



HANDEL  
ARCHITECTS

# IMPACT

LARGE-SCALE SUSTAINABLE DESIGN

## Big Buildings, Sustainably Designed

Sustainable design is at the core of our practice, and is rooted in the belief that architecture and design matter – that through our work, we can make a difference in the world. Since buildings account for roughly 40% of U.S. carbon output, it is imperative that we design with future generations in mind.

Handel Architects is a world leader in sustainable design, and we are the single most experienced firm in the world at large-scale Passive House design. Our work includes The House, which was designed for Cornell Tech's new campus in New York City, and is both LEED Platinum and Passive House

certified. Recent work includes a 709-unit tower called Sendero Verde, which is the largest fully affordable Passive House building in the world; Winthrop Center in Boston, a mixed-use office and residential tower which includes 812,000 sq.ft. of Passive House & LEED Gold office space, making it the world's largest Passive House commercial building; and the University of Toronto's new Passive House Residence Hall at their Scarborough Campus, which is the largest Passive House dormitory in the world.

We're changing the  
way buildings get built.

HANDEL  
ARCHITECTS





# THE HOUSE AT **CORNELL TECH**

The House is part of Cornell Tech's new 2.1 million square foot technology campus on Roosevelt Island in New York City. The building is designed to reinforce the unique model of academic integration, multi-disciplinary research, and collaboration at the core of the Cornell Tech mission.

*THE HOUSE IS THE TALLEST  
BUILDING ON THE CORNELL  
CAMPUS AND WAS THE  
LARGEST PASSIVE HOUSE  
BUILDING IN THE WORLD  
WHEN IT COMPLETED IN 2017.*



*"Constructing the first Passive House residential high rise in the world is the latest and most exciting example of our effort to set new benchmarks in sustainability and innovation. We hope this will serve as a model for how Passive House standards can be brought to scale in the United States and create a new template for green design here in New York City."*

Daniel Huttenlocher  
Dean, Cornell Tech

# PASSIVE HOUSE

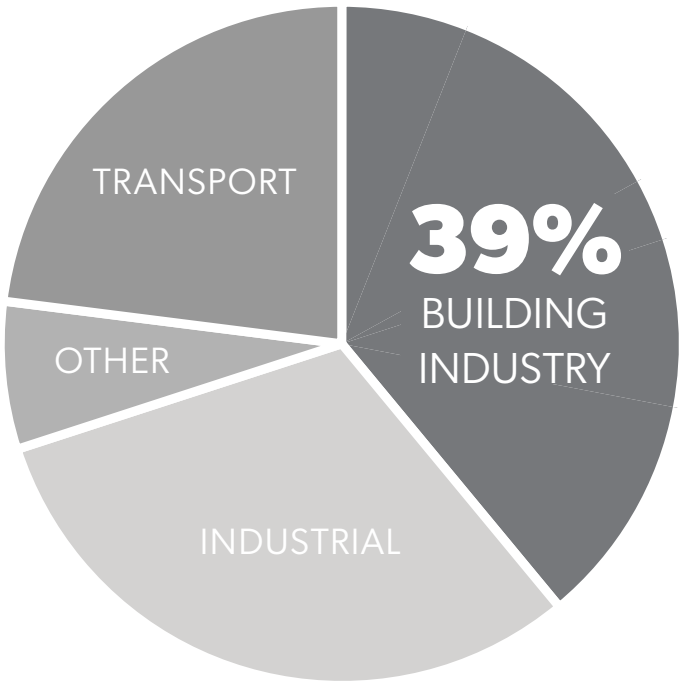
## WHAT IS IT?

- 1 Performance based, not prescriptive
- 2 High performance building envelope; tight & insulated
- 3 Constant fresh air ducted to every habitable room
- 4 Heat recovered from all exhaust air
- 5 Careful documentation and high quality construction

## WHY PASSIVE HOUSE?

<b>Superior</b> thermal comfort & indoor air quality	<b>Long term</b> durability of building materials	<b>Reduce</b> carbon emissions, lower green house gasses, combat global warming
<b>40-60%</b> overall energy savings	<b>Improve</b> health of inhabitants	

EMISSIONS PROFILE OF THE BUILDING INDUSTRY (2018)  
*International Energy Agency Global Status Report for Buildings and Construction, 2019*

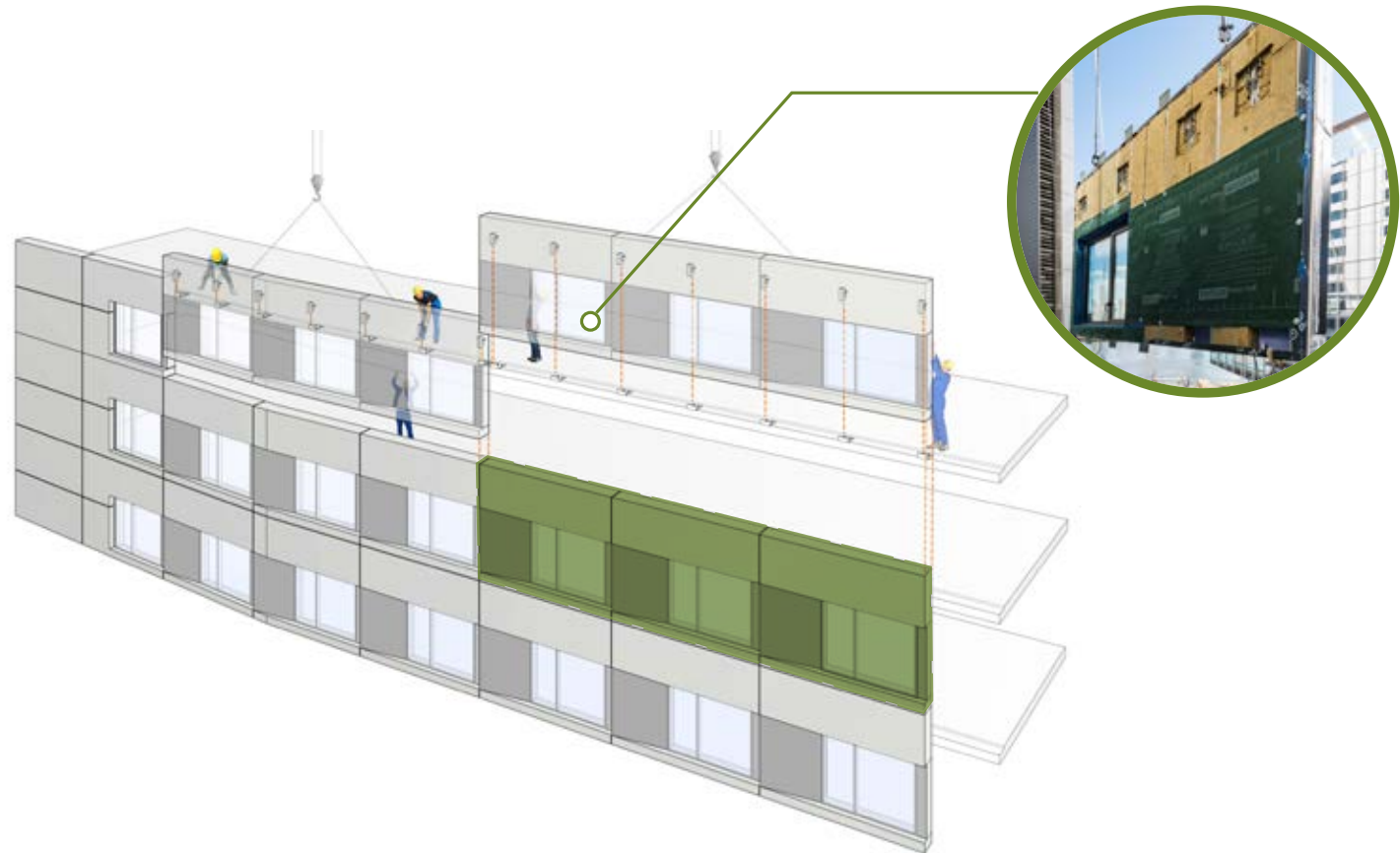


Since buildings are the largest global contributor of carbon emissions, **making them even just a little bit more efficient has an out-sized result.**



# THE HOUSE: PANELIZED WALL SYSTEMS

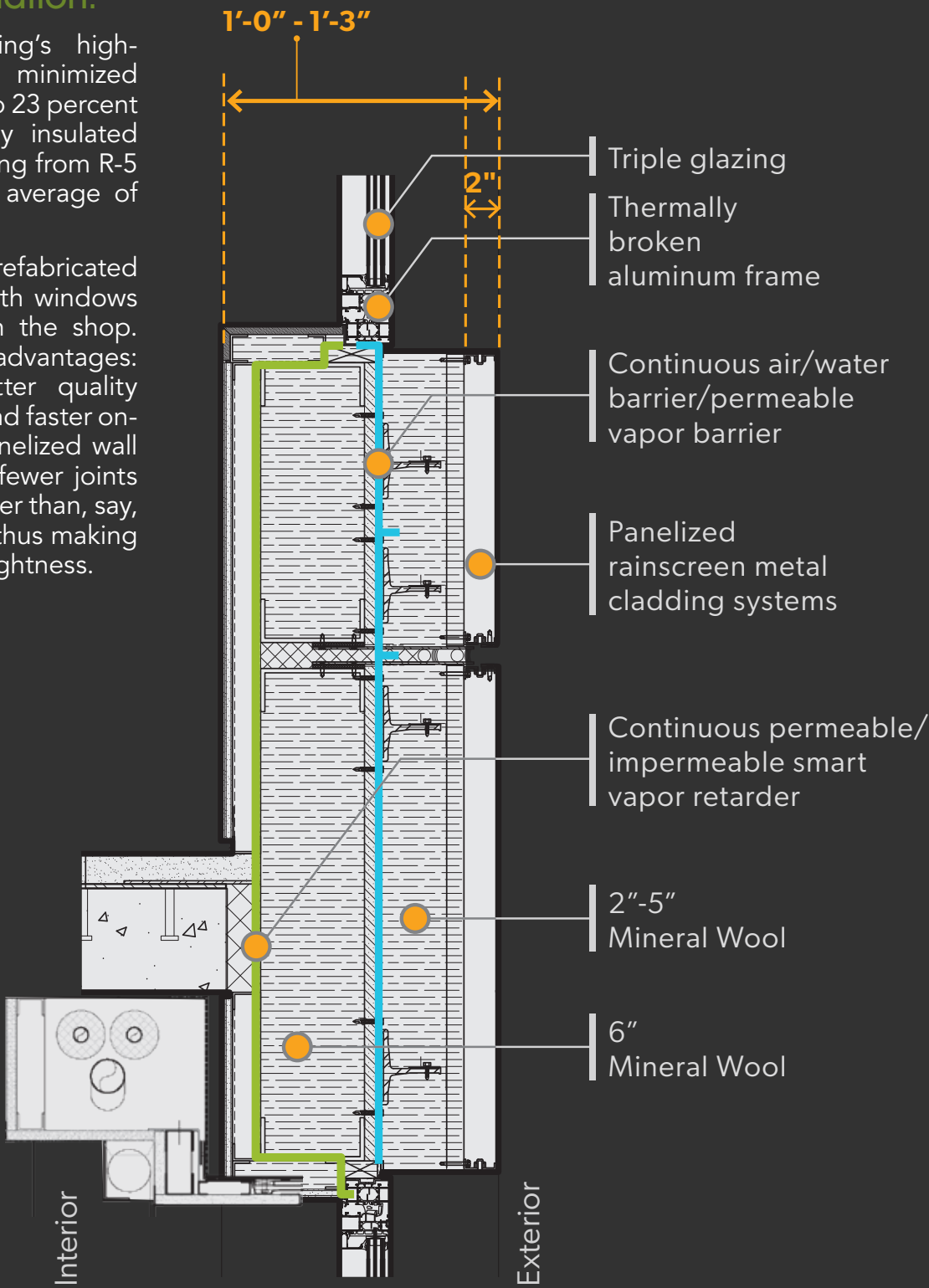
To meet the rigid sustainability requirements, the project used a thick, continuous insulated wall that we dubbed "The Wrap." The façade is carefully bent to provide as few sharp corners as practical since tight corners lower the R-value of a wall.



# THE HOUSE: EXTERIOR WALL COMPOSITION

## It's all about insulation.

To create the building's high-performance skin, we minimized the amount of glazing to 23 percent and designed a highly insulated wall with R-values ranging from R-5 to R-40 for an overall average of R-19. We opted to use a prefabricated metal panel system, with windows inserted and sealed in the shop. The panels had several advantages: cost-effectiveness, better quality control in the factory, and faster on-site construction. A panelized wall would inherently have fewer joints on the building perimeter than, say, a unitized curtain wall, thus making it easier to achieve airtightness.

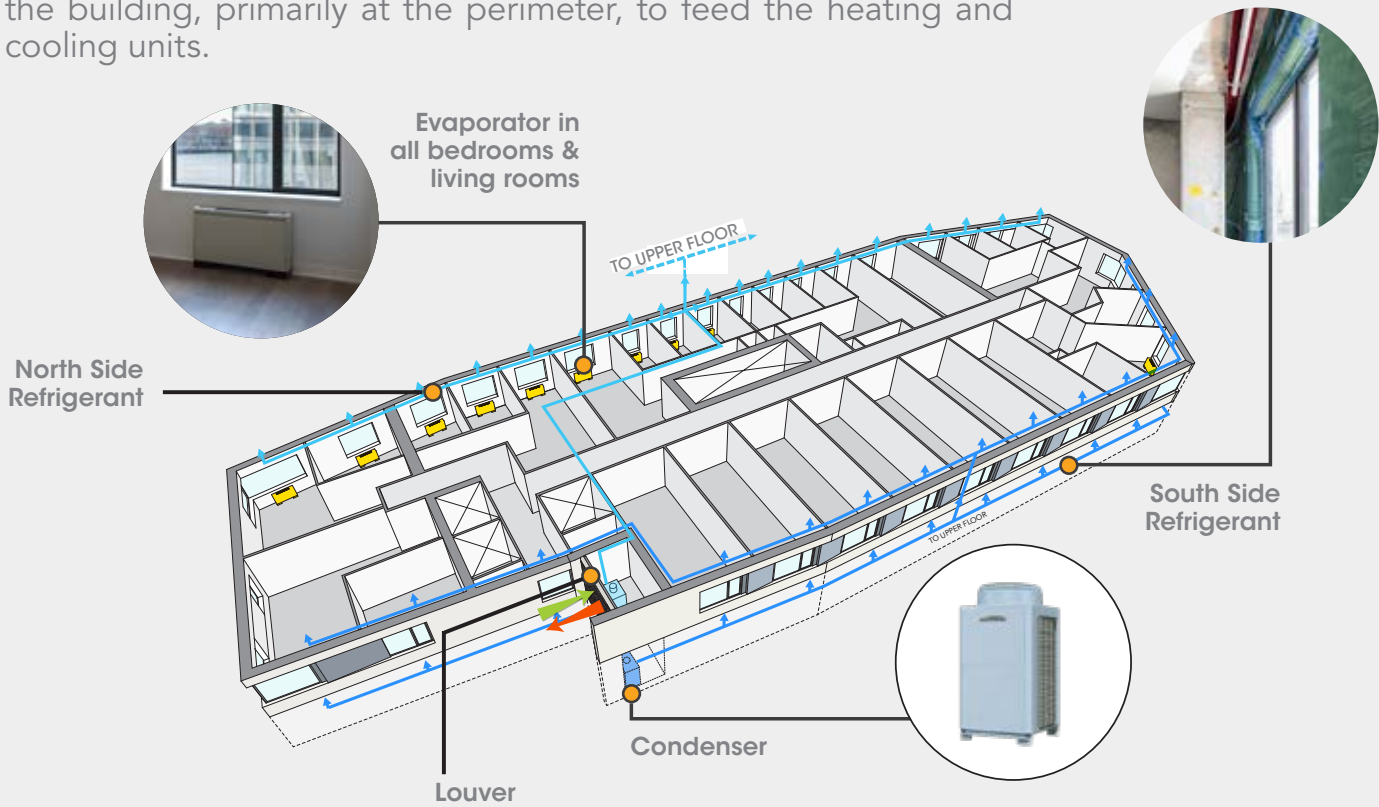




# THE HOUSE: HEATING & COOLING / VENTILATION

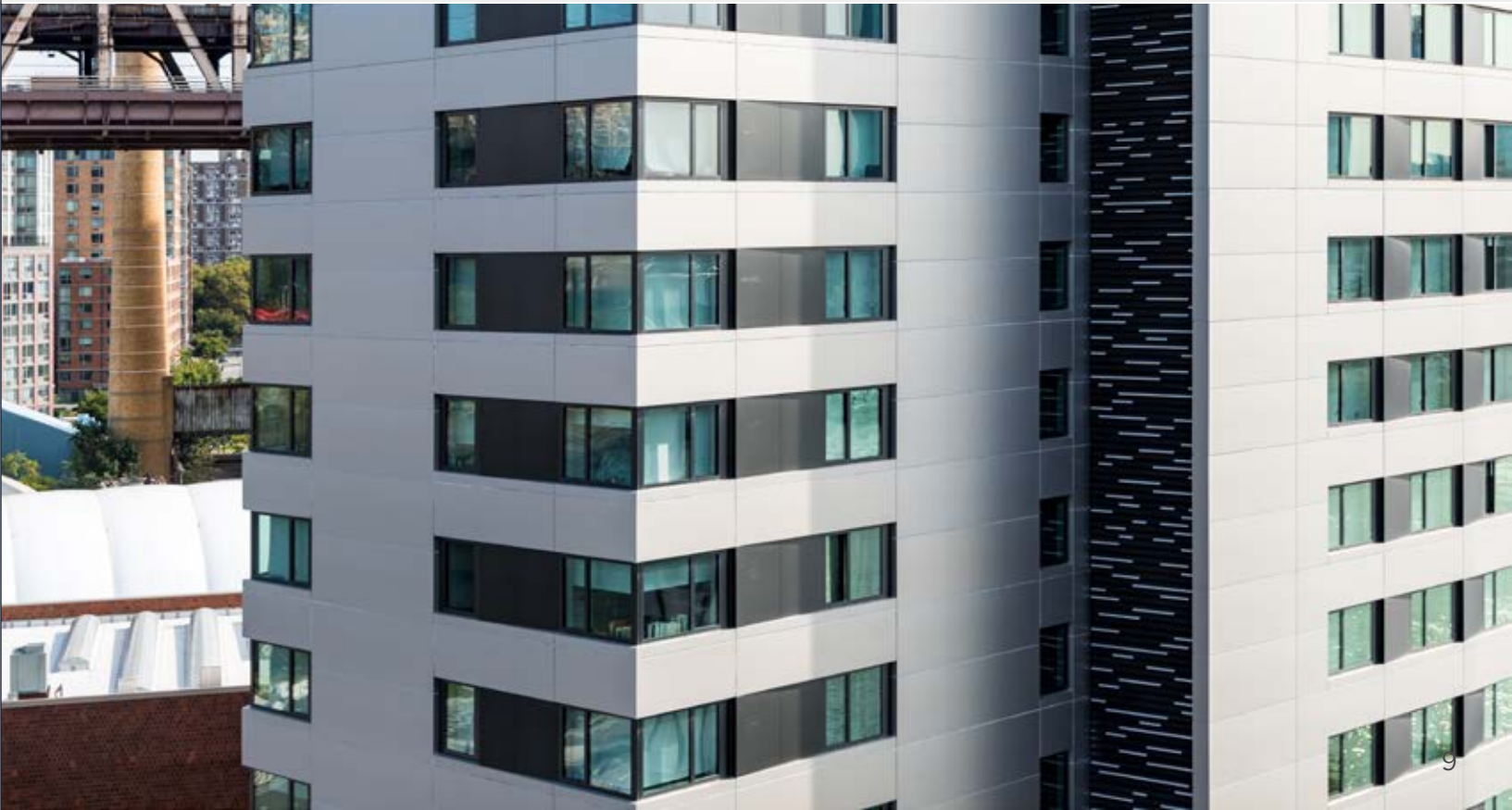
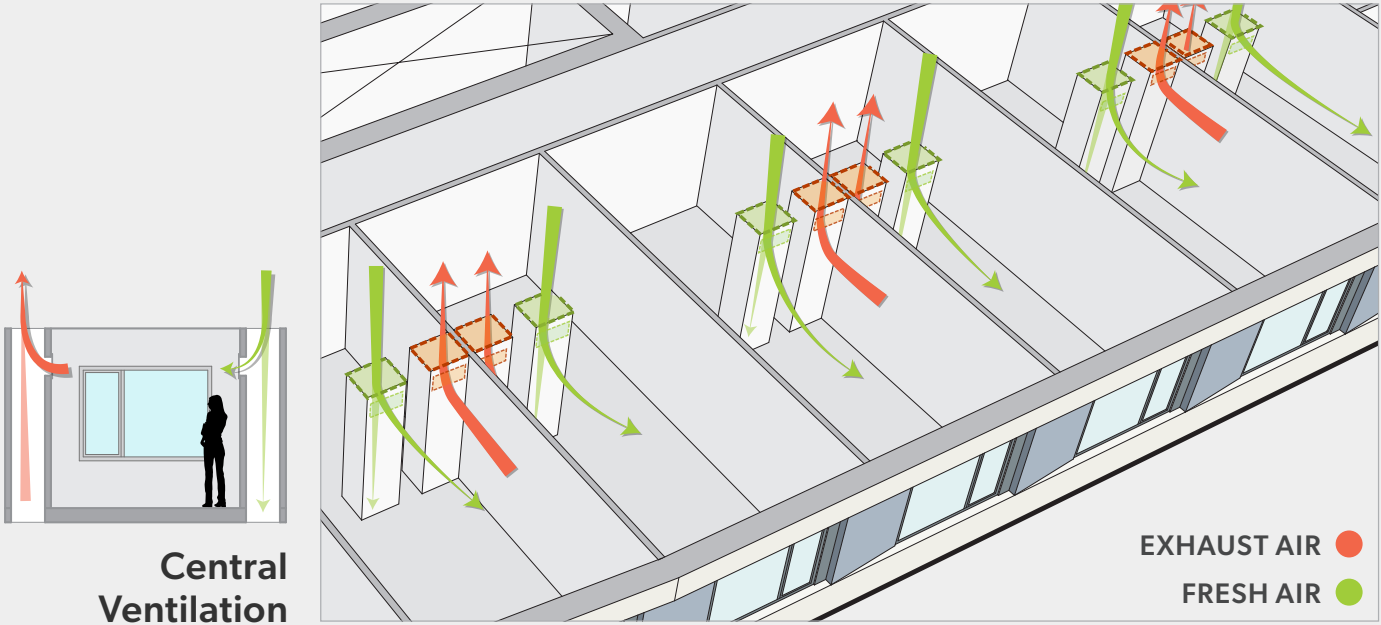
## Integrating Low Energy Mechanical Systems

Refrigerant runs from porch mounted condensers throughout the building, primarily at the perimeter, to feed the heating and cooling units.



## Balanced Ventilation with Heat Recovery

Purified fresh air is ducted into each bedroom and living room 24/7, providing superior indoor air quality. Use of low VOC-paint, which limits off-gassing and also improves indoor air quality, is used throughout the building, among many other elements.













# SENDERO VERDE

## EAST HARLEM

Located in New York City, Sendero Verde is a mixed-use multi-building project awarded through the City's SustainNYC program, which seeks to create affordable housing for New Yorkers without compromising design quality.

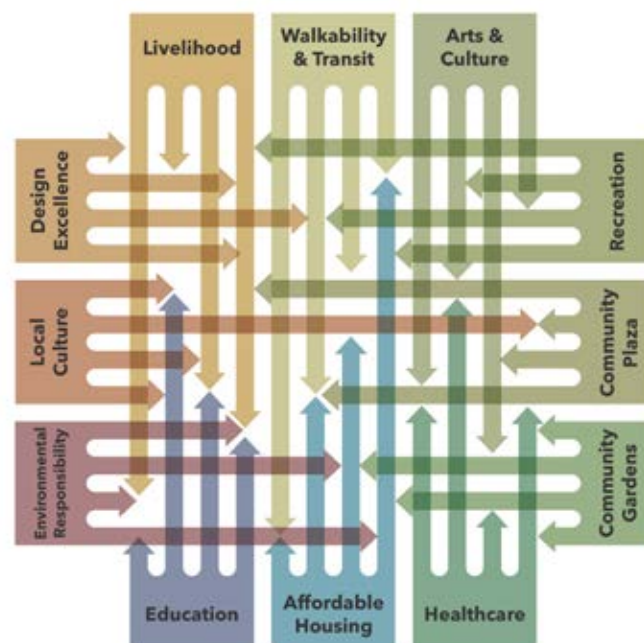
Sendero Verde contains 709 designated affordable units as well as extensive community space, retail space, and outdoor gardens. A school also operates in the

space, as well as supportive programming operated by Union Settlement, which is one of the oldest settlement houses in New York City. These community tenants, alongside retail, publicly accessible outdoor space, and community gardens, activate the ground plane.

Sendero Verde is Passive House certified, making it the largest fully affordable Passive House building in the world.

### Concept: Community of Opportunity

By providing a variety of opportunities and support services under one roof, a "Community of Opportunity" within the building can work to break the cycle of poverty that disrupts so many people's lives. This concept is woven throughout the project and is reflected in both the types of spaces that are offered, and in how those spaces are arranged. Each intrinsic program element retains its own individuality, but their juxtaposition and linking yields something greater.



*SENDERO VERDE IS THE LARGEST FULLY AFFORDABLE PASSIVE HOUSE BUILDING IN THE WORLD.*





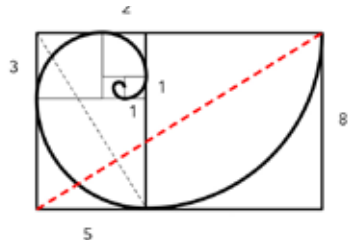
# SENDERO VERDE: FACADE ARTICULATION

The articulation of the façade echoes the underlying design concept. Used as a mechanism to break down the forms, a pattern of subtle colors weaves throughout the façade. The colors allow the façade to visually recede and project, causing the eye to move about the architecture. The building on 112th St and as well as the tower are further broken up by pushing and pulling the façade slightly to create shadow lines and visual richness.

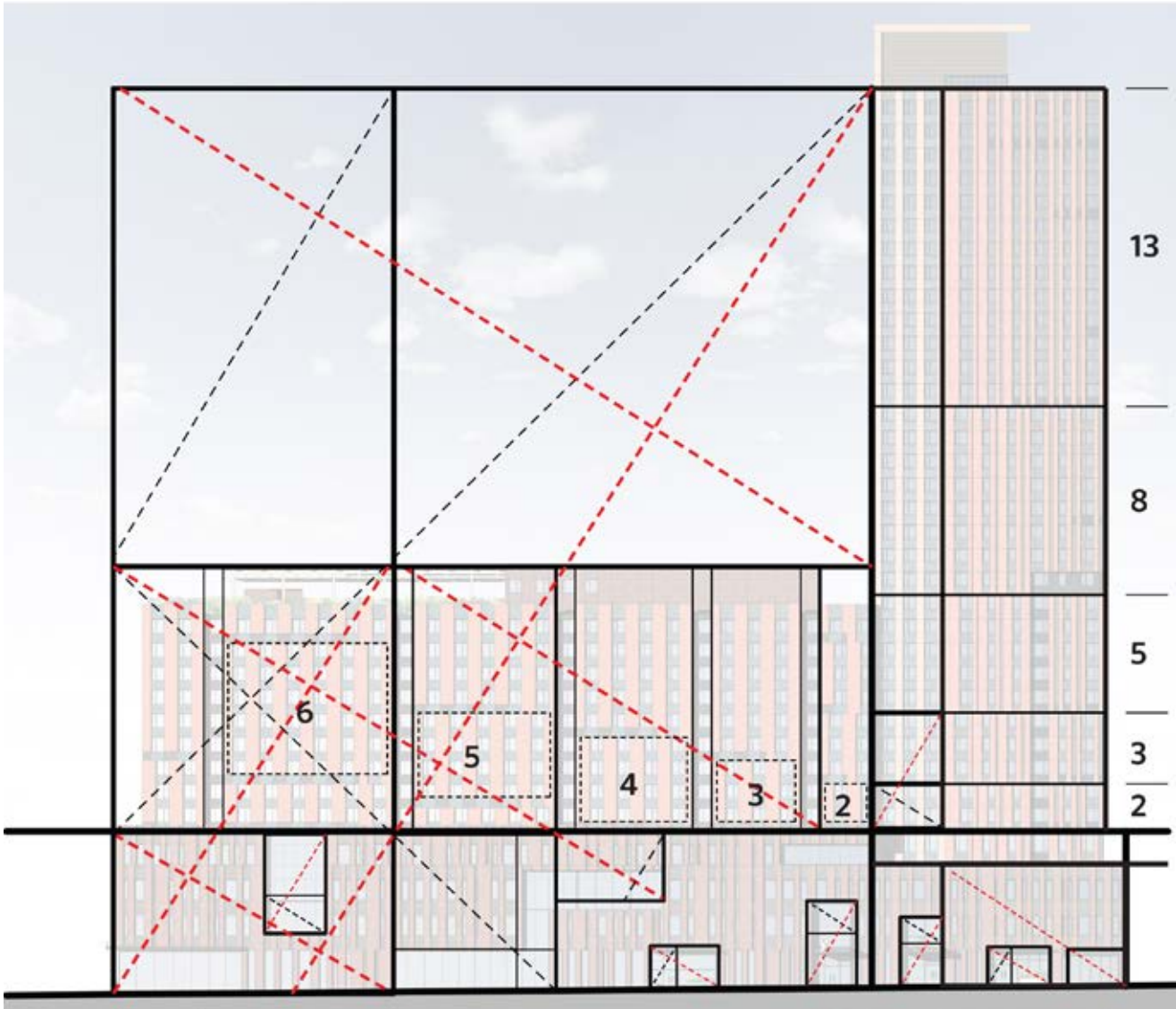
The facades also have a rationality to them, an inner organization that is guided by the Golden Mean and the Fibonacci sequence. These regulating, proportional systems aided the design team regarding rational placement for windows, color tone, patterning, façade articulation and massing.



Nautilus shell cutaway view revealing Golden Spiral



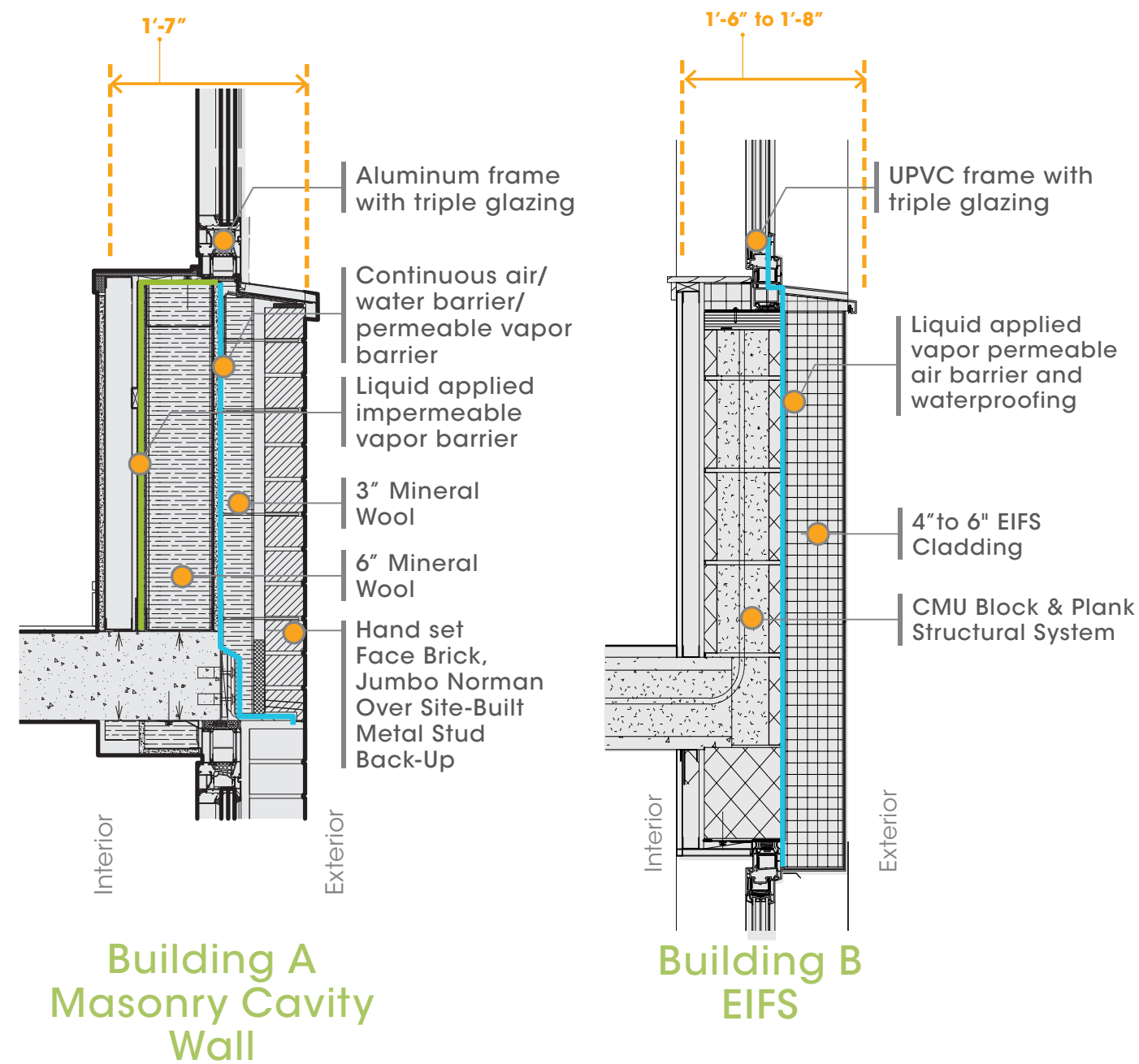
Golden Rectangle and Golden Spiral constructed by Fibonacci Squares





# SENDERO VERDE: TWO WALL TYPE APPROACHES

Key to meeting the project budget was the need to utilize conventional “off the shelf” materials that could be assembled on site by local tradespersons and meet the Passive House criteria. Components such mineral wool insulation, stand-off shelf angles, stainless steel brick ties, UPVC thermally broken window frames, triple glazing, and air/vapor barriers and tapes are now relatively common, however during the design of Sendero these materials were not yet widely used.

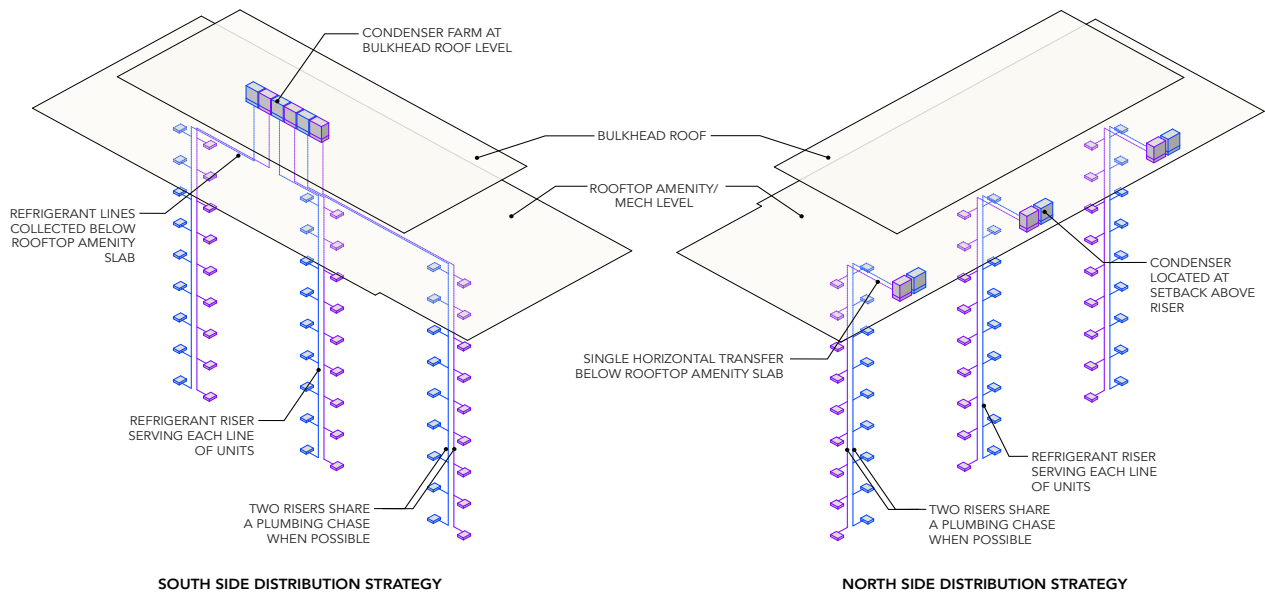




# SENDERO VERDE: HEATING & COOLING / VENTILATION

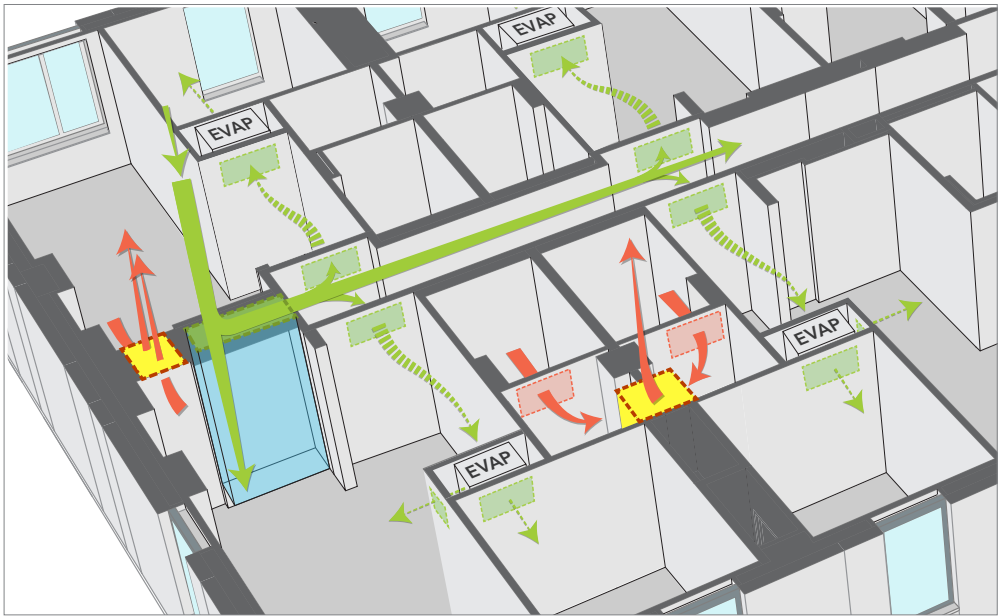
## Re-thinking refrigerant distribution

By placing the necessary condensers on the roof and dropping directly down to feed output units within each apartment, the aim was to minimize the refrigerant runs as much as possible.



## A centralized ventilation distribution strategy was designed to save cost.

Fresh air enters in the apartments and is drawn towards the VRF unit. The fresh air is subsequently conditioned and distributed through ductwork to the living room and each bedroom.



● Fresh Air  
● Exhaust Air









# HARMONY COMMONS

UNIVERSITY OF  
TORONTO

Harmony Commons at the University of Toronto Scarborough is the centerpiece of the northward expansion of the University's 300-acre campus. Designed to house 718 first-year students, along with supportive resident advisors, the Student Residences also serve the wider campus with its first full dining hall as well as central offices that serve student life and campus security.

Taking advantage of the natural surroundings, the building has been sited and shaped so that as many occupied spaces as possible feel a connection to the outside. A preserved, historic grove of trees to the north becomes a focal point for common rooms, a large 2nd floor landscaped terrace and the large dining hall at ground level.

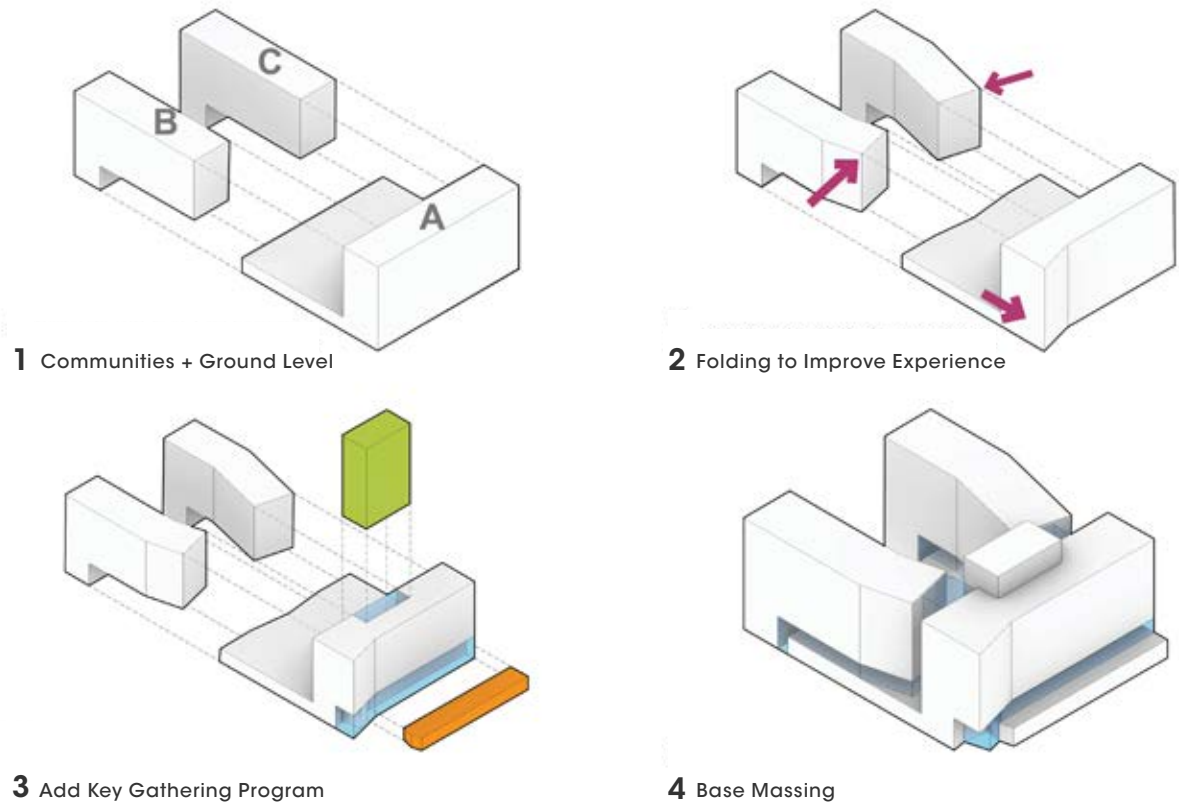
*HARMONY COMMONS IS  
THE LARGEST PASSIVE  
HOUSE DORMITORY IN  
THE WORLD.*





Building Morphology

Dormitory rooms are arranged in clusters or “communities,” each having their own identity, and are all designed to create a strong sense of home. The sculpted nature of the building’s form was driven by this concept of student communities.



Planning - Typical Floor Plan



Community A



Community B



Community C



2-Bedroom Suite



4-Bedroom Suite

Making the Case for Passive House

The University of Toronto at Scarborough (UTSC) had ambitious goals for incorporating sustainable design into their 718-bed residence hall that also included a 400-seat dining hall and a myriad of student support spaces. UTSC was keen to do a Passive House project because it could achieve such high performance, which is difficult in a tough climate. The University also wanted to use this project as a means to educate the construction industry about its feasibility, despite the barriers that had derailed other Passive House designs in the past.

Working with the teams engineers and sustainable design consultants, Handel Architects devised different ways to present the benefits of Passive House design to the University, building a case that the benefits outweighed the costs. This led to approval for incorporation of Passive House.

Decreased Utility Cost

	2000	2020 - PH	
Utility Costs	\$450,000 CAD (\$329,580 USD)	\$150,000 CAD (\$109,860 USD)	66% Decrease!
Green House Gas Emissions	30 kg per m2	5 kg per m2	83% Decrease!

This decrease is the result of the implementation of Passive House design and the province-wide effort to modernize and decarbonize the electricity grid.

Source: UTSC Facilities management

Investment & Emissions Analysis

Est. Add for PH Design at 100% DD (2% overall estimate) = \$1,481,000 US

Est. Yearly savings as compared to code compliant design powered by electricity = \$82,885 US

18 YR PAYBACK

GHG emission from code compliant SB-10 Building = 206 tonnes CO2e/yr

GHG emission from UTSC = 154 tonnes CO2e/y

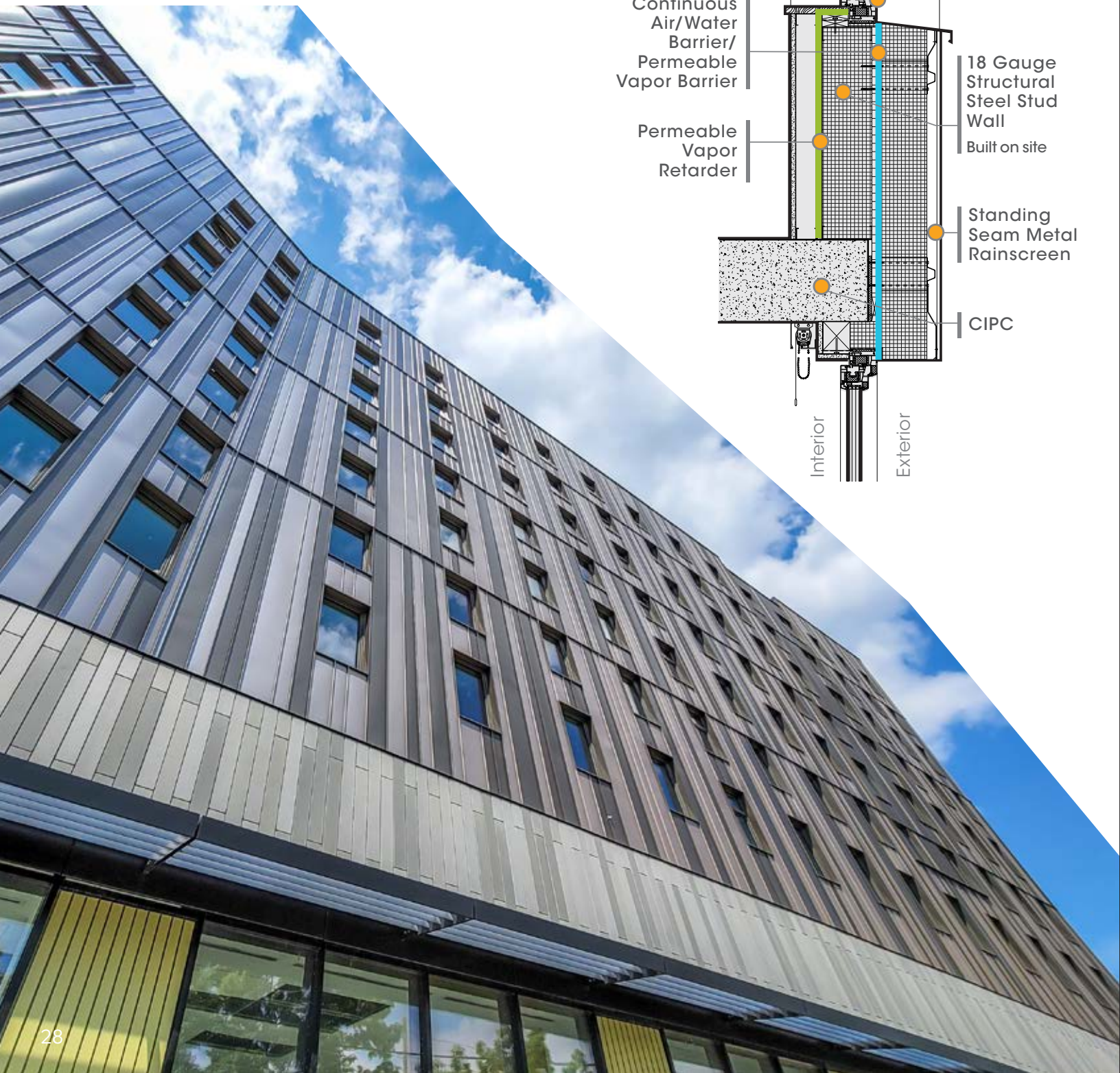
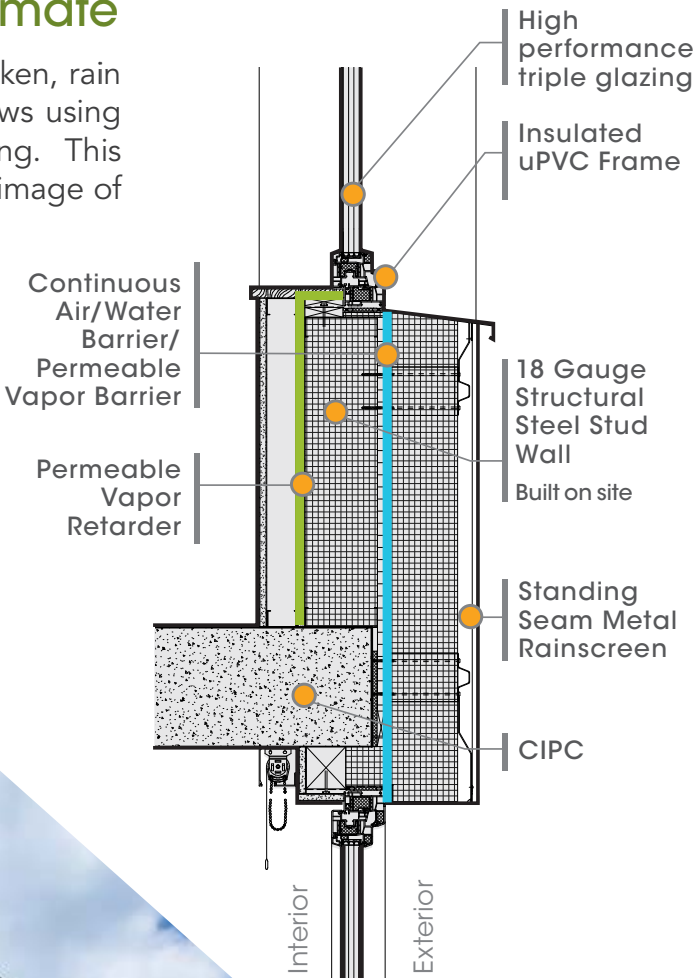
52 Tonnes Savings (25% Less)



# HARMONY COMMONS: EXTERIOR WALL COMPOSITION

## Stick Built Facade for a Colder Climate

Handel Architects designed an efficient thermally broken, rain screen facade with UPVC framed triple glazed windows using three colors of off-the-shelf standing seam metal siding. This facade is both extremely robust and gives the overall image of the project a distinctive appearance.

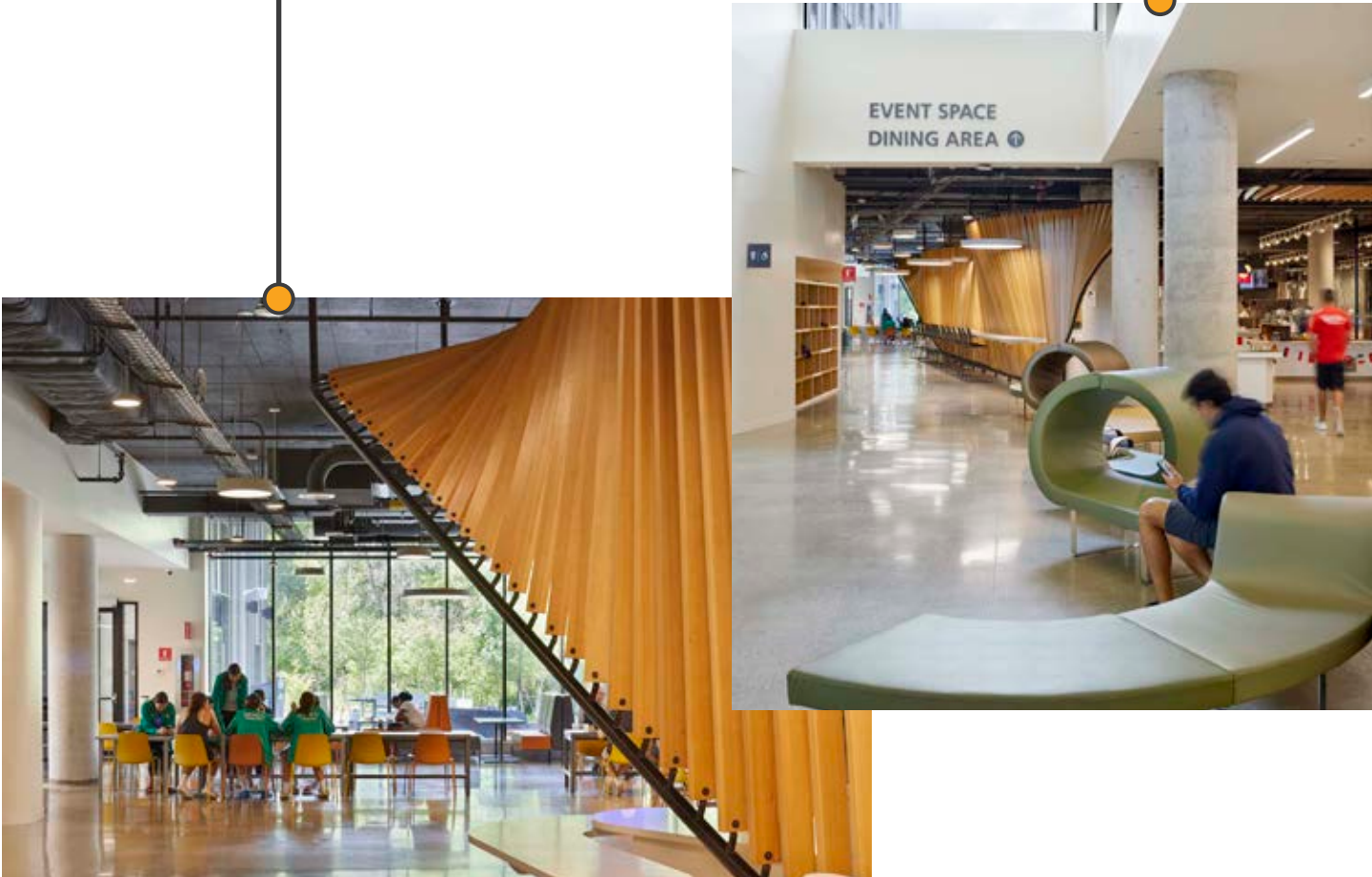
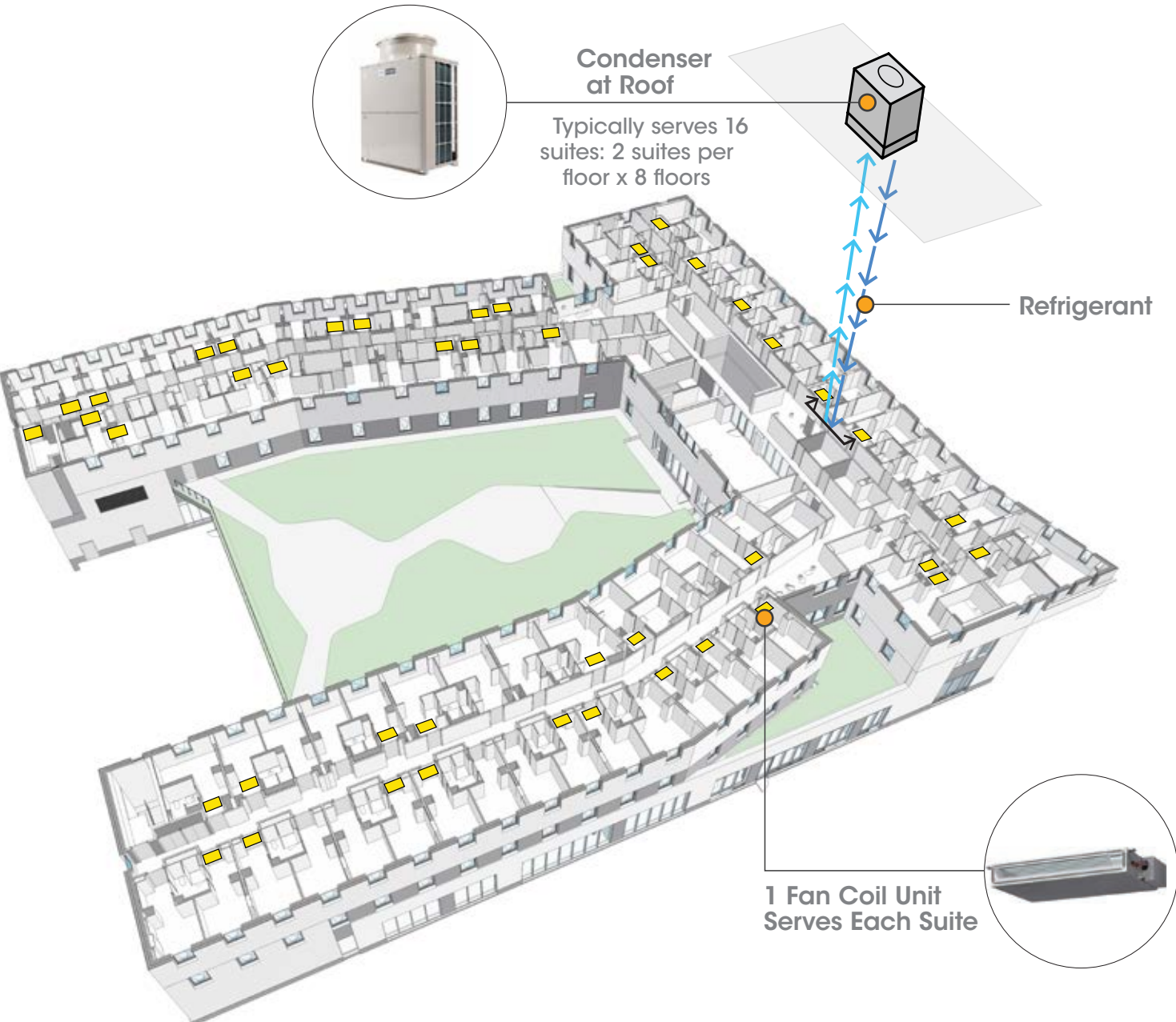




# HARMONY COMMONS: HEATING & COOLING / VENTILATION

## Hyper Efficient VRF Split System Approach

Refrigerant runs were designed to be as short as possible, by mounting condensers directly above the two adjoining dorm suites and allowing them to directly serve the suites below.







SPACE  
AREA ↑

RESIDENCE ↑



# WINTHROP CENTER

## BOSTON

Located in Boston's Financial District, Winthrop Center is designed to give new definition and vitality to this part of the city. The building is a beacon on the Boston skyline, while showing respect for the adjacent One Winthrop Square and other neighboring Art Deco-era buildings built in the 1920's and 1940's. Though technically one tower, the massing of the building splits into two as it rises, and each form is treated differently on the skyline.

Winthrop Center is over 1.8M sq. ft. of residential, office, and retail space, designed to LEED Gold standards. The 812,000 SF office component of the project is certified Passive House, the most rigorous energy efficiency standard in the world, making Winthrop Center the largest Passive House office building in the world.

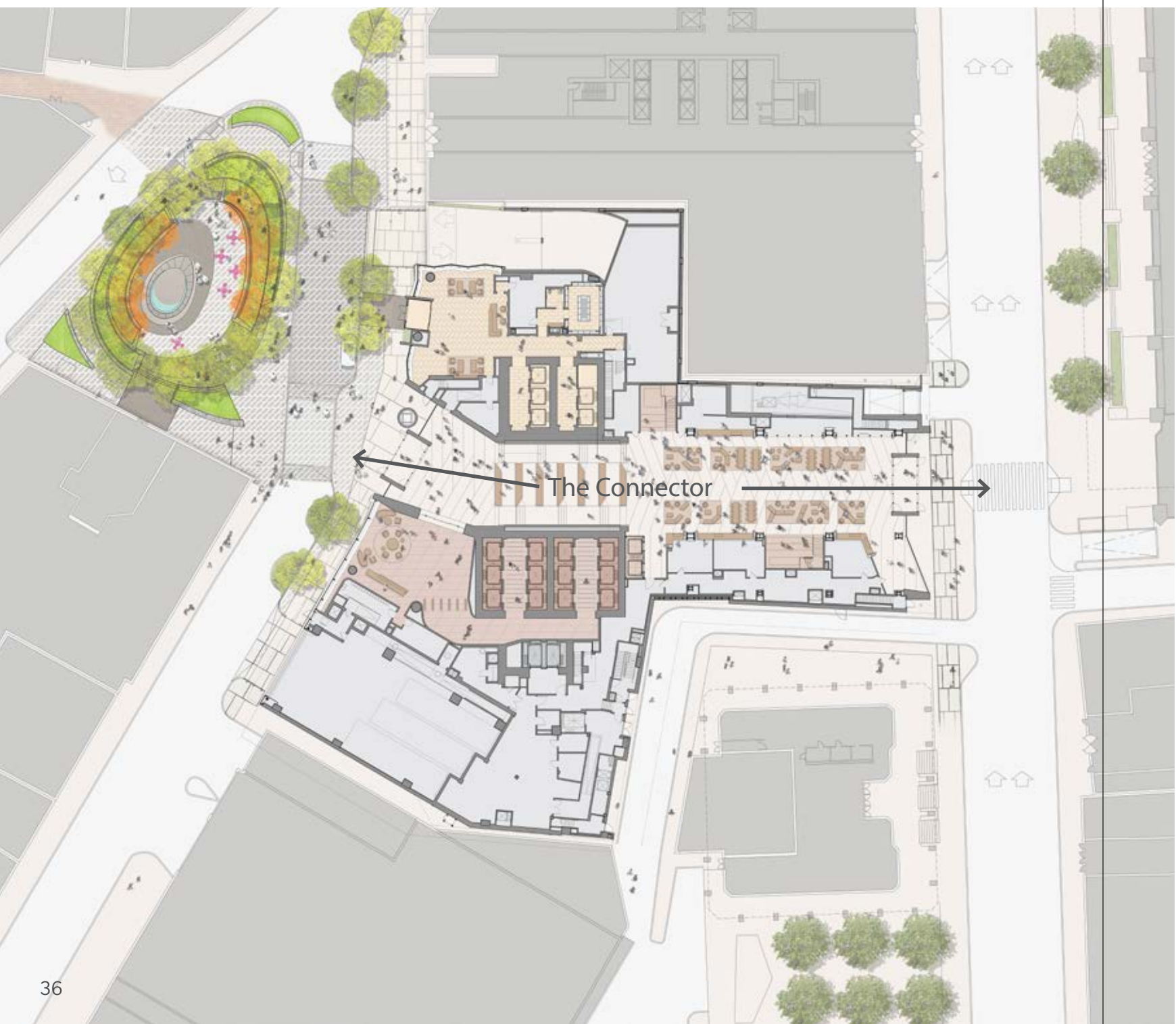
*WINTHROP CENTER IS  
THE LARGEST PASSIVE  
HOUSE OFFICE BUILDING  
IN THE WORLD.*





Urban Scale

Winthrop Center seeks to enhance and revamp the existing Winthrop Square, creating new open space to serve Boston, and linking together several other adjacent outdoor spaces. A grand new public space entitled the Connector will anchor the building and traverse the site between Federal and Devonshire streets. This space is envisioned as a year-round gathering place with programmed activities such as art shows or farmer's markets, as well as more permanent retail establishments and restaurants.

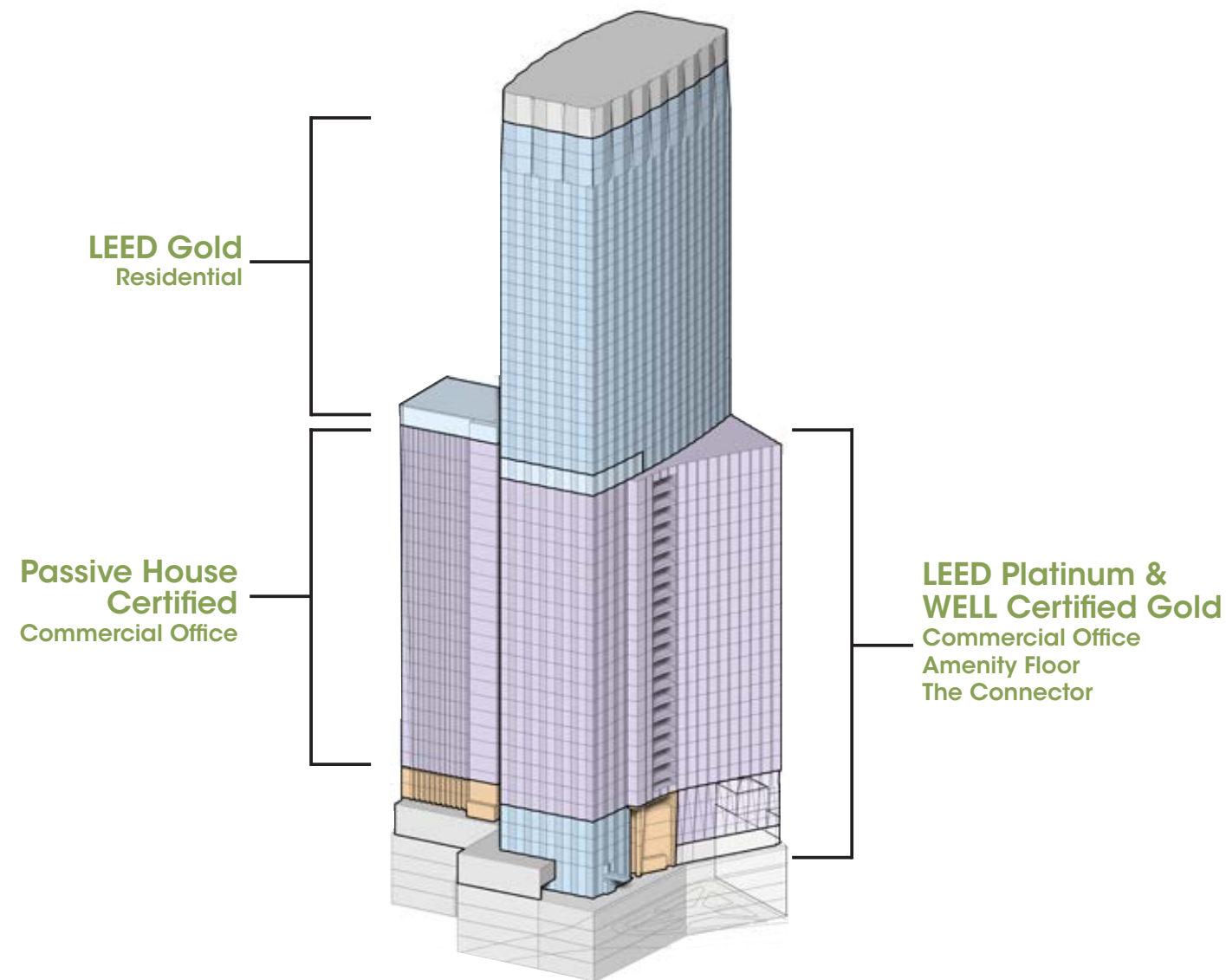


The site's through-block nature creates a T-shaped plan and allows the tower to relate to two different sets of context. To the west, from Winthrop Square, a much more formal, enclosed portal threshold is utilized, creating a dramatic emergence into the Connector space. The entry scales down the overall tower so as to complement and show deference to One Winthrop Square. Above the Connector, the office portion of the building gently curves around Winthrop Square to the west, creating an inflection in the massing.



Sustainable Development and Green Building

Winthrop Square uses three separate sustainability standards: Passive House, WELL Gold, and LEED Gold. The office program meets Passive House standards, making it the largest Passive House office building in the world. The office is also WELL Gold Certified, a sustainability standard that focuses on increasing the health, happiness, wellness, and productivity of the users by impacting the building from design through construction, and importantly continues through the long term maintenance and operation of the building. The office and public spaces meet LEED Gold requirements. The LEED Gold standard complements Passive House and WELL Gold by prescriptively addressing environmental impacts like water usage, recycling, materials use and sourcing, and building operating procedures.

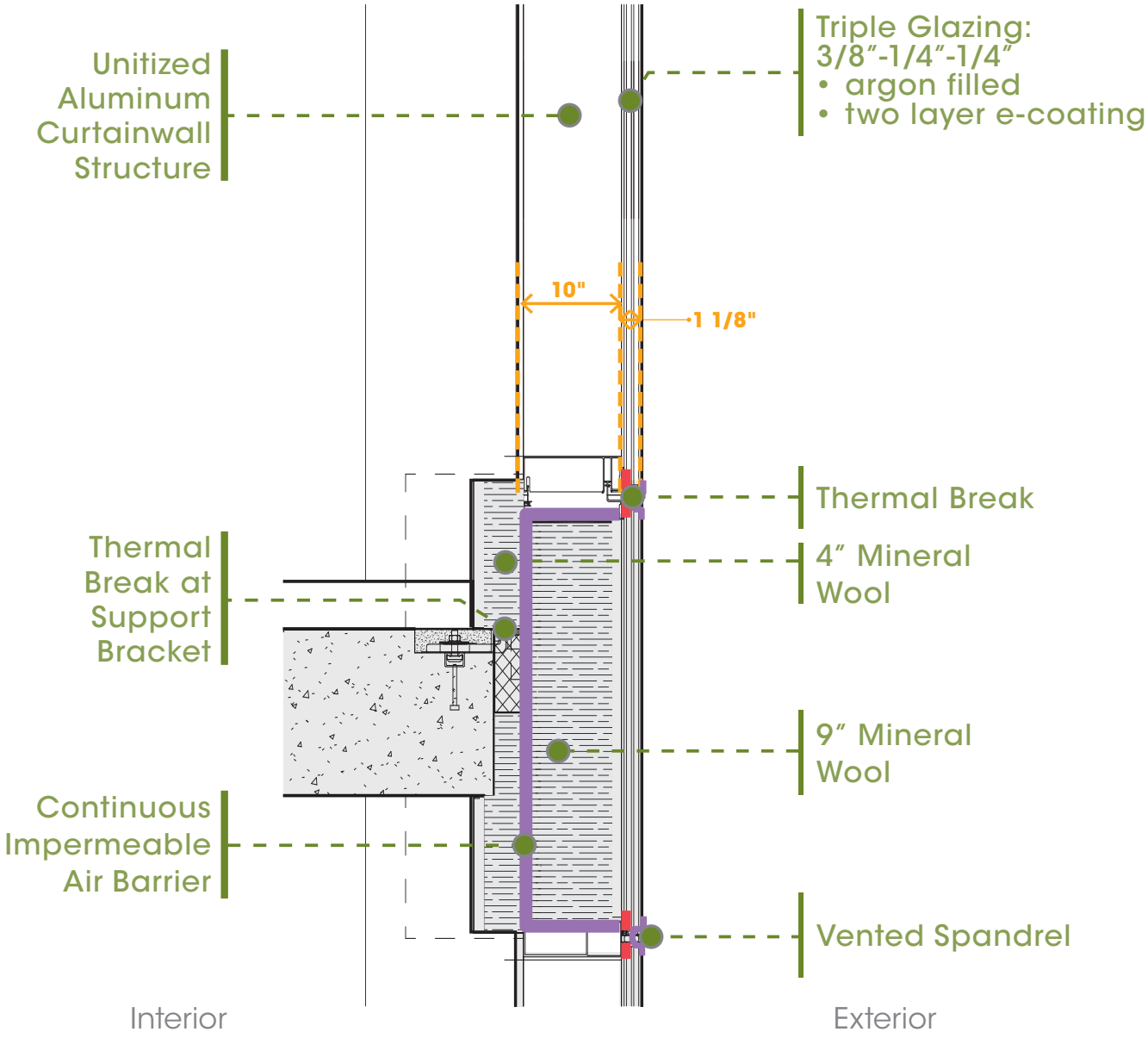


30-40% ENERGY USE REDUCTION

The office space at Winthrop Center is designed to reduce energy use by approximately 30-40% compared to code baseline (ASHRAE 90.1-2013).



WINTHROP CENTER:  
EXTERIOR WALL COMPOSITION









WINTHROP CENTER:  
**ENERGY CONSERVATION MEASURES**

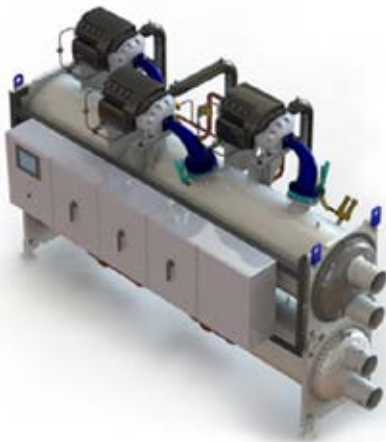
Winthrop's energy strategy is based on aggressive sustainability goals.



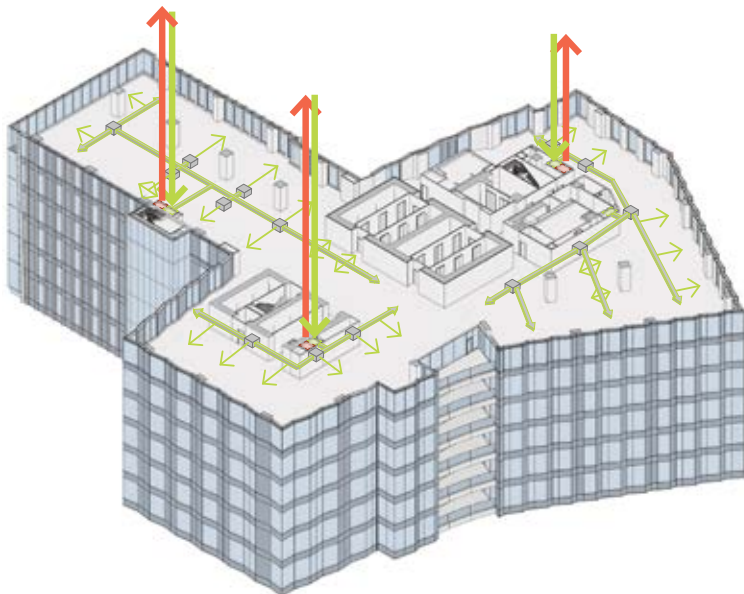
Triple glazing



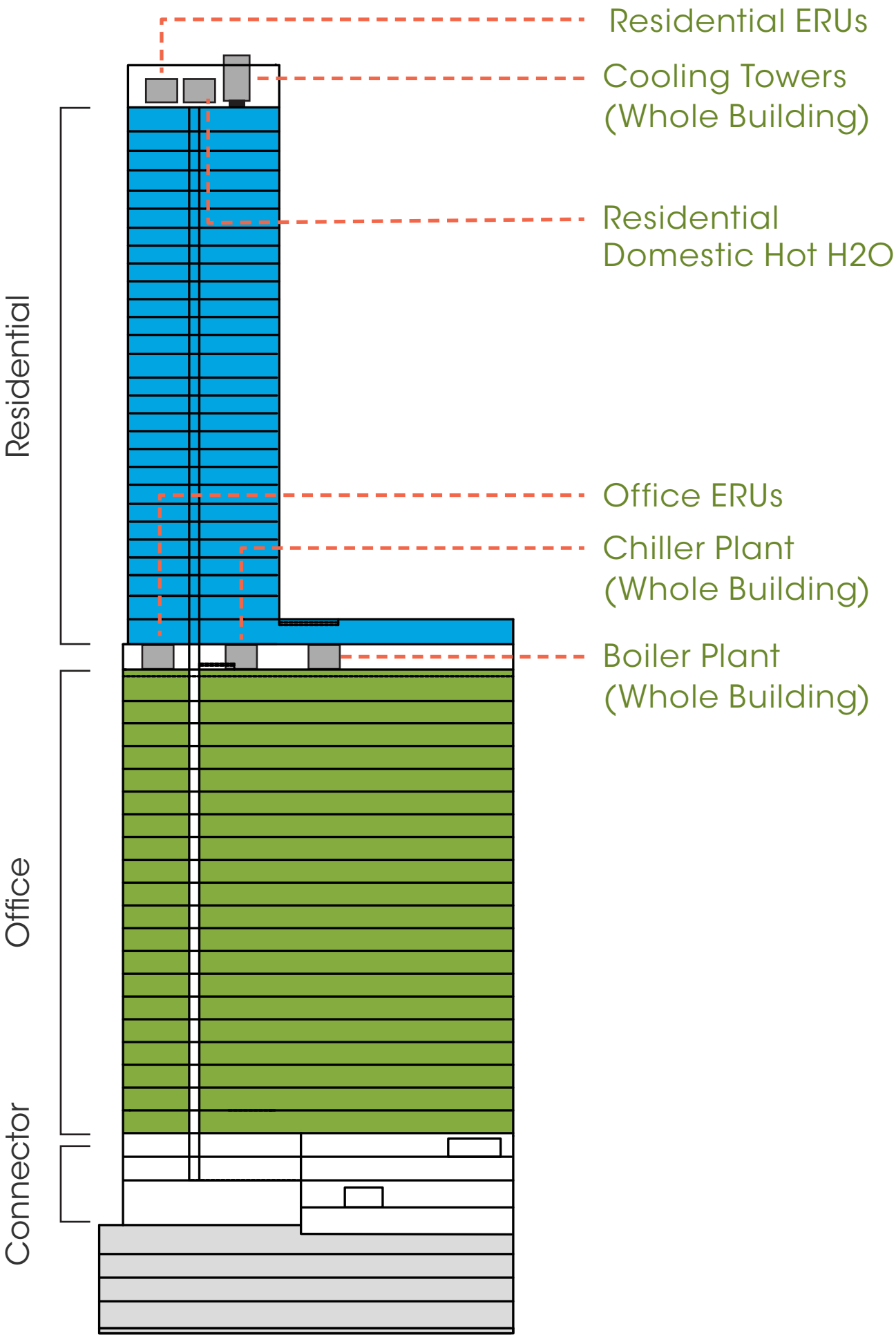
High-efficiency condensing  
boilers



High-efficiency magnetic  
chillers with variable speed  
compressors



Dedicated outside air ventilation systems  
with energy recovery and variable speed  
fans and pumps









PASSIVE HOUSE:  
A FLEXIBLE STANDARD



THE HOUSE AT  
CORNELL TECH  
STUDENT HOUSING

- Density: 1 pp / 385 GSF avg.
- Climate Zone 4
- Energy Budget:  
**38.1 kBTU/ft<sup>2</sup>/yr**

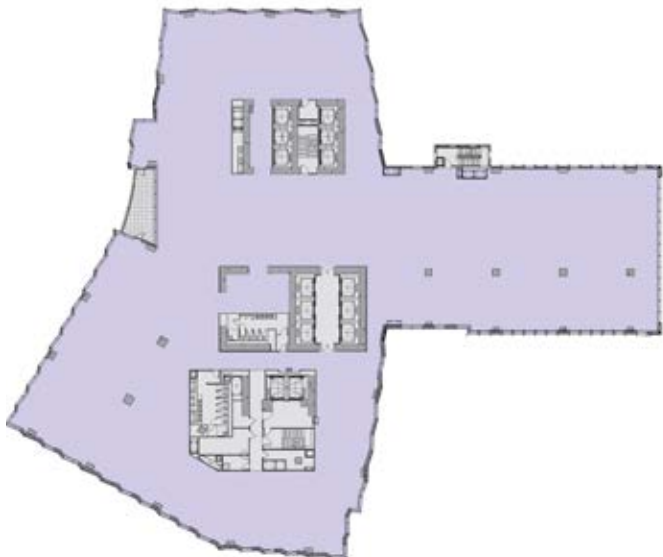
SENDERO VERDE  
MULTI-FAMILY  
AFFORDABLE HOUSING

- Density: 1 pp / 330 GSF avg.
- Climate Zone 4
- Energy Budget:  
Building A: **38.1 kBTU/ft<sup>2</sup>/yr**  
Building B: **48.1 kBTU/ft<sup>2</sup>/yr**



HARMONY COMMONS  
DORMITORY

- Density: 1 pp / 297 GSF avg.
- Climate Zone 6
- Energy Budget:  
**70.5 kBTU/ft<sup>2</sup>/yr**



WINTHROP CENTER  
OFFICE

- Density: 1 pp / 123 GSF avg.
- Climate Zone 5
- Energy Budget:  
**53 kBTU/ft<sup>2</sup>/yr**

Note: Energy budget is impacted by use, climate zone, etc.



PASSIVE HOUSE:  
A FLEXIBLE STANDARD



Facade: Mega-Panel Rainscreen

THE HOUSE AT  
CORNELL TECH  
STUDENT HOUSING

Component	Efficiency
Roof	R-50
Walls	R-19 Avg.
Windows	U-0.18
Slab Edge	R-10+
Cantilevered Floors	R-40
Glazing	23%



Facade: Masonry Cavity Wall & EIFS

SENDERO VERDE  
MULTI-FAMILY  
AFFORDABLE HOUSING

Component	Efficiency
Roof	R-40
Walls	R-20 Effective
Windows - Operable	U: 0.15
Windows - Fixed	U: 0.14
Cantilevered Floors	R-11
Glazing	21%

Reference: Typical NYC Exterior Wall is ~ R-12  
Typical Double Glazed Aluminum Window U ~ 0.45



Facade: Stickbuilt Rainscreen

HARMONY COMMONS  
DORMITORY

Component	Efficiency
Roof	R-40
Walls	R-30 Avg.
Windows	U: .13
Glazing	28%



Facade: Curtainwall

WINTHROP CENTER  
OFFICE

Component	Efficiency
Roof	R-30
Walls	R-18 Effective
Windows	Fixed U: 0.22 Effective
Glazing	45%



# SUSTAINABLE DESIGN LEADERSHIP TEAM



**Deborah Moelis FAIA CPHD**  
Principal

Deborah Moelis FAIA is a Principal and a founding member of Handel Architects. She has lectured extensively on the principles of Passive House design, including presentations at North American Passive House Network, AIANY, Greenbuild DC, nZeb in Wexford, Ireland and the International Passivhaus Institute conference in Vienna, Austria.

Ms. Moelis served as Principal in Charge for Sendero Verde, a 709-unit residential building in New York City, which opened in 2024 and is now the largest fully affordable Passive House building in the world. She also managed the design and construction of the Grand Street Residences, a 100% affordable development designed for Grand Street Guild on the Lower East Side; a second building is planned which will focus on seniors and will be Passive House, and she is leading that effort as well. Ms. Moelis served as Principal in Charge of Harmony Commons for the University of Toronto Scarborough, which is the largest Passive House dormitory in the world. She served in a similar capacity for Cornell Tech's residential tower in New York City, The House, which was the largest building in the world built to Passive House standards when it completed in 2017.

Previously Ms. Moelis managed the design and construction of Aire, a 42-story 315-unit residential tower on Manhattan's Upper West Side, as well as Millennium Place, a 256-unit residential building in downtown Boston. She has also led numerous teams through successful entitlement processes in New York City as well as Jersey City and Boston, MA. Ms. Moelis' projects have been extensively published and received numerous awards, including honors from AIANY, ULI, USGBC, and the Chicago Athenaeum.



**Louis Koehl AIA CPHD**  
Director of Sustainable Design

Louis Koehl is a Senior Associate and Director of Sustainable Design at Handel Architects. He is responsible for advancing the firm's mission of industry leadership in sustainable design by supporting strategic initiatives focused on aspirational goals. He serves as a resource to both the firm and the development community.

Mr. Koehl's projects at Handel Architects include Sendero Verde in East Harlem, the world's largest fully affordable Passive House building; Harmony Commons for the University of Toronto, the largest Passive House dormitory in the world; and Winthrop Center, a mixed-use project in Boston which includes 812,000 SF of Passive House commercial space, making it the largest Passive House building globally. He also worked on Sven, a LEED Platinum residential tower in Long Island City.

Current work includes two projects for Banco Santander, both of which will showcase groundbreaking approaches to sustainable design. Santander's Santiago Headquarters is designed to "open up" to the outside in order to reduce the building's reliance on active mechanical systems – and the fossil fuels that power them. And the Santander Tower in Miami will feature an external diagrid, resulting in a 30% savings in structural concrete.

Louis is a registered architect in the State of New York and a Certified Passive House Designer. He received his Master of Architecture from Columbia University after receiving his Bachelor of Arts in Architecture from the University of Kentucky.



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