

# welcome.



**NYSERDA**



# Buildings of Excellence **High Performance Glazing Systems**

Building Energy Exchange, October 15, 2019

Since 1972, Steven Winter Associates, Inc. has been providing research, consulting, and advisory services to improve the built environment for private and public sector clients.

Our services include:

- Energy Conservation and Management
- Sustainability Consulting
- Green Building Certification
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We have over 125 staff across three office locations:  
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[www.swinter.com](http://www.swinter.com)



# NYC High-Rises – by the numbers

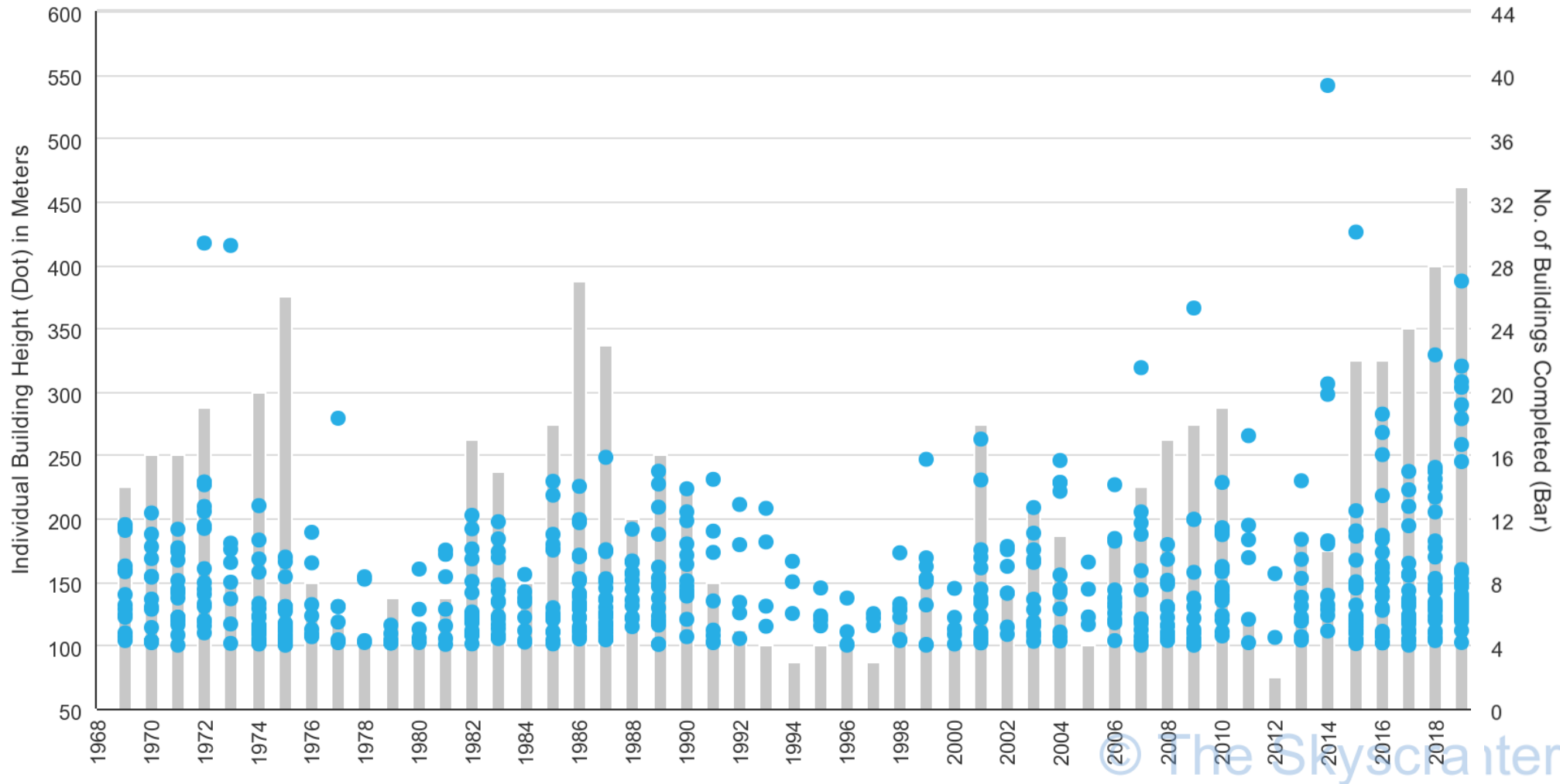


#	City	Country	All Buildings	<u>330 ft</u> 100m+	<u>490 ft</u> 150m+	<u>650 ft</u> 200m+	<u>985 ft</u> 300m+
1	Hong Kong	China	923	644	355	66	6
2	New York City	United States	1,548	860	280	79	10
3	Shenzhen	China	275	247	223	82	11
4	Dubai	United Arab Emirates	466	316	192	82	23
5	Shanghai	China	413	210	159	54	5
6	Tokyo	Japan	403	328	154	26	0
7	Chicago	United States	571	327	126	31	6
8	Chongqing	China	155	145	119	39	2
9	Guangzhou	China	175	137	115	35	10
10	Bangkok	Thailand	171	118	90	20	3
10	Jakarta	Indonesia	409	152	90	39	0

**Sky Scrapper Center**

<https://www.skyscrapercenter.com/city/new-york-city>

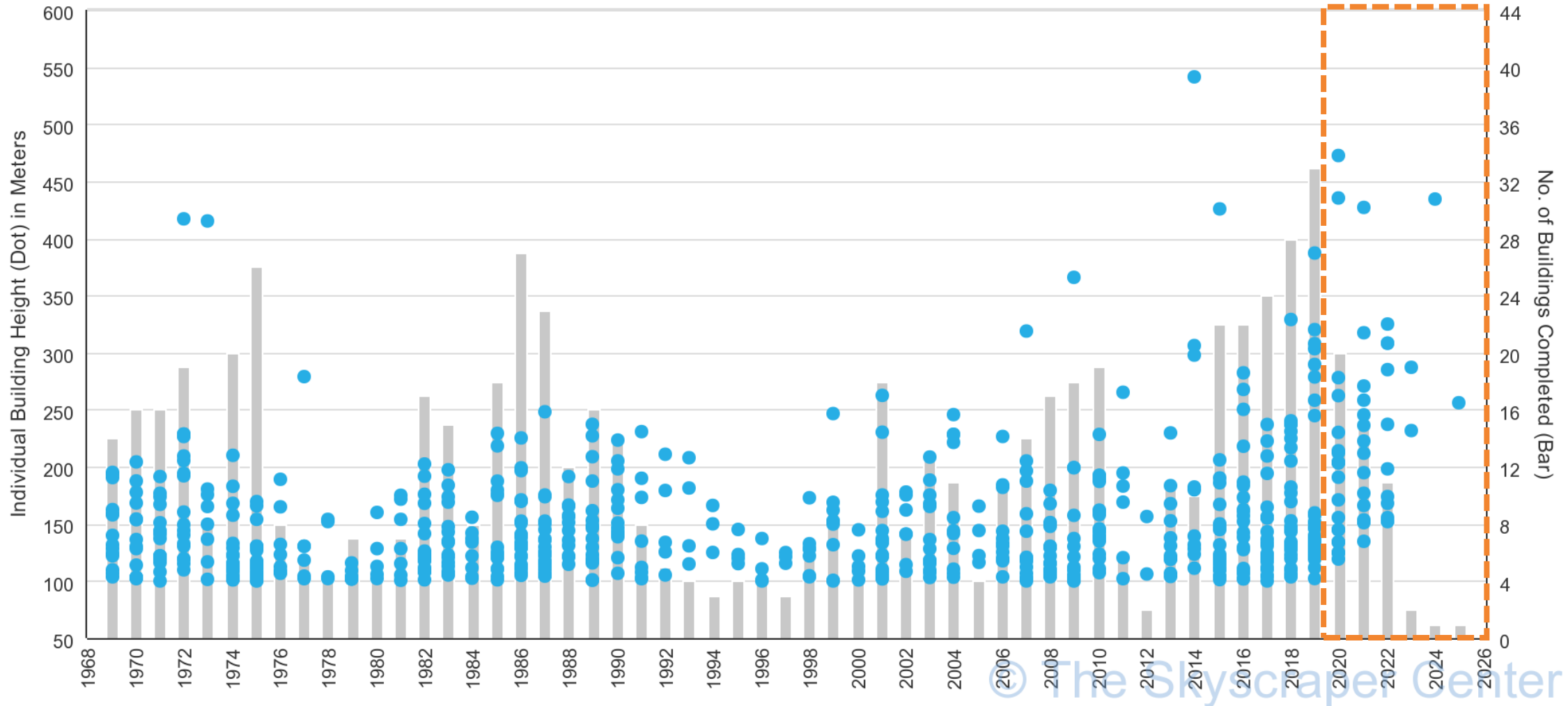
# NYC High-Rises – last 50 years



**Sky Scraper Center**

<https://www.skyscrapercenter.com/city/new-york-city>

# NYC High-Rises – next 5 years



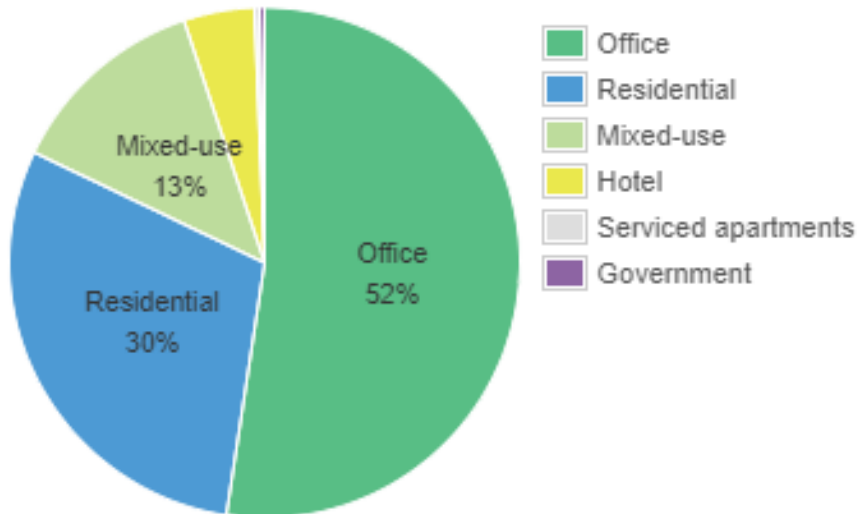
**Sky Scraper Center**

<https://www.skyscrapercenter.com/city/new-york-city>

# New York City High-Rises Typology / Construction Type

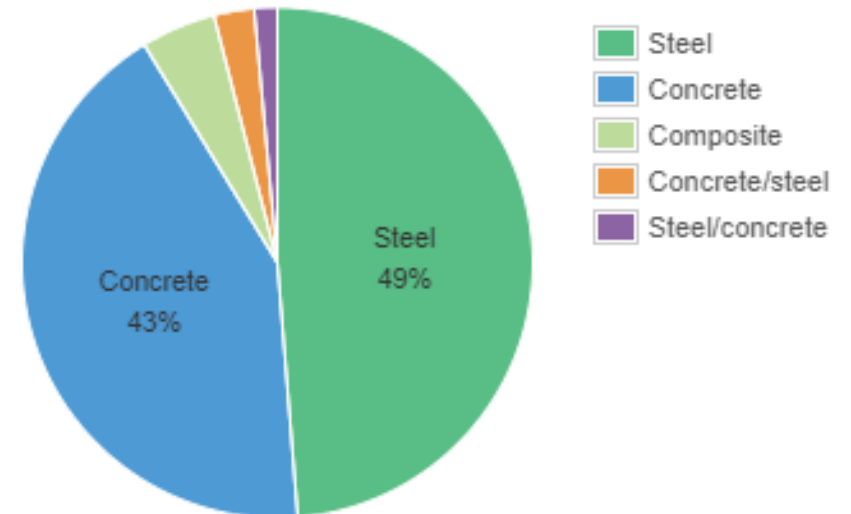
## Building Function

Based on 313 Buildings Over 150m Height



## Structural Material

Based on 275 Buildings Over 150m Height



**Sky Scrapper Center**

<https://www.skyscrapercenter.com/city/new-york-city>

# NYC High-Rises – in the news



*We are going to introduce legislation to ban the glass and steel skyscrapers that have contributed so much to global warming...*

**- Mayor Bill De Blasio**

**New York Times**

**The New York Times**

## *De Blasio's 'Ban' on Glass and Steel Skyscrapers Isn't a Ban at All*

New York City may require more eco-friendly building materials, but neither glass nor steel would be prohibited.



Mayor Bill de Blasio cited buildings at Hudson Yards "as examples of the wrong way to do things," although he did not specify which ones. Chang W. Lee/The New York Times

 By Jeffery C. Mays



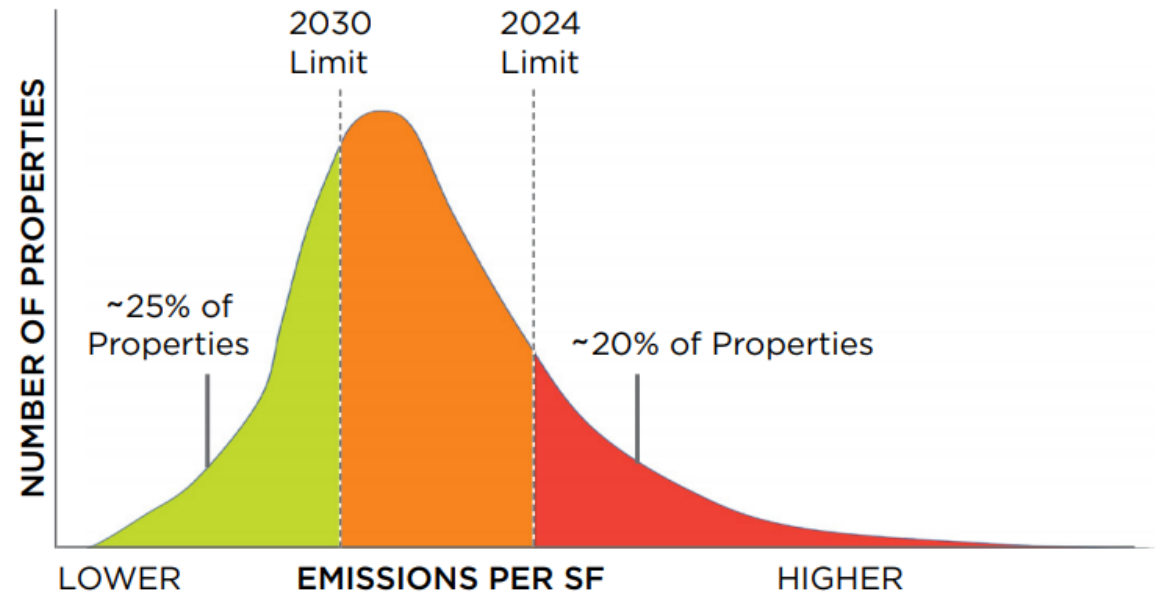
# NYC High-Rises – Local Law 97



## NYC BUILDING EMISSIONS LAW SUMMARY

Groundbreaking climate legislation sets carbon emissions caps for energy use in NYC's large buildings starting in 2024.

**FIGURE 3**  
**Emissions Distribution of Covered Properties**



*This graph is meant as a conceptual aid and does not represent actual properties or emissions limits.*

**Urban Green Council**

[https://www.urbangreencouncil.org/sites/default/files/urban\\_green\\_emissions\\_law\\_summary\\_v3\\_0.pdf](https://www.urbangreencouncil.org/sites/default/files/urban_green_emissions_law_summary_v3_0.pdf)

# High-performance Glazing in High-Rise Construction

## The Principles

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- Aesthetically pleasing
- Air-tight
- Comfortable
- Solar control
- Insulative value
- Visible transmittance

# High-performance Glazing in High-Rise Construction

## The Principles

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- Visible transmittance
- Constructible
- Cost-efficient



Winthrop Square

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# A Passive House High Rise Case Study

# Winthrop Square

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- Downtown Boston
- (Very) high-rise mixed use
- Numerous sustainability goals
- Office portion → **PH Pilot Project**



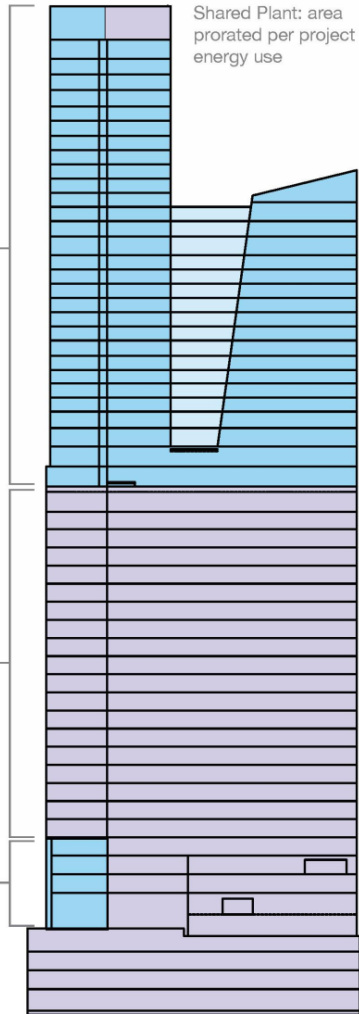
# Winthrop Square



LEED PLATINUM  
New Construction  
Residential

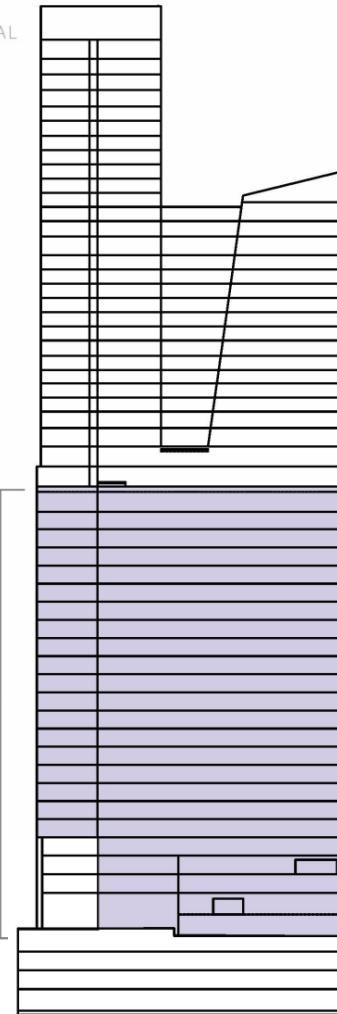
LEED PLATINUM  
Core & Shell  
Commercial Office  
Amenity Floor

LEED PLATINUM  
New Construction  
Residential Entrance

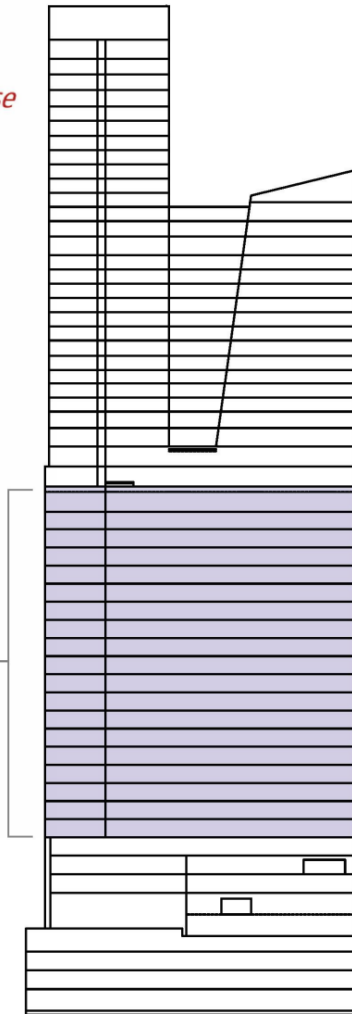


WELL BUILDING  
INSTITUTE  
Commercial Office  
Amenity Floor  
Great Hall

LEED PLATINUM  
Core & Shell  
Great Hall  
Parking (Parksmart)

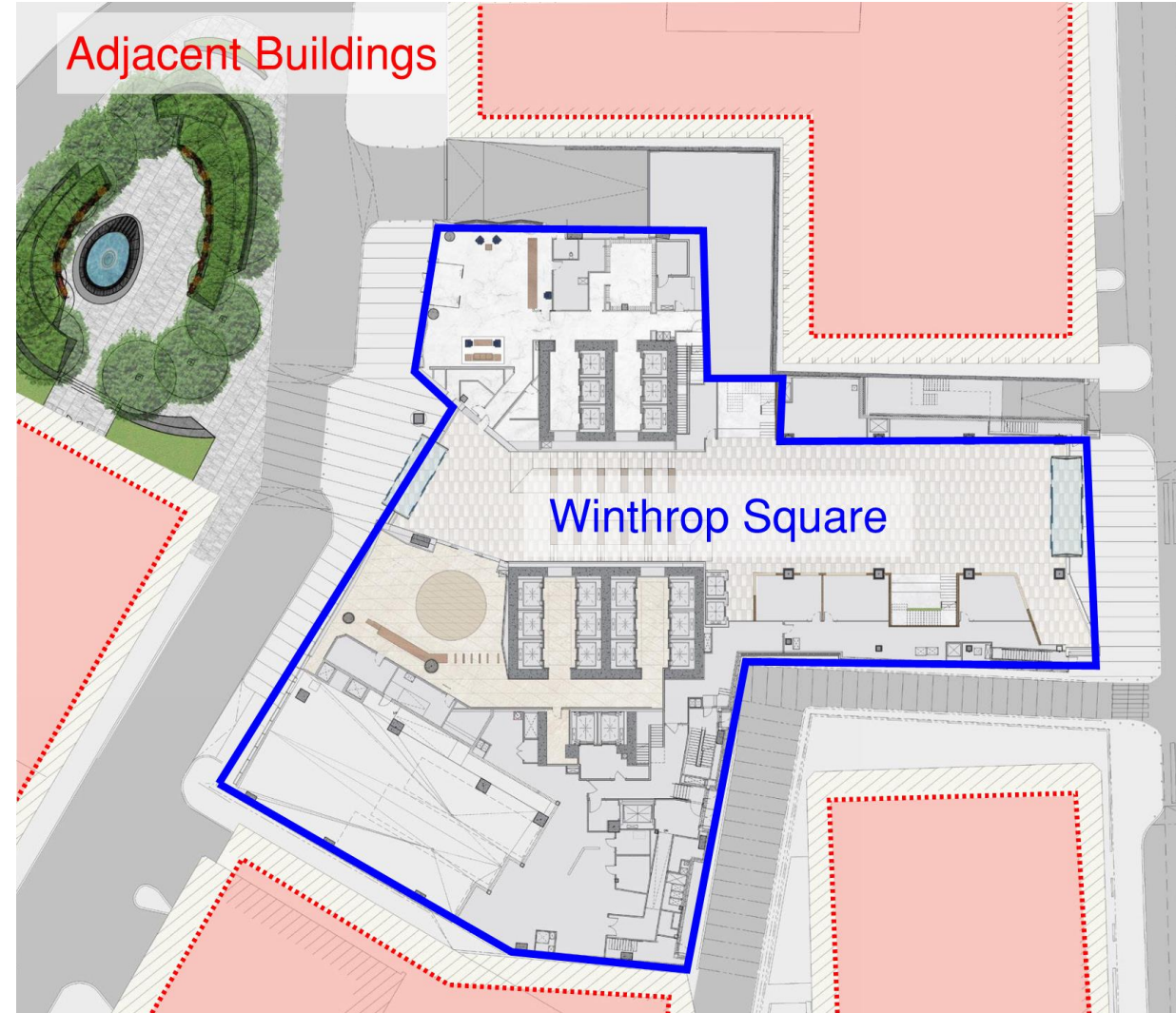


PASSIVE HOUSE  
Commercial Office



# Winthrop Square Design / Constraints

- Completely custom system
- Unitized system in 5 ft modules
- Hung from inside
- High wind loads
- Office WWR ~43%
- **Thermal requirements for PH R-18**
  - Opaque U-value  $\leq 0.055$  Btu/hr.ft<sup>2</sup>.°F
  - Vision U-value  $\leq 0.220$  Btu/hr.ft<sup>2</sup>.°F



# Winthrop Square Unique Wall Types



Unique Wall types =  
Unique U-values

- WT-A
- WT-B
- WT-C
- WT-D
- WT-DB
- WT-E
- WT-ES
- WT-F
- WT-F1.SB



# Winthrop Square Unique Wall Types

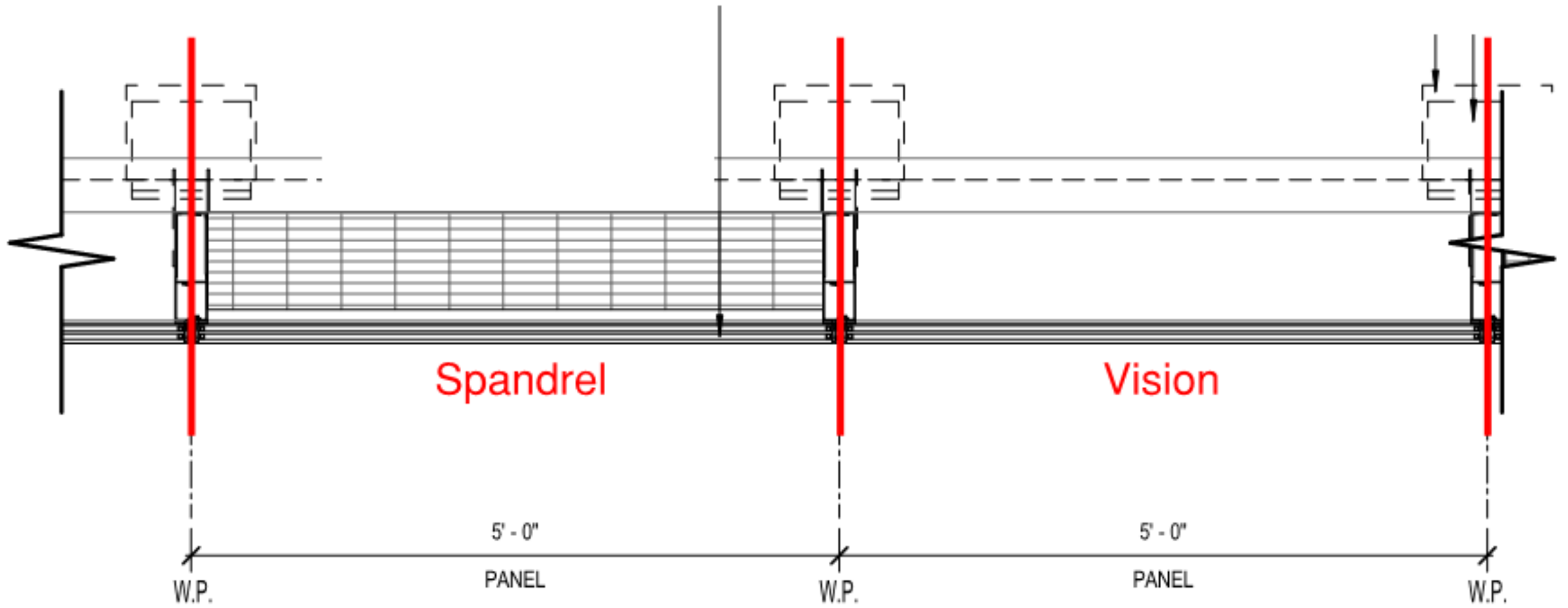


Wall Type	Wall Name	Gross Area	Weighted U - vis	Weighted R-value - op
B	C1_16_EAST	1,102	0.203	18.7
D	C3_16_EAST	284	0.239	14.7
F	D1_16_SOUTH	1,132	0.232	14.6
E	D3_16_SOUTH	476	0.226	17.7
E	E1_16_NORTH	284		18.1
F	E2_16_NORTH	994	0.223	16.7
F1	E3_16_EAST	988	0.190	n/a
B	F1_16_EAST	941	0.218	16.6
C	G1_16_NORTH	1,169	0.214	17.6

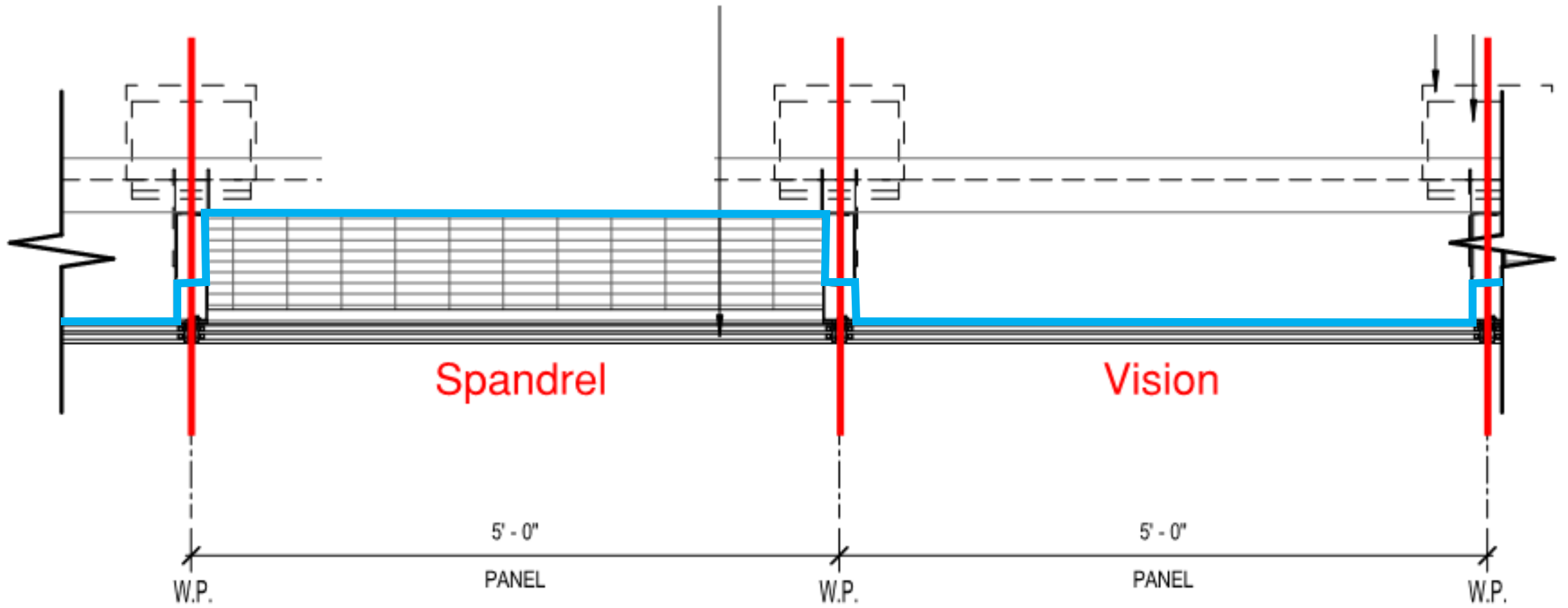
*and more...*

Real-time UxA Results			
Office Floors (based on current CW unit inputs)			
Opaque Area:	6,343	sf	50%
Vision Area:	6,426	sf	50%
<b>Weighted U - op:</b>	<b>0.064</b>	<b>Weighted R-value:</b>	<b>15.7</b>
<b>Weighted U - vis:</b>	<b>0.221</b>		

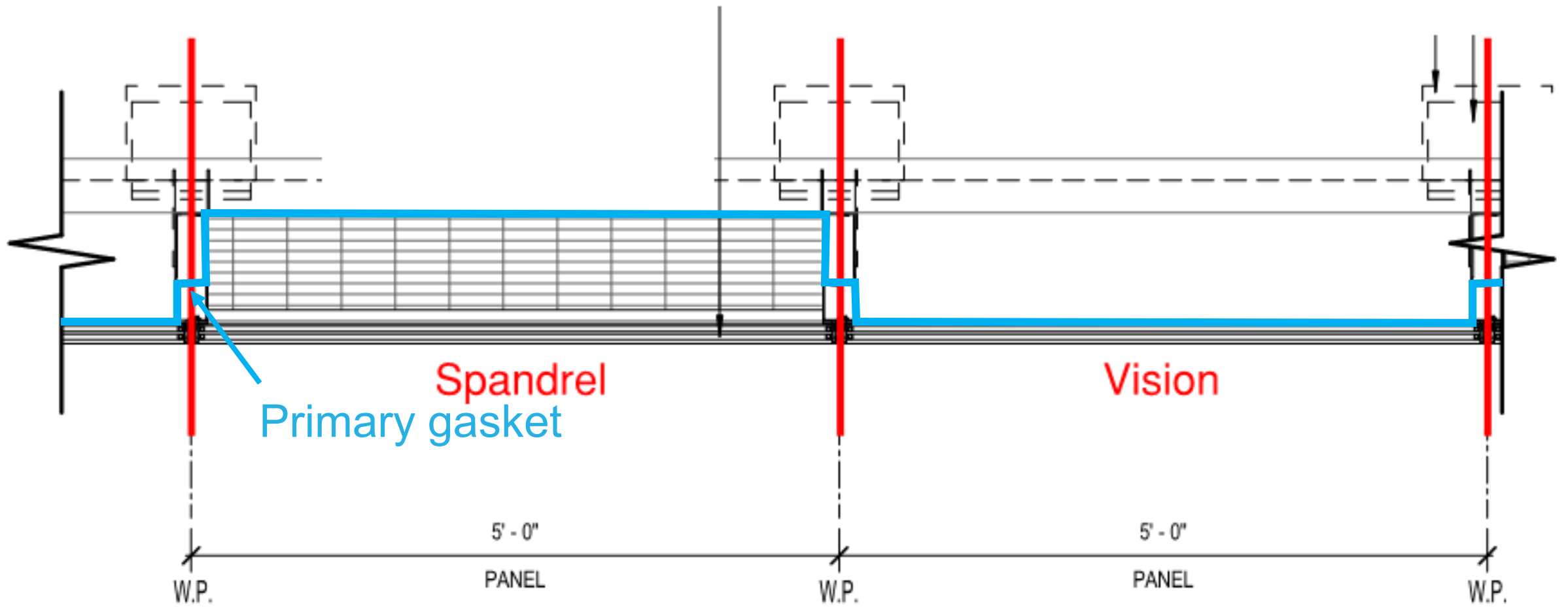
# Winthrop Square Air Tight Layer



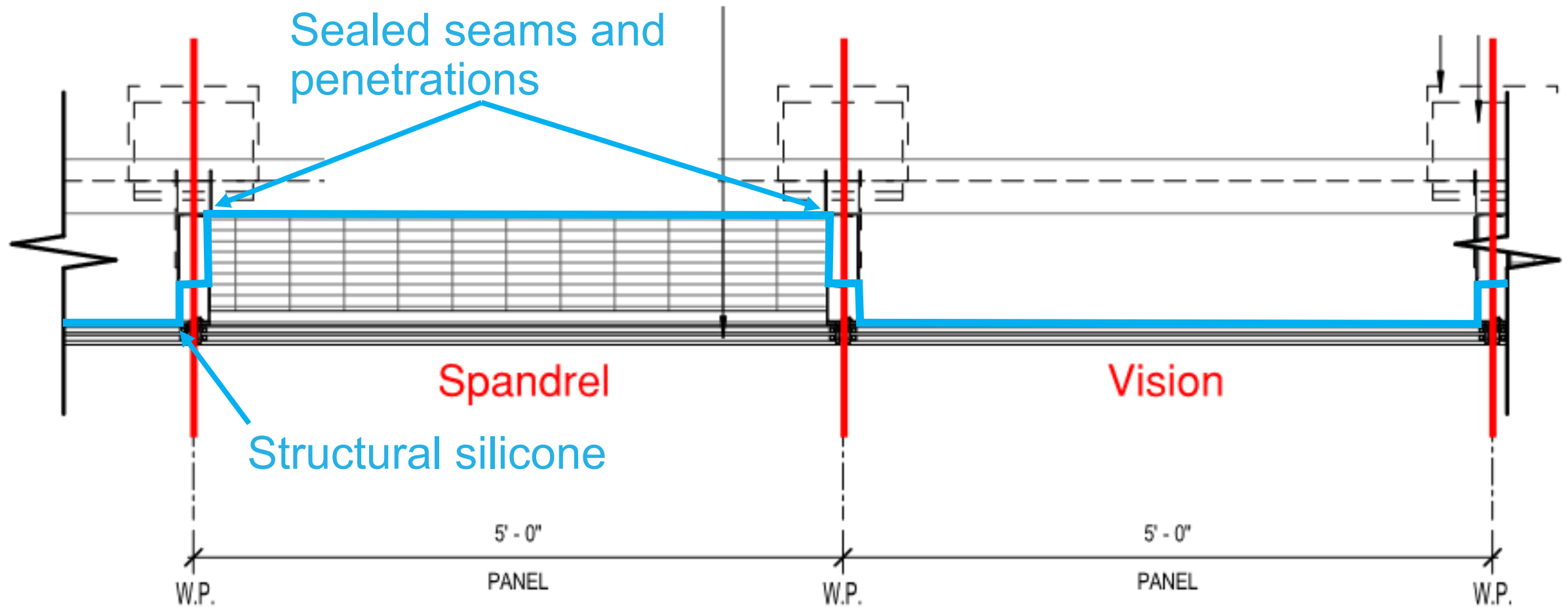
# Winthrop Square Air Tight Layer



# Winthrop Square Air Tight Layer



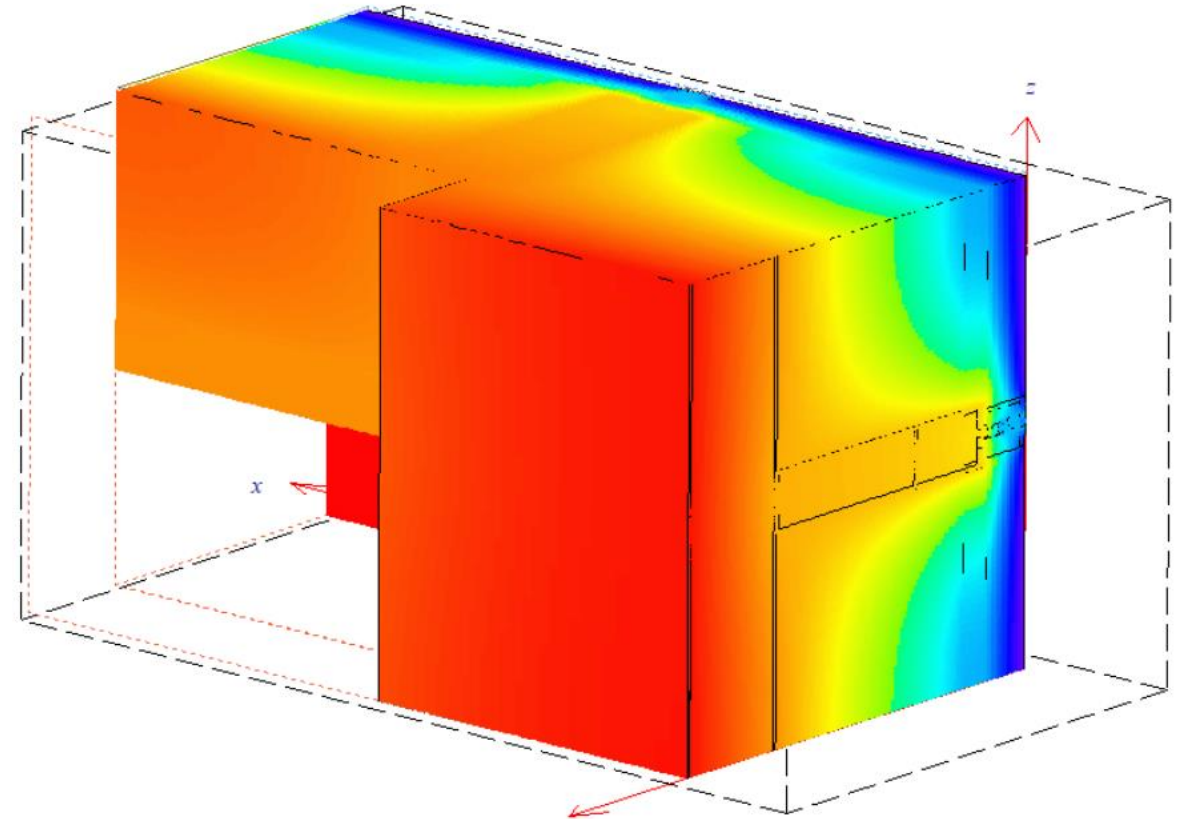
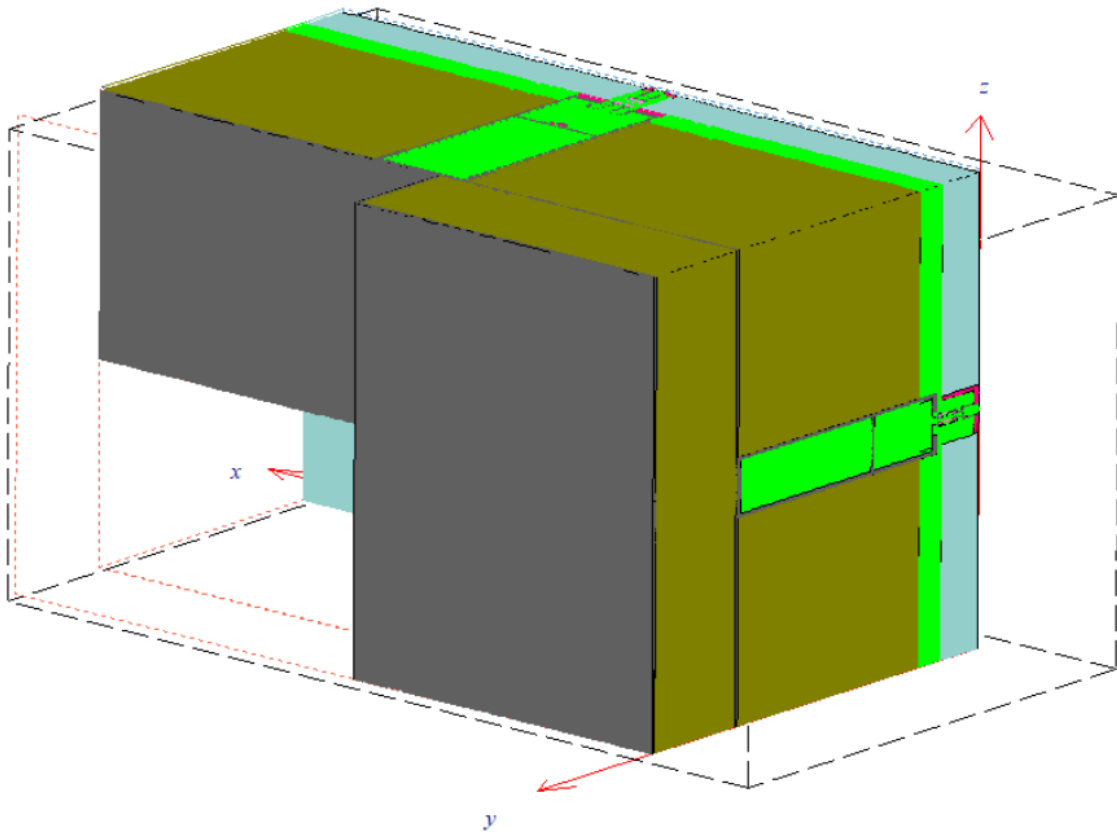
# Winthrop Square Air Tight Layer



# Winthrop Square Condensation Evaluation



## *Unique 3D Details (Heat3)*



# Takeaways for Towers of the Future



- Understand and model internal gains properly
- Flush out internal heat gains mechanically
  - Air-side economizers in ERVs / AHUs
- Custom curtain walls requires detailed thermal modeling
- Limits to thermal performance on metal curtain walls in US given current technology
- **Passive House levels of design are possible**

# discussion.



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