The House

Cornell Tech

Team 19

THEHOUSE AT CORNELL TECH

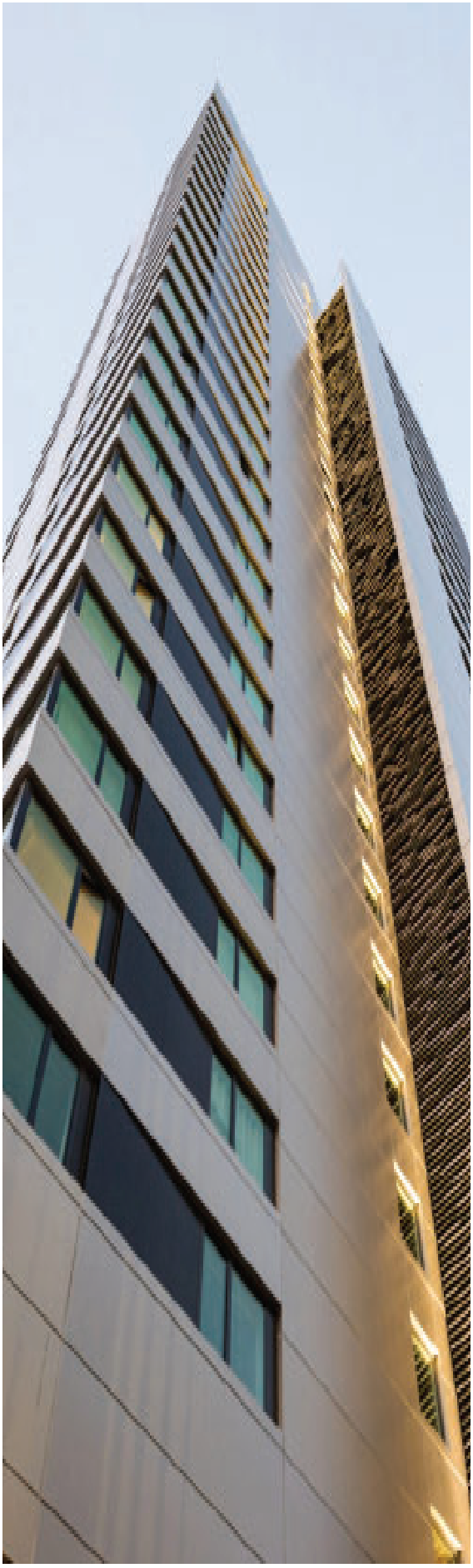
Building the World's Largest Passive House

EXECUTIVE SUMMARY

In 2011 Mayor Bloomberg announced a competition to develop a new engineering and research university. The 2009 recession had demonstrated the city's financial resilience and Mayor Bloomberg believed that diversifying the city's economy by strengthening the technology sector was necessary for its survival. "New York City has a history of planning for and investing in its future to ensure it will be brighter than its past. Today, we are looking far into the future once again, and launching one of the most promising economic development initiatives in the City's long history," said Mayor Bloomberg.

The winner was promised $100 million in capital contributions as well as city-owned land. Applicants selected from pre-determined sites in the Brooklyn Navy Yard, on Governor's Island, and Roosevelt Island. Out of seven formal proposals submitted from institutions around the world, a joint proposal from he Israeli university, of technology, Technion and Cornell University for a campus on Roosevelt Island won. "The development of the campus presents a new vision for how cities can evolve to compete in the new global economy. Starting today, we are going to put our plan to work, tapping into our extensive connections throughout the city and build a truly 21st Century campus to fuel the creation of new businesses and new industries throughout the city for decades to come." said former Cornell President David Skorton

The Cornell Tech Campus offers research and graduate degrees within the applied sciences and fields related to the technology sector. It aims to bridge research, entrepreneurship and business with a focus on developing technology in areas that have high commercial potential, particularly in New York's established sectors like finance, fashion and media. This focus is intended to accelerate the development of New York City's technology sector, increase the number of technology companies, and create more high paying jobs that will contribute to New York's economic prosperity. The first phase of the development includes the TATA Innovation Center, the Emma and Georgina Bloomberg Center and the House at Cornell Tech. Each of the three buildings in the first phase has a separate development team.



SITE HISTORY: ROOSEVELT ISLAND

COLONIAL PERIOD

1666: Island siezed by English Captain John Manning

1796: Blackwell House Constructed

INSTITUTIONAL PHASE

1825: Island purchased by the City of New York for $32,000

1829: Blackwell's Island Penitentiary constructed

1839: Municipal Pauper Lunatic Asylum opens

1856: Smallpox Hospital opens

1921: Blackwell's Island renamed "Welfare Island"

1927: Mae West sentenced to 10 days in the Women's Workhouse

1939: Goldwater Memorial Hospital opens

MASTER PLAN PHASE

1969: Johnson and Burgee Master Plan

1973: Welfare Island renamed Roosevelt Island

1984: Roosvelt Tramway Opened

1989: Roosevelt Island F subway station opens

CONTEMPORARY PHASE

2011: Cornell wins bid for Roosevelt Island site

2012: Franklin D. Roosevelt Four Freedoms Park opened to the public

2014: Goldwater Hospital Demolished, cleared for The House

2017: Cornell Tech, and the House open

2019: Verizon Executive Education slated for completion

Roosevelt Island is a 147 acre island located in the East River between Manhattan and Queens. In colonial times the island was farmed by the Blackwell family, who sold "Blackwell Island" to the city of New York in 1825. The city used the island for various institutional buildings, including a penitentiary, workhouse, an asylum and several hospitals. The penitentiary and workhouse had notorious reputations and were closed when Riker's Island opened in the mid 1930s. In 1939 the Goldwater Memorial Hospital opened on the Island's southern end, on the site formerly occupied by the penitentiary.

Following the opening of the Welfare Island Bridge from Queens, Mayor John Lindsay began rethinking the island's potential. In 1969, Philip Johnson and John Burgee developed a mixed use masterplan for 20,000 residents, envisioning the island as a mixed-income, car free neighborhood with landscaped plazas and promenades. Roosevelt Island's main thoroughfare is Main Street, a mixed use commercial alley that runs north to south. After decades of somewhat sleepy development, the island is currently in a phase of transition, as much of the affordable housing that was part of the Mitchell-Lama program expired and new market rate condominiums and rental buildings have come up in the Island's "Southtown".

Roosevelt Island is home to around 14,000 people. Administratively, the Island is part of Manhattan's Community Board 8. Some public services are provided by the city of New York and others, including public safety and the tramway, are administered by the Roosevelt Island Operating Corporation.

PROJECT SUMMARY

Cornell and Technion's winning proposal focused on creating a 24/7 center of innovation. Central to this vision was a commitment to sustainability, with promises for all of the buildings to be LEED Certified. A residential building for students and faculty was planned for the first phase of the campus' development to anchor the new community being built. In keeping with the campus' foundational ideas, Cornell and its developer partners Related and Hudson sought to push the boundaries of sustainable building. The House at Cornell Tech is built to passive house standards, the most rigorous green building standards. Passive buildings are highly energy efficient, using 70-80% less energy than their counterparts. The facility is proudly the world's first passive high-rise. The House at Cornell Tech provides a tangible demonstration of eco-conscious living and has sparked renewed interest in Passive Houses, paving the way for this important innovation to be more widely adopted.

SITE PLAN

At the time of Cornell Tech's inception, the footprint of the future campus still housed an abandoned healthcare facility and had little attractive space. The site itself presented unique challenges in terms of physical layout and the trouble associated with working across a body of water. The Island's sole vehicular access is via a bridge to Queens and the Island only has one main road, making transportation of construction material difficult to manage. Complicating the situation further, three new buildings were constructed simultaneously, requiring coordination across several projects. To help manage truck traffic and prevent construction from restricting the Island's internal roads, barges from Brooklyn were deployed to move much of the heavy, bulky material and supplies. This effort was managed by Cornell staff, and included the coordination of crane pickups for short, 500-800 feet, deliveries. To facilitate multiple parties in need of literal tons of material, the project required a full-time delivery manager and logistic supervisor to ensure that installers were kept in supply.

With the side-by-side construction of multiple buildings, another consideration lied in how soil was dealt with. As the campus plans on expanding, a concise landscape master plan was developed to detail where and how to dispose of excavated earth. In order to most efficiently carve the topography of the island into its final form, crews moved without handling aggregates twice. This mastery allowed for the ground to transform as rapidly and efficiently as possible, setting the tone for future students of the campus.

"We hope that this boundary-pushing development will serve as a living lab and enduring inspiration to the community of next-generation problem solvers who will live within its (well insulated) walls." David Kramer, Principal of the Hudson Companies.

DEVELOPER'S VISION

After winning the competition, Cornell and Technion began operating out of Google's Manhattan space in 2012 as the campus on Roosevelt Island was being developed. Cornell's vision for their Roosevelt Island campus re-imagined the site as a 24/7 center of innovation. Central to that vision was providing immediate, move in ready housing to students and faculty upon the campus' opening. The passive house is for graduate students, faculty and staff. The House at Cornell Tech offers 272,500 SF of residential space divided across 352 units.

In its RFP, Cornell stressed three main goals:

- *Maintaining affordability*
- *Creating a development that would match the campus' innovative and entrepreneurial spirit*
- *Demonstrate a commitment to sustainability and a desire to create a tangible demonstration of eco-conscious living*

The bold decision to develop the world's tallest Passive House building reflects the campus' deep commitment to sustainability and innovation. Beyond the sustainability benefits, the House is meant to serve as an hub of collaboration and a proper home for its hard-working students.apartment comes furnished with custom, well-designed pieces that reflect the transiency of the students and help ease move. said David Kramer, Principal of the Hudson Companies. The building features world-class amenities such as collaborative indoor and outdoor spaces as well as extensive communal resources like a fitness center and rooftop.

The developer's approached the building as a market-rate development in terms of finish and amenities, with deep thought given to the different needs of graduate students. Each apartment comes furnished with custom, well-designed pieces that reflect the transiency of the students and help ease move.

DEVELOPMENT TEAM

The bid to develop the House was won by the following consortium of development, design and construction partners:

Cornell

Cornell launched an RFP process to find developers and partners for the first phase of the campus' development. The first phase included the construction of housing for graduate students and faculty. Ultimately, Cornell chose Hudson and Related to lead development of the campus' first residential building.

The Hudson Companies

Hudson was founded in the late 1980s and has built over 64,000 residential units with 5,000 more in development since its founding. They have experience in affordable housing, market rate and institutional housing. A leader in sustainability, Hudson developed the first LEED platinum certified mid-rise homes in New York City. Since 2007, over 90% of Hudson's buildings have achieved some level of LEED certification.

Related Companies

The Related Companies is an international and privately owned real estate firm. Founded by Stephen M. Ross and headquartered in New York City, Related has been involved in many of the most important large scale, recent developments in the city. From the Hudson Yards, to the development of the Cornell Tech Campus, Related works across asset types, from affordable housing, to luxury condos and mixed use development.

Handel Architects

Handel Architects is an architecture and interior design firm that was founded in 1994. Handel Architects has a deep sustainable design practice and works across scales, from stand alone buildings, to corporate headquarters, and has also been involved in urban infrastructure and master planning projects. They are committed to designing buildings that contribute to local communities and serve as catalysts for positive urban and social change.

MARKET ANALYSIS

While Cornell was to some extent dealing with a captive population, the competitiveness of the New York City rental market meant that they'd have to deliver an affordable and high quality product to entice graduate students to live on campus. Cornell, municipal and philanthropic contributions also made it possible to offer modern furnished units with quality amenities at a fair cost. A comparison of annual rental rates of The House and the Manhattan and Queens neighborhoods adjacent to Roosevelt Island is demonstrated in the following table:

Annual Average Rent	Studio	1 Bed	2 Beds	3 Beds
The House	$1,775	$2,250	$3,000	$3,750
LIC	$2,471	$3,086	$4,496	$7,076
Hunters Point	$2,467	$3,089	$4,486	$6,737
Lenox Hill	$2,475	$4,091	$5,917	$7,485

"The residential building is a critical piece of Cornell Tech's ability to attract the best talent by creating a 24/7 community of graduate students and faculty, with outstanding on-campus residential facilities that complement the leading-edge academic environment,"

Dean, Dan Huttenlocher

Once completed in 2036, the Tech campus will need to support 2,000 students and hundreds of faculty and staff. The zoning amendment application documents indicate that Cornell plans for two distinct phases of construction, each with academic and housing elements. The House proposed 442 total units, with 271 for faculty and 171 for students, on a gross floor area of 300,000 square feet. This translated into 536 total beds1 for faculty and students. The 352 actual units are split into studio, one, two, and three-bedroom arrangements. The amenities offered are competitive with more expensive, nearby units. The House was built to accommodate future housing need projections, meaning that during its first few years of operation it may not achieve full occupancy. Nonetheless, the building has been able to capture two-thirds of its current target population. Cornell Weill Medical and Cornell's College of Architecture, Art and Planning have also signed leases to reserve a certain number of units for their respective students.

The project is part of a wave of increasing deliveries of energy-efficient constructions, which are driven by a 2005 New York City law tying LEED certification to city subsidies. Figure shows that while delivery of LEED-certified buildings is increasing (largely a result of the 2005 requirement), delivery of LEED-platinum buildings has remained stagnant. The House is one of 45 LEED-platinum certified buildings in New York City, representing 3% of total Platinum-certified gross floor area. The House also realizes Cornell Tech's and NYC Economic Development Corporation's goal to set an example of sustainability. The financial backing for construction costs, coupled with the ground lease offering made achieving Passive House standards a possibility. With a total stock of over 1 million structures there were only 72 Passive Houses permitted buildings in New York City, 28 of which are currently under construction or planned.

PLANNING AND ENTITLEMENT ISSUES

Project Site
Rezoning Area (Special Southern Roosevelt Island District)
Study Area Boundary
Residential
Residential with Commercial Below
Industrial and Manufacturing
Transportation and Utility
Public Facilities and Institutions
Open Space and Outdoor Recreation
Parking Facilities
Vacant Land

The Cornell Tech Campus was aided in navigating the planning and approval process by its prior experience negotiating with the city. Mayor Bloomberg's enthusiasm for the project also helped smooth the often complex entitlement process. Nonetheless, there were a number of legal changes that had to be passed by the city to allow the development to come to fruition.

"Cornell Tech is an investment in the future of New York City, a future that belongs to the generations to come, and the students here will help build it."
-Mayor Michael Bloomberg

Ownership

The majority of the site was owned by the City of New York and occupied by the Coler-Goldwater Hospital and Nursing Facility; the remainder was owned by the city of New York and leased to the RIOC (Roosevelt Island Operating Corporation). The city leased its portion of the site to Cornell and helped negotiate a ground lease between the city, Cornell and the RIOC for the remaining acres.

Rezoning

New York City has a multi stage approval process. Ultimately the development petitioned the city planning commission for:

-A text amendment to establish the Special

-Southern Roosevelt Island District

-Zoning map amendment to rezone the site from R7-2 to C4-5

-Amendment to the city map to establish a new street

-Disposition of City-owned property

Historic and Cultural Resources

The Goldwater Hospital Complex had been deemed eligible for listing on the State/ National registers of historic places. Cornell worked with the NY State Office of Parks, Recreation and Historic Preservation (OPRHP) and Landmarks Preservation Commission (LPC) to work to preserve the WPA murals and prepare documentation- including photographic, historic plans and historical narrative pieces. Cornell agreed to develop a digital media display about the murals, include plaques or historic markers and prepare a report to submit to OPRHP and the LPC.

PLANNING AND ENTITLEMENT ISSUES

Community Relations

Following announcement of the site selection on Roosevelt Island, Cornell and the city began meeting with local groups to address the impact of the campus. A community and construction task force was founded to address ongoing issues during the planning, construction and current operational phase. Parking, service provision, construction timelines, construction trucking, access to the campus and public space and ensuring community benefits were the most widely debated topics. Given Roosevelt Island's unique conditions and limited road infrastructure, residents were concerned that the influx of construction related vehicles would result in massive gridlock. In response, Cornell agreed to limit construction to 9-5 Monday-Friday and make use of barges to transport many materials. As part of the negotiations, Cornell Tech made further specific commitments to the community, such as developing programing for the Island's middle school and working with the senior and disabled populations living on the Island.

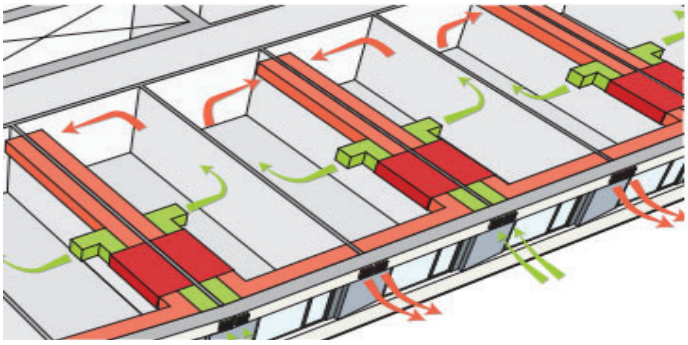
Although Cornell Tech was widely supported by the administration and many civic and business groups, the local community reception has been more muted. During city hearings community members expressed frustration with the lack of specificity of Cornell's commitments and the potential disturbances that construction would wreak on the Island's limited infrastructure. The campus is being developed adjacent to a community and a city that has been undergoing its own transition, as the housing affordability crisis deepens and more neighborhoods face gentrification.

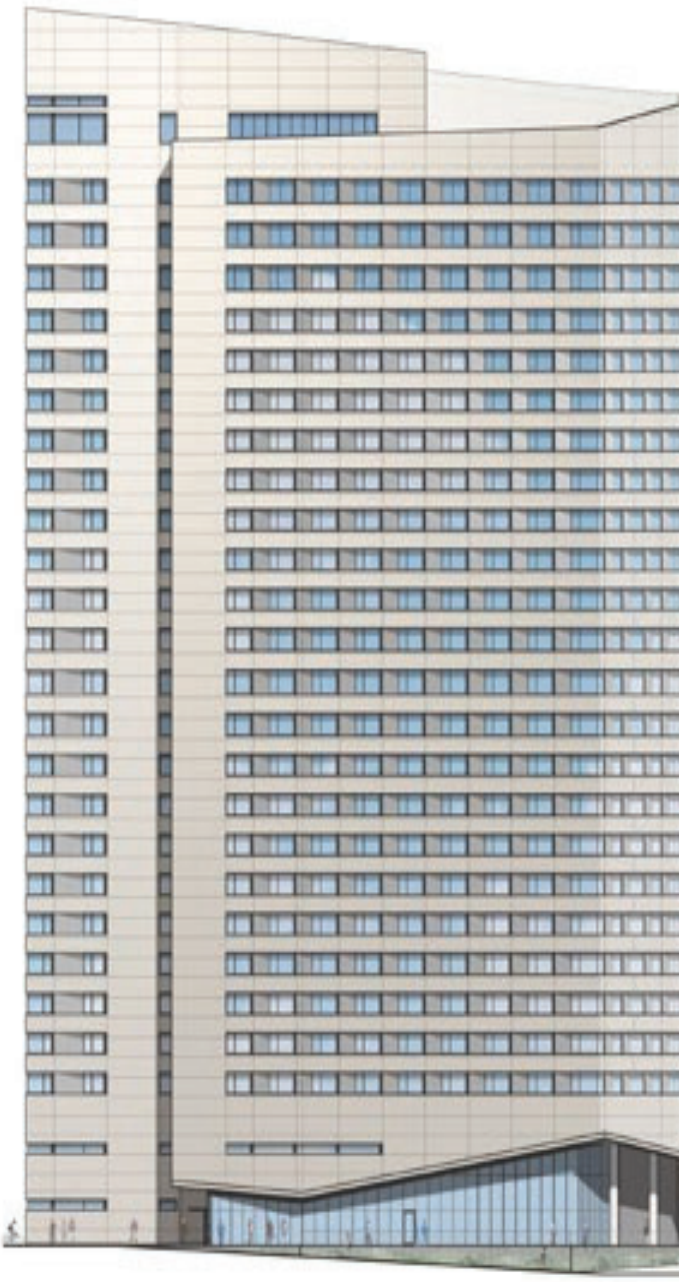
DESIGN & FEATURES

Sustainable building techniques require much more than aggressive insulation and efficient appliances. For a space to use as little energy as possible, full attention to detail on every aspect of the project is required. Recognition on passive design entails the collaboration of every team-member involved.
With regenerative energy at the forefront of design requirements put forth by the University, every component of this building's mechanical system has been detailed for efficiency.

On top of stringent functional features, which maintain a comfortable environment inside, an exterior skin works to capture energy and insulate the building from the harsh NY weather.

By orienting the narrow helm of the building on an East-West axis, direct sunlight bisects the building façade in warmer months, while the southern elevation captures the low-lying sun during winter. This allows for passive heat to be added into living spaces from windows exposed to southern sunlight. On top of this, to redirect unwanted heat, a color-changing paint reflects light by migrating between silver & champagne tones.





South Elevation

In order to achieve the Passive House certification, every connection in the building was scrutinized so that little to no space would allow for air penetration. In another departure from traditional construction techniques, The House utilized modularized wall panels for the exterior of the building. This allowed for both faster assembly onsite, and a high level of control over typical weak points in a building. The various teams worked together to make sure that everyone understood that finished walls were not to have material set against them in order to avoid puncturing the building envelope, and for every hole to be mended immediately. Although cumbersome and incredibly difficult, these efforts paid off. The building was found to have four times the air tightness mandated by Passive House standards.

PROJECT FINANCING

The House's total project cost was $117 million, as part of a total Cornell Tech cost estimate of $2 billion. Cornell Tech's development generated significant excitement and interest within the philanthropic community. Indeed, one of the reasons Cornell beat out Stanford and other applicants was the University's success at leveraging its alumni community in New York City to solicit donations.

Around $750 million was donated, with large donations from Charles Feeney of Duty Free Shoppers ($350 million), Irwin Jacobs, founding chairman of Qualcomm ($133 million), and Bloomberg Philanthropies ($100 million). As part of the competition prize, NYC contributed an additional $100 million for construction and the land that the campus sits on, offering it to Cornell Tech as a 99-year ground lease for $1 per year. The ground lease provisions allow for Cornell to purchase the land at the end of this period.

For equity, Cornell partnered with developers Hudson Inc. and Related Companies to create joint venture Hudson Cornell Residential JV LLC, in which Cornell controls 86.59% of financial interest in the company. The provisions of the ground lease with the city of New York prohibited renting to groups not affiliated with Cornell. Normally, these kinds of provisions make it difficult for developers to obtain traditional financing. However, Cornell's equity stake and excellent credit allowed the group to get traditional construction loan financing from Wells Fargo at good terms. The construction loan of $105 million was secured after the building was nearly completed. Hudson Companies Principal David Kramer stated, "We spent the equity funding first so we have a building that's already topped out… The construction loan happened after the building topped out which is the first time in our [30-year] history that that's happened."

Aside from construction costs, other hard costs include the cost to remediate the ground (the undisclosed cost was amortized into cost of the ground lease), as well as the cost to demolish the Goldwater Memorial Hospital ($55,364). Construction costs to achieve Passive House standards were increased an estimated 5%-6% above a standard construction,numerous "on-the-fly" innovations were developed to keep costs for the project manageable.

Given these facts, it can be assumed for this project that hard costs were likely slightly higher than average. On the other hand, the coordination with city agencies likely brought soft costs below average for a project of this magnitude.
The following table estimates capital uses:

	Estimated Total Cost	% Total Cost
Hard Costs	$87,750,000	75.00%
Soft Cost	$29,194,636	24.95%
Demolition	$55,364	0.05%
Total Cost	$117,000,000	

Cornell Tech reports that in the first year of leasing, The House was rented by 30 professors and 300 students. Rates start at around $1,275 per person, per month, representing a current monthly revenue of at least $420,750. Still below capacity, this figure is expected to continuously grow through the next phase of campus development and beyond. Having Cornell as an equity partner provides a backstop on rent, allowing for housing with such amenities to be provided at a lower than average price point. According to the Passive House Institute, The House is likely to enjoy a 60%-70% reduction in utility costs.

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OPERATIONAL ISSUES

Due to the nature of this sophisticated project and the systems used within its walls, maintenance staff have an unusual challenge. With condensers behind the massive vertical louver on each floor, and air filtration systems in each apartment, there is a constant effort to prevent breakdowns and mechanical faults. Special training is required for staff repairing potential flaws in the state of the art facility, and finding staff capable of this sophistication requires an extra level of dilegence.

The House's successful construction required deep levels of teamwork and collaboration. Passive certification relies on maintaining the integrity of the facade. This required special work and care from everyone working on the project. The building also required more field testing and inspections, Steven Winter Associates, the sustainability consultants, were largely responsible for on site inspection.

EXIT STRATEGY

Hudson Companies, Related Companies, and Cornell are waiting for the property to stabilize to determine the best method of permanent financing. The House is different not only because of its cutting edge environmental engineering, but also for its emphasis on amenities and communal living. There is an inherent risk in doing something different, but the House provided the developers with a unique opportunity to test out a concept in a lower risk environment. Their success at deploying this new technology is paving the way for others. Indeed, project architects Handel are currently working on an affordable passive house development for New York City's Housing, Preservation and Development Department (HPD).

The House must also be considered in its present state as a long term investment. Conditional to the site's ground lease, the House must serve its purpose as a dormitory for the 99 year lease term. Currently, the House captures two-thirds of Tech students seeking housing. Students are not required to live at the House, so the fact that it is able to capture the majority of the market is a testament to its appeal. During its first semester the House achieved 75% occupancy, which is encouraging considering the Tech campus will grow and the demand for housing will increase.

"New York City is positioned to become the new technology capital of the world"- David Skorton

DEVELOPMENT IMPACT

In an interview with The New York Times in 2011, former Cornell President David J Skorton said “New York City is positioned to become the new technology capital of the world”. The creation of Cornell Tech is undeniably a critical part of making Skorton’s vision a reality. When Cornell entered the bidding process for Roosevelt Island, they promised to construct a residence hall that would consume as little energy as possible. The House makes good on that promise. Becoming the new technology leader of the world requires a built environment that is as technologically advanced as the companies that seek to inhabit it. The House represents the spirit of New York’s drive to become a global tech leader, and Cornell’s pledge to be amongst the most sustainable universities in the world. Already a number of prominent tech companies have set their sights on New York City. Just this Fall Amazon announced that Long Island City in Queens was selected as a new HQ2 site and reports have surfaced that Google intends to expand its New York workforce by over 8,000 people. Indeed, recent reports indicate that New York City officials took Amazon executives on tours of Cornell Tech to help woo them to Queens., a stone’s throw from Roosevelt Island. New York City Mayor Bill de Blasio lauded the new campus saying ““As we work to keep New York City a leader in the 21st Century economy, we celebrate the opening of the Cornell Tech campus and the opportunities it opens up for our city and our people”.

The building’s sustainable features will produce 882 tons of CO_2 fewer than similar buildings, which equates to the carbon filtering capabilities of over 5,000 trees. Environmental benefits aside, The House responds to recent trends in campus housing. Increasingly, dorms have become more than just a place to sleep and shower, they are now designed with an emphasis on community.

The House captures this community feel with its rooftop barbeques, common room, fitness center, and numerous lounges. The building also provides residents with 24/7 concierge service in the lobby. These kinds of amenities, many of which originated from the hotel and hospitality industry, are becoming more common, not just in campus housing, but in multifamily residential developments in general. The House’s abundance of collaborative space is a central component of its design. Students with different skill sets are able to come together and share ideas within spaces at their disposal. This kind of collaborative atmosphere can function as an incubator. The Tech campus has already launched over 40 startups. The campus is expected to produce more than 500 spin off companies over the next 30 years.

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