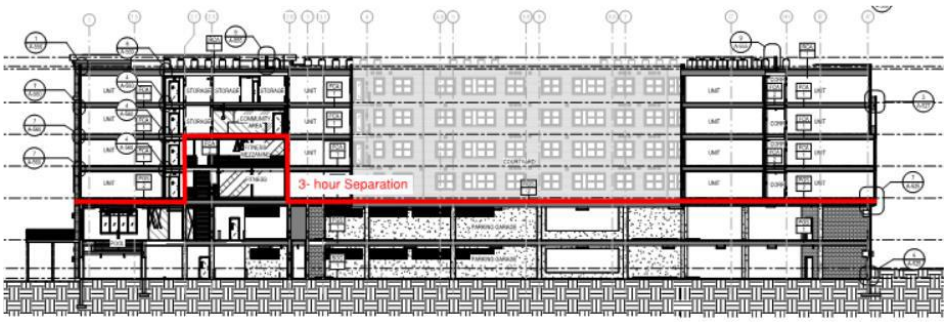
- Open Parking garage below Groups A, I, B, M, & R.
- Open parking garage shall not exceed ht & area limits of Section 406.5
- building above shall not exceed Section 503 (measured from GP)
- Separation shall be per 508.4 for uses involved.

130

Other Special Provisions (Section 510.8)

- Open parking garage (S-2) >B or M use groups
- Separated by 2hr FRR horizontally assembly (HA)
- Building < HA is IA construction (*Exception: IB or II but not <type of construction required for open parking when building below is 1 story > GP)
- Building < HA does not exceed HT & Area T503
- HT & area of S-2 does not exceed Section 406.5 (Ht measured from GP)
- Exits (2hr FRR) from S-2 direct discharge to street or public way

131



132

2018 IBC Code Changes

- Where vertical offsets are provided in the horizontal assembly (Podium)
- Both the vertical offset and its supporting structure requires a 3 hr FRR
- Offsets beneficial for elevation changes, tall lobbies, etc.

133

134

BCS
Building
Consultation
Services

QUESTIONS?

135