welcome.
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
- Accessibility Consulting

We have over 125 staff across three office locations:
New York, NY | Washington, DC | Norwalk, CT

For more information, visit www.swinter.com
<table>
<thead>
<tr>
<th>#</th>
<th>City</th>
<th>Country</th>
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<th>490 ft</th>
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<td>152</td>
<td>90</td>
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**Sky Scraper 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

- Office: 52%
- Residential: 30%
- Mixed-use: 13%

Structural Material

Based on 275 Buildings Over 150m Height

- Steel: 49%
- Concrete: 43%

Sky Scraper Center

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

Urban Green Council
https://www.urbangreencouncil.org/sites/default/files/urban_green_emissions_law_summary_v3_0.pdf
High-performance Glazing in High-Rise Construction

The Principles

- Aesthetically pleasing
- Air-tight
- Comfortable
- Solar control
- Insulative value
- Visible transmittance
High-performance Glazing in High-Rise Construction

The Principles

- Aesthetically pleasing
- Air-tight
- Comfortable
- Solar control
- Insulative value
- Visible transmittance
- Constructible
- Cost-efficient
Winthrop Square

A Passive House High Rise Case Study
Winthrop Square

- Downtown Boston
- (Very) high-rise mixed use
- Numerous sustainability goals
- Office portion → **PH Pilot Project**
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**
  - Opaque U-value $\leq 0.055$ Btu/hr.ft$^2$.°F
  - Vision U-value $\leq 0.220$ Btu/hr.ft$^2$.°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**

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<tr>
<th>Wall Type</th>
<th>Wall Name</th>
<th>Gross Area</th>
<th>Weighted U - vis</th>
<th>Weighted R-value - op</th>
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</table>

**Real-time UxA Results**

**Office Floors (based on current CW unit inputs)**

<p>| | | | |</p>
<table>
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<tbody>
<tr>
<td>Opaque Area:</td>
<td>6,343</td>
<td>50%</td>
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<td>Vision Area:</td>
<td>6,426</td>
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<tr>
<td>Weighted U - op:</td>
<td><strong>0.064</strong></td>
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<td><strong>15.7</strong></td>
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<tr>
<td>Weighted U - vis:</td>
<td><strong>0.221</strong></td>
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</table>

*and more…*
Winthrop Square **Air Tight Layer**

Spandrel

Vision

W.P.  5'-0"  PANEL  5'-0"  PANEL  W.P.
Winthrop Square Air Tight Layer

Spandrel

Vision

5' - 0"

PANEL

W.P.
Winthrop Square **Air Tight Layer**

- **Spandrel**
- **Primary gasket**
- **Vision**

Steven Winter Associates, Inc.
Winthrop Square Air Tight Layer

Sealed seams and penetrations

Spandrel

Structural silicone

Vision
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.