

PASSIVE HOUSE CASE STUDIES

211 W 29TH & 511 E 86TH NEW YORK, NY



OVERVIEW

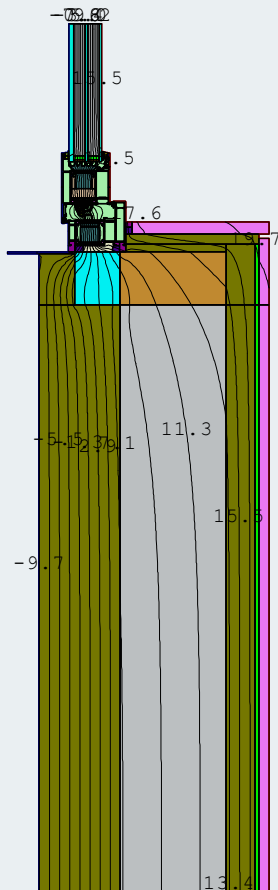
211 West 29th (right) and 511 East 86th (left) housing developments appear to apply a prototypical Manhattan mid-rise, mixed use, mixed affordability typology with contemporary design. The single setback and deepened punched window facade of 211 West 29th takes on a more minimal approach, while 511 E 86th expresses a more varied series of setbacks and materiality across the facade. While these two projects' facades and form may vary, it is in fact their similarities that make them stand out among the sea of buildings in NYC; they are both Passive House (PH) certified. This means air tightness and insulation are prioritized, affording lower utility cost and operation carbon footprint, better indoor air quality, reduced street noise and better overall standard of living for its occupants. All these aspects positively affect the occupants but don't directly express themselves through the architecture. From a design and construction execution standpoint, each building had its own developer and architect but used the same design energy consultant, construction company and window manufacturer. This afforded both the design team and construction teams to share lessons learned and expertise between projects.

DESIGN CHALLENGES

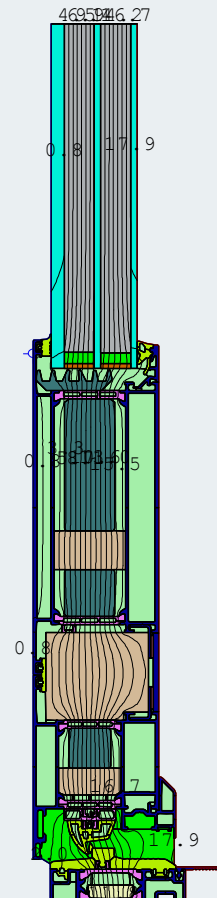
The implementation of Passive House enclosure design starts by adding more insulation, increasing the efficiency of the windows, introducing appropriate thermal breaks and ensuring all fenestrations are air tight. While these are crucial to the overall approach, they introduce a whole other host of complex issues for the building, from too much solar heat gain to moisture getting trapped in unwanted places. These aspects are complicated by having to consider the implementation of a standard and practice that was born in Europe but also needs to adhere to federal, state and local code requirements. This situation underscores the need to have building systems holistically considered through upfront design, modeling and manufacture consultations to ensure that the design can be executed to meet Passive House standards and mitigate these risks.

DESIGN SOLUTIONS – ENVELOPE DESIGN

As with many aspects of architecture and tectonics, it is the connection between elements that is most challenging. The center of glazing and center of an opaque wall are where you'll find the best insulation and thermally separated conditions. However, the glazing to its frame and the frame to the wall rough opening are most challenging to manage thermal bridging and condensation. For 211 West 29th, the facade above the ground level deploys a repeating punched windowed rain screen with a series of building setbacks, which affords consistency in design detailing and installation. This architectural feature allows for the energy design consultant and window manufacturer to model window frame thermal simulations and fine-tune solar heat gain coefficient in a relatively efficient way for both typical and atypical conditions. Through this analysis it was determined the project would be required to have a 0.121 U-value and 0.5 SHGC performance ratings. On the 511 East 86th project, a slightly more articulated punched windowed, rain screen facade was implemented with a series of terraces, then balconies at the upper floors. The balconies proved to be the most challenging part of this facade because of the required thermal separation of the slab between the balcony and dwelling. In addition, the requirement for an ADA kick plate necessitates an increase in the door frame width, resulting in an increase in thermal bridging at this condition. Similar to the first project, thermal and solar simulations were used to fine-tune the project requirements, which ended up being 0.15 U-value and 0.33 SHGC performance ratings. The simple comparison of the two projects reveal an inverse shift for the U-value (0.121 to 0.15) vs SHGC (0.5 to 0.33) giving a glimpse into the project specific calibration of the window thermal performance and solar heat gain to best suit occupancy comfort and building performance.



211 WEST 29TH THERMAL DETAIL



511 EAST 86TH THERMAL DETAIL

511 E 86TH PROJECT TEAM

ARCHITECT
Arquitectonica

CLIENT/OWNER
Sky Management

INSTALLER
Ext-Tech LLC

CPHC
Steven Winters Associates

WINDOW SUPPLIER
Schüco USA LLLP

GLASS SUPPLIER
Guardian Glass



511 EAST 86TH FACADE

DESIGN SOLUTIONS – ENVELOPE INSTALLATION

Because of the high performance standards that Passive House requires, designing, specifying and simulating the project's various conditions is only part of the process. Ultimately, the drawings and models are not Passive House Certified but the buildings are. As with many aspects in construction, there are varying degrees of required precision, craftsmanship and implementation of designed systems. While Passive House elevates the overall construction of buildings, there are still few conditions that require more precision and expertise than the installation of window frames and the glazing within the frame. This is where the window manufacturer's hands-on, in-the-field training can make the difference, so the project can be done efficiently and correctly the first time, as the blower door test tells all.

WHAT WE LEARNED

When working on two of the first large scale PH buildings in NYC the list of items learned along the way is extensive, but through this process a few stood out. First is having the ability and willingness to teach the other collaborators and stakeholders on the project. The reality is PH is still a relatively nascent idea in the US, and being able to not only answer questions when asked, but prompt questions that others might not know to ask because of the deep technical nuances associated with PH. Secondly is being able to leverage technology and thermal simulations as early in the design process as possible to help mitigate risk and prove out the project can be delivered to meet PH requirements. This relies on open lines of communication between the architect, energy consultants and window manufacturer.

WOULD DO AGAIN

The use of custom facade systems and windows is often intriguing from an architecture perspective because this allows for the most flexibility when developing the design of a project facade. From a PH perspective proven systems are not only a requirement but in many cases best practice as they implement a system which has been iterated and tested many times over when compared to custom systems. Both of these projects use the same off the shelf Passive House certified windows, doors and curtain wall systems, showcasing the ability to have varied architectural and facade expression while implementing a tested system. The use of these standard systems also afford both the design and construction team access to the deep knowledge of how a product has been designed and can best be used.

WOULDN'T DO AGAIN

As many of us know in the AEC industry, a project can have many stakeholders, designers, engineers, contractors, and supply chains that all need to seamlessly feed into the execution of a project. The relative efficiency of the execution of the project relies heavily on each party having a deep knowledge of their craft but also a broader knowledge of the process. While PH popularity has been growing in the US, the important technical expertise needed may be found in some segments of the design and construction teams. However, it is not safe to assume that all parties have the required training and certification needed to deliver a PH project. Being aware of these shortcomings early in the process can help avoid delays and ultimately increase the efficiency of project delivery.

211 W 29TH PROJECT TEAM

ARCHITECT
Zakrewski + Hyde Architects

CLIENT/OWNER
Bernstein Real Estate

INSTALLER
Ext-Tech LLC

CPHC
Steven Winters Associates

WINDOW SUPPLIER
Schüco USA LLLP

GLASS SUPPLIER
Guardian Glass



211 WEST 29TH FACADE