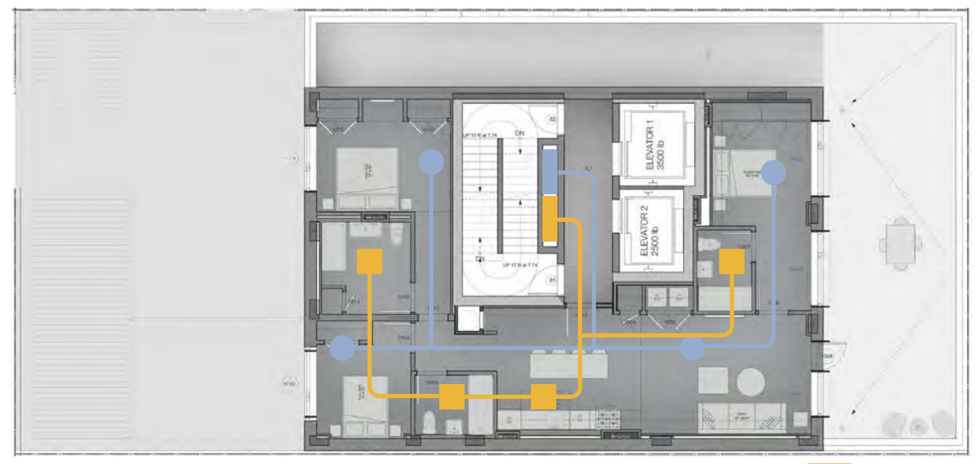
FLOW Chelsea

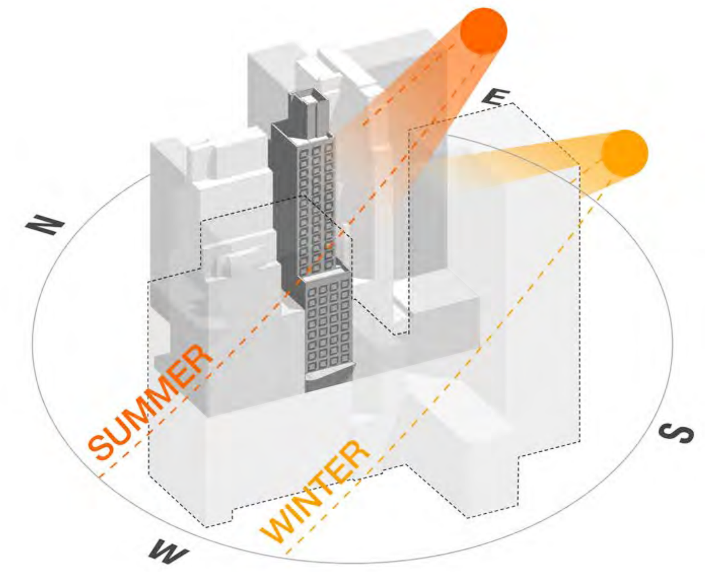
NYC TALL PH
URBAN INFILL

CLIMATE ZONE 4
WARM-TEMPERATE

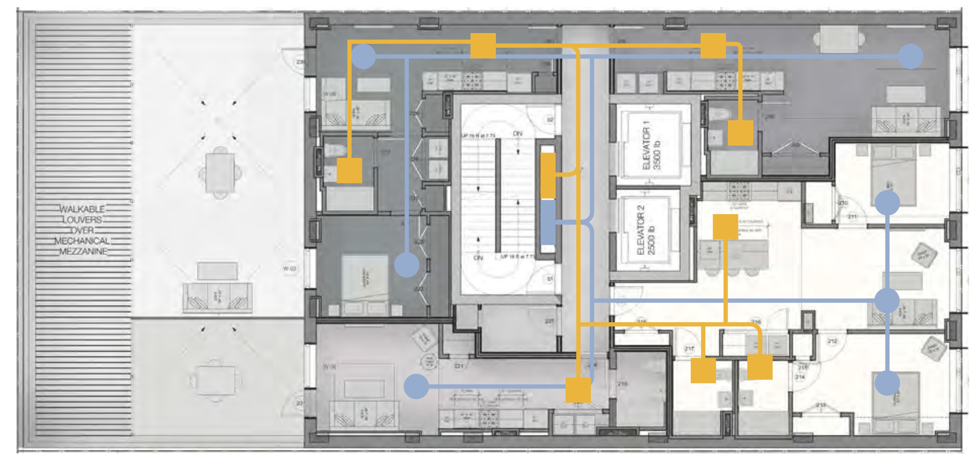
BUILDING SITING & LAYOUT



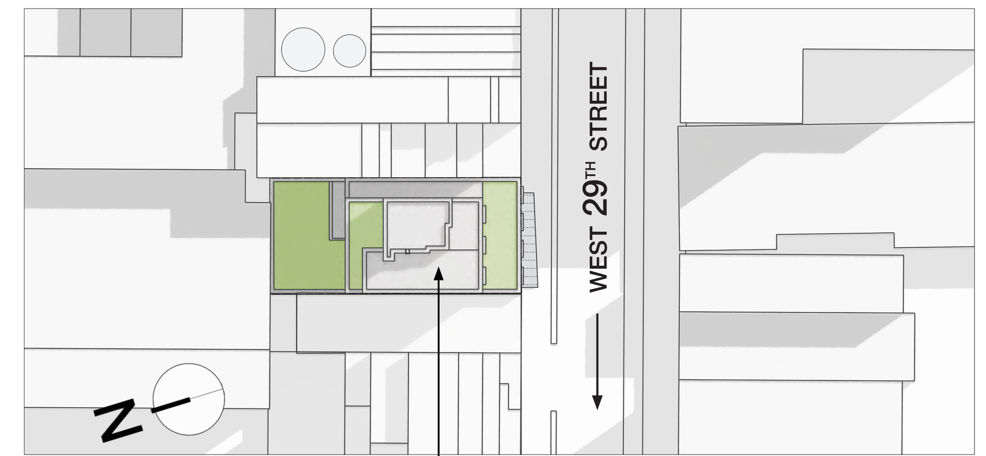
TYPICAL FLOOR PLAN AT SETBACK — SUPPLY — EXHAUST



BUILDING SITE



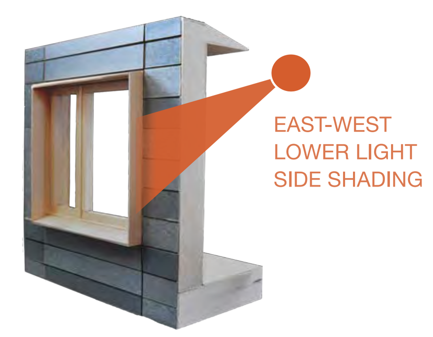
TYPICAL FLOOR PLAN — SUPPLY — EXHAUST



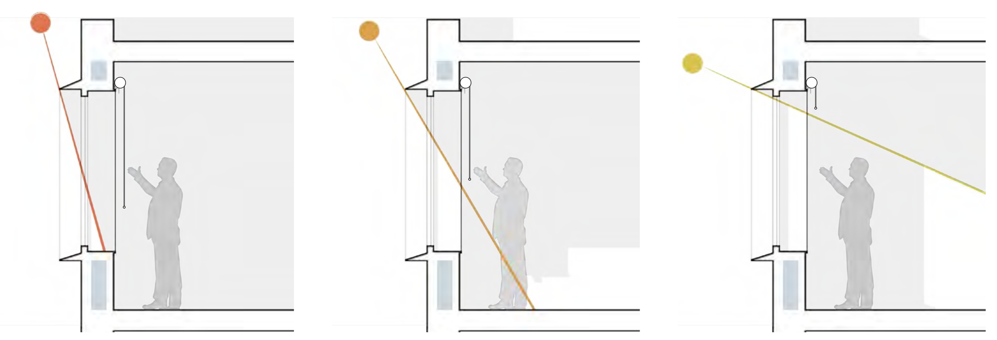
SITE PLAN — FLOW Chelsea

INTERNAL HEAT GAINS - SOLAR SHADING STUDIES

IR IMAGE OF BUILDING ENVELOPE



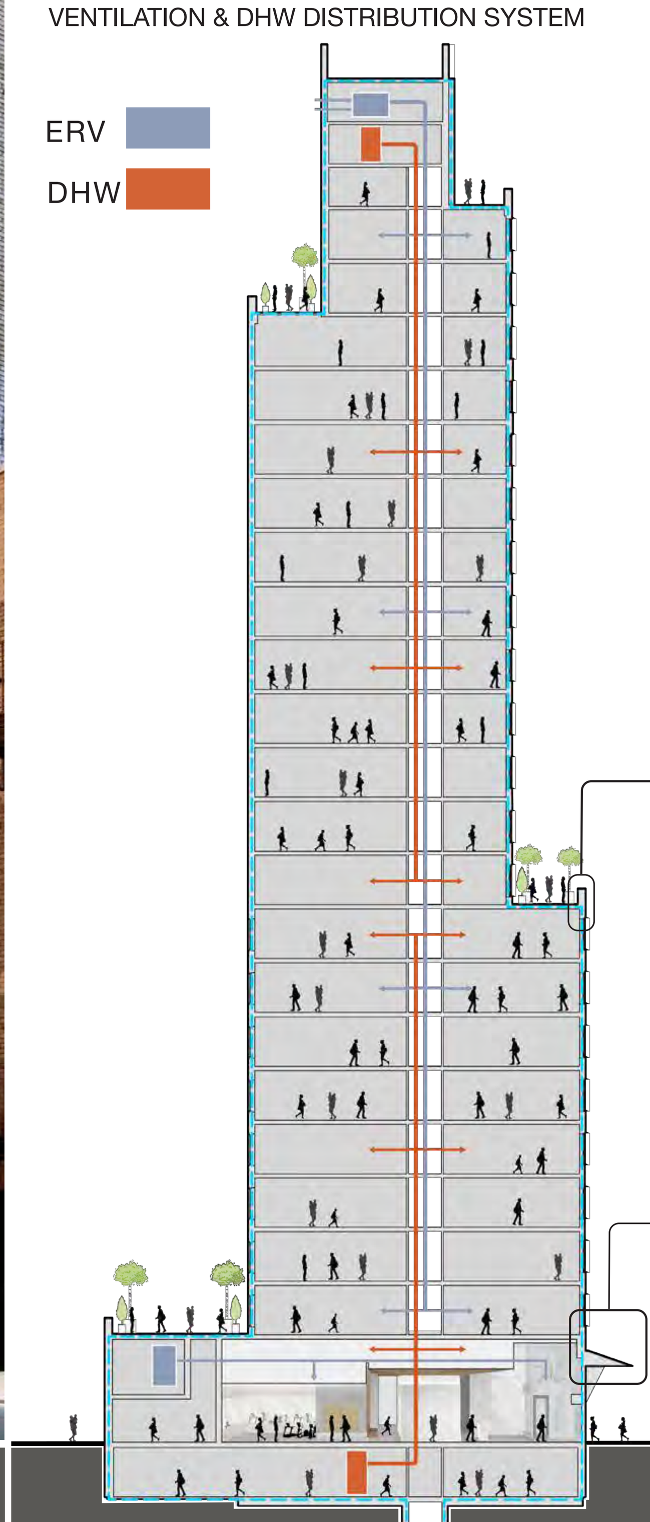
SHADING STUDY MODEL

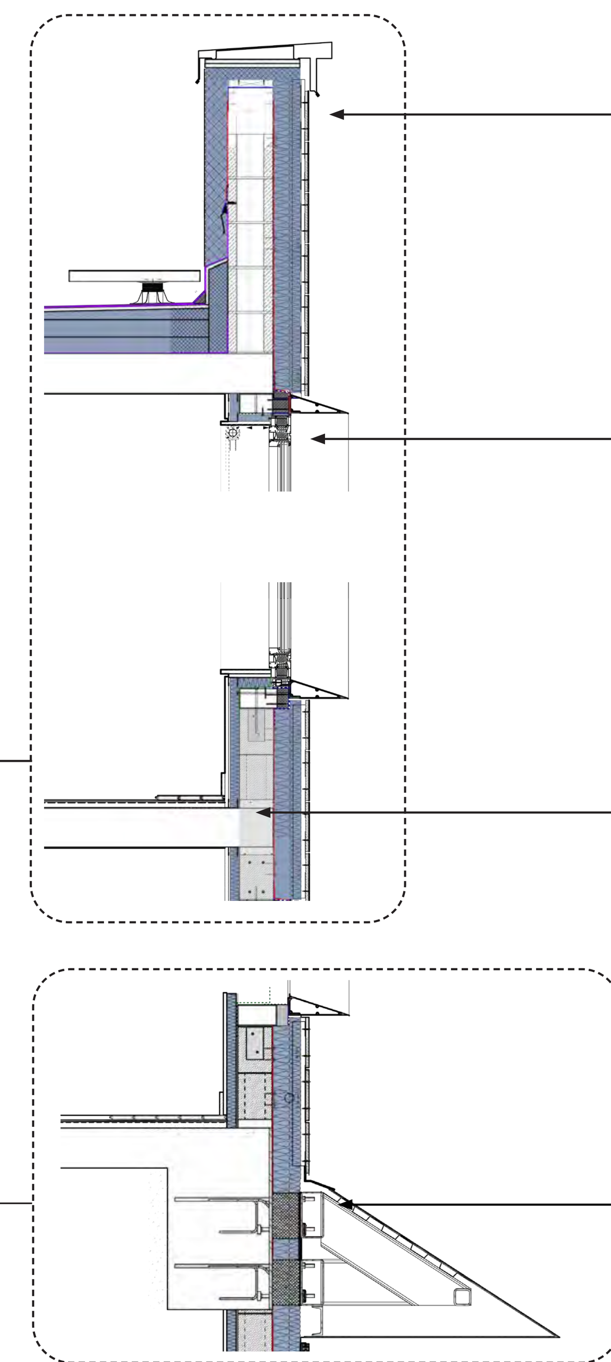


SUMMER AUTUMN WINTER

ENVIRONMENTAL PERFORMANCE FEATURES

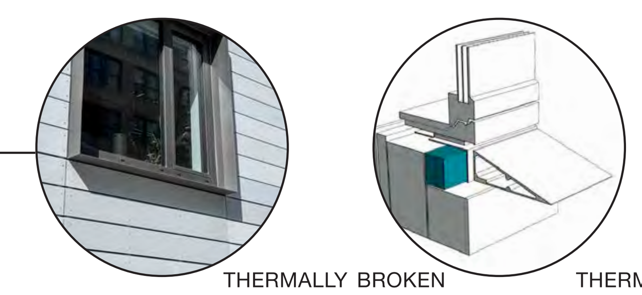
VENTILATION & DHW DISTRIBUTION SYSTEM





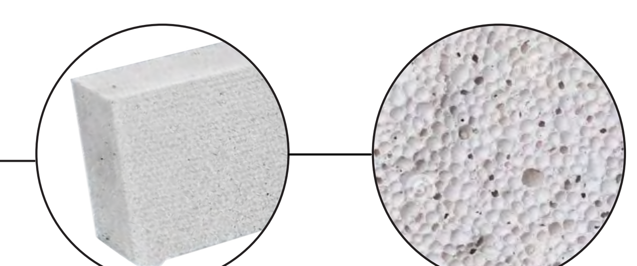
MINERAL WOOL & VENTILATED RAINSCREEN SYSTEM

THEMALLY BROKEN UNI STRUT INSTALL DETAIL OF RAINSCREEN



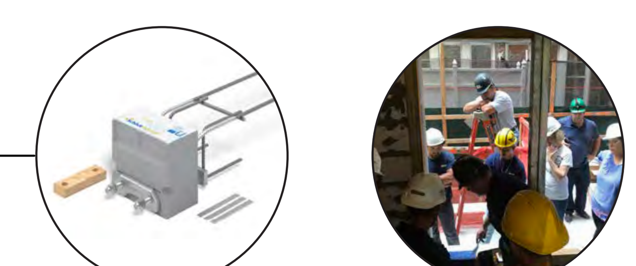
THERMALLY BROKEN EXTERNAL SHADING ELEMENTS

THERMAL BREAK MINIMIZING THERMAL BRIDGING FROM METAL SUNSHADE



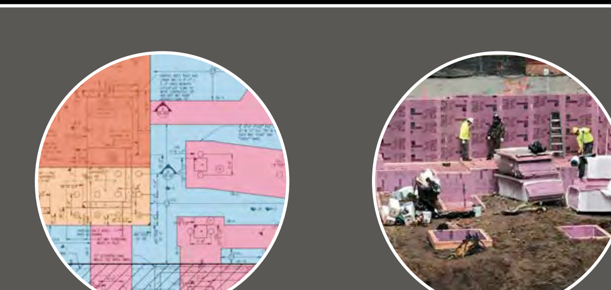
'AAC' AERATED AUTOCLAVED CONCRETE BLOCK

DETAIL OF CELLULAR STRUCTURE



THERMALLY BROKEN SHADE AWNING

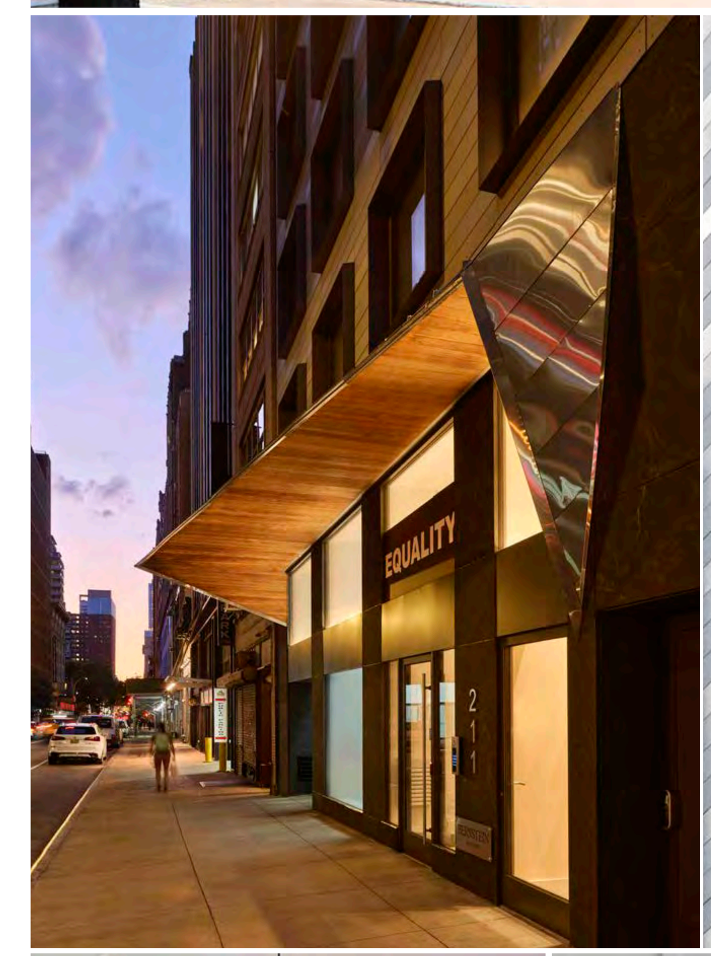
MOCKUP OF EXTERIOR ENVELOPE

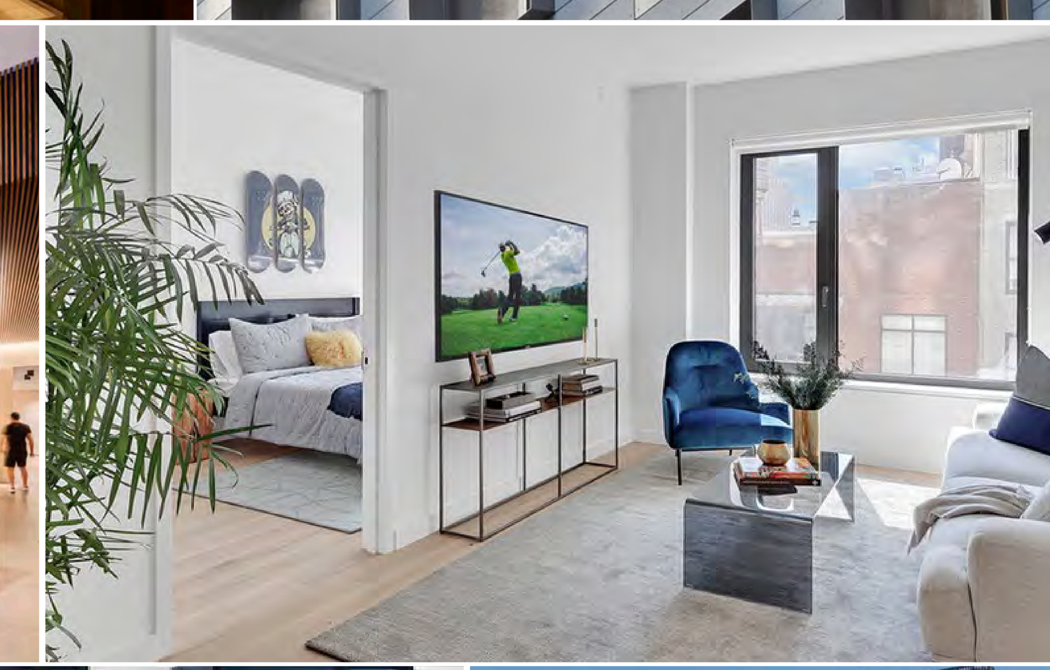


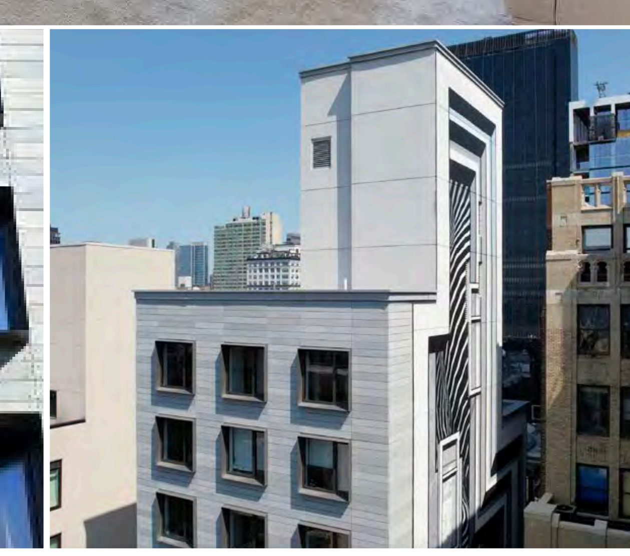
FOUNDATION INSULATION DIAGRAM

INSTALLATION OF SUB-GRADE INSULATION

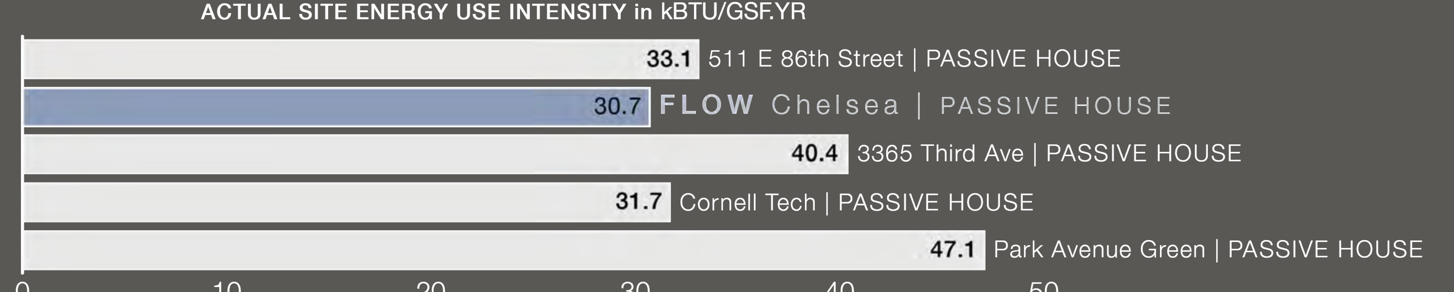
HIGH PERFORMANCE VERNACULAR







ACTUAL SITE ENERGY USE INTENSITY in kBTU/GSF.YR



NEW YORK STATE OF OPPORTUNITY. Buildings of Excellence Award Winner

Certified Passive House Passive House Institute classic

In New York City, where buildings account for over 70% of carbon emissions, our goal for "Flow Chelsea" at 211 West 29th Street was to set a new sustainable architectural benchmark. Our partnership with Bernstein Real Estate (BRE) was grounded in a mutual ambition to redefine urban sustainability standards, by adhering to Passive House criteria. BRE also chose to provide affordable housing to reflect NYC's economic diversity. With tools like the Passive House Planning Package (PHPP) and Therm at our disposal, and iterative design revisions, we could fine-tune each element of our design. Specific focus areas included ERV efficiency, Variable Refrigerant Flow (VRF) heat pump performance, appliance energy consumption benchmarks, commercial ventilation controls, lighting control efficiencies, and intricate detailing of window/cladding attachments and glazing properties. This iterative approach enabled us to tackle site-specific complexities adeptly, merging technical and design elements into a unified final product.

Site Conditions - PHI Climate Zone: Warm-temperate and Southwest Orientation

The local climate of this site (PHI Climate Zone: Warm-temperate) presents distinctive challenges in adhering to Passive House standards. With high cooling and latent loads in the summer due to humidity and significant heating loads in winter, multiple elementrequired careful balance in the design process. Unlike a greenfield site which offers flexibility in building size and orientation, this project is situated on a tight, single-access infill lot with fixed Southwest orientation. Urban settings necessitate considerations for neighboring structures that cast shadows and create specific site needs. The design addressed existing site shading complexities that result in substantial shading during low winter sun and exposure to high summer sun, potentially increasing cooling demand and overheating risks. These conditions are exacerbated by the elevated internal gains typical of dense multifamily projects. Additionally, the site's location was tagged with a Little E designation which mandates measures to mitigate the noise from street traffic.

Urban Infill Site & Detailing

Careful attention was paid to the facade and fenestration. Shading elements were designed to balance heat gains in the winter while minimizing cooling demand and overheating in the summer. An optimal glazing-to-wall ratio was established after multiple thermal performance simulations, balancing daylight needs with thermal efficiency. A wrap-around brow was implemented for all southern-facing windows, acting as an external shading mechanism which is significantly more effective than interior shading. Iterative design and energy modeling was done to optimize the depth of this shading element for all seasons. Exterior detailing is critical in PH projects to achieve thermal bridge free construction. All window and cladding attachments were designed using advanced thermal modeling to ensure zero thermal bridging. An added challenge was to meet the client's request to maintain light and air for their neighboring building to the East despite the less advantageous form factor that this necessitated. This resulted in the team working through PHPP to slightly improve the envelope and window thermal performance to balance the impacts of this exposed Eastern wall. The application of polyiso insulation at the foundation was used to mitigate thermal loss and safeguard the interior from water vapor penetration. Though the ideal scenario involves insulating the entire foundation, the construction of Flow Chelsea on pile foundations restricted the insulation to certain extents. By utilizing XPS with a R-value of 5.6 per inch, we succeeded in achieving a weighted average U-Value of .462 for the foundation. Lastly, specific to NYC and other large dense cities is the high value of space where every square inch counts. To maximize space we chose to use AAC block instead of CMU which provides a higher assembly R-value with less overall wall thickness. ACC Block also provides better acoustic performance, better fire performance, and lower embodied energy than conventional CMU or metal frame.

Primary Energy

Passive House Primary Energy Demand limits are challenging to meet in Multifamily Buildings for a number of reasons. High unit density results in a large number of residential appliances and higher internal gains from the density of occupants. High rise construction also requires energy intensive elevators, large pumps, code requirements for robust egress lighting, and long service runs for centralized equipment. The design team leveraged their experience to address these challenges in the following key areas:

- The domestic hot water (DHW) system is typically a major portion of primary energy demand in a multifamily building and challenging to reduce to meet the Passive House demand limits. Rather than use an expensive heat pump hot water heater to reduce demand, the team was able to carefully design the DHW system to minimize piping and provide thorough insulation, thus reducing the primary energy consumption of this system and meet the certification requirements.
- Careful selection of appliances, equipment, lighting, and controls was also critical to meet primary energy limits of multifamily construction; even a slight change in residential appliance energy use has a significant impact on overall consumption. An example of this is omitting ice makers in freezers throughout.
- To reduce energy use from ventilation we installed a CO2 sensor and damper in the gym which activated when the gym was in use, drastically reducing the overall CFM and energy usage.

Addressing Internal Gains and Overheating

The design team took advantage of the flexibility of the Passive House Standard to address the inherent internal gain and overheating challenges of the project in a cost-effective manner through the following strategies:

- Fenestration and shading were carefully designed to balance heat gains in the winter while minimizing cooling demand and overheating in the summer.
- DHW systems are not only a major factor in Primary Energy demand, the distribution of hot water can also result in serious overheating if not carefully designed. Normally this would not be considered in detail during design of building massing and apartment layouts, but the design team carefully coordinated between architecture, structural, and MEP to create the most efficient plumbing and services layouts possible. This minimized the amount of piping and waste heat in the building, reducing the cooling demand and overheating rates.
- The ERV system was selected to provide the best efficiency possible for the large units required and designed to minimize ducting between the unit and the building to improve efficiency.
- Operable windows were integrated into the design and maximized in size and ease of use to encourage natural ventilation by occupants.
- HVAC system - Because most of the apartments had a single exposure (north or south) we selected a HVAC system that was able to internally balance the refrigerant flow.

Resiliency

Another advantage of passive house design is that the building is so well insulated and sealed for airtightness that in an event of a power outage and the loss of cooling or heating in extreme outdoor temperatures the building and apartments will remain comfortable for a much longer period of time allowing the tenants to ideally stay in their homes in a short term emergencies. Flow Chelsea will also contribute to its own energy production, and is in the process of designing a 16KW array for the bulkhead and rooftop.

Actual Energy Usage Data

A review of Flow Chelsea's Energy usage during 2021 showed a typical Site EUI of 30.7 Kbtu/sf/yr. Recent benchmarking data shows that median site EUI for multifamily residential buildings in NYC is 82 kbtu/SF/Yr, showing that Flow Chelsea performs significantly better than typical construction.

High Performance Vernacular

The design team aimed to integrate various technical and performance factors into a unified, cohesive design. We were lucky to have clients who valued both aesthetics and performance. Given the performance-driven nature of Passive House standards, crafting a striking envelope and interior spaces necessitated a distinct design process. Early in the process, daylight and material studies were initiated to establish parameters for our high-performance envelope. Several design iterations were explored, albeit some did not align with budget or design expectations. This process culminated in a High-Performance Vernacular, a design language tailored for the local climate and specific needs, harmoniously blending optimal form factor with architecturally striking spaces and facades. This vernacular seamlessly incorporates performative shading and integrates high-performance details into a sleek, modern aesthetic. "Flow Chelsea" stands as a pioneering example in NYC, blending rigorous technical design with sustainability and aesthetics, and serves as a replicable model for future urban developments.