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The Bellwether—A Passive House Tower Renews a Public Housing Campus



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Abstract

This study examines issues and opportunities around The Bellwether, a 52-story tower located in a 1960s public housing campus in Manhattan. It is the first of the New York City Housing Authority's "NextGen" program, where perimeter sites are being leased to the private sector to spur mixed-income development. The Bellwether incorporates about 400 apartments and an outward facing, non-profit athletic facility. Its design skillfully inserts a slender tower in a "left-over" triangular parcel and in doing so, creates a network of improved open spaces on the campus. About to start construction, the project is planned to be the world's tallest Passivhaus tower. The Bellwether is emblematic of the type of creative planning and design needed to repair and elevate these challenged conditions, resulting in a smarter, greener, better integrated, more efficient and more humane city.

Keywords: Affordable Housing, Density, Passive Design, Vertical Urbanism

Introduction

It is vitally important that, as cities grow and mature, they not only grow outward into entirely new districts, but also repair, renew, and reinvent the less-successful legacy developments closer to their cores. In many cities, especially those in North America, post-WWII social housing projects have had an outsized, adverse impact on the greater physical and social fabric. As has been widely discussed, the application of the "towers in the park" paradigm to social housing has been problematic, resulting in monocultures of class, race, typology, and a general bleakness, disconnected from the vitality of a re-emergent center-city. However, new forms of high-rise, high-density infill housing can improve these challenged "superblock" conditions by providing equitable and highly sustainable growth and reconnecting these campuses to the larger context, presenting opportunities for compelling uses, urbanism and tower design.

NYCHA—Social Housing in New York

The trajectory from the idealism of the early European modernist social housing models (e.g., Ville Radieuse, Weissenhof Siedlungen) to the large-scale American production of the 1950s and '60s (e.g., Pruitt-Igoe, Cabrini-Green)—tainted with a whiff of racial engineering and certainly with profiteering—is well-documented (see Figure 1). In North America, large public housing developments, employing "towers in the park" planning paradigm in large isolated campuses, are now widely discredited. Indeed, there is an established movement to replace them. However, where other cities have razed these types of housing developments, New York City has retained its enormous public housing stock. The New York City Housing Authority (NYCHA) provides homes for over 400,000 people—about the population of the State of Vermont—in 2,413 buildings, on 325 campuses.

NYCHA's mission is to increase opportunities for low- and moderate-income New Yorkers by providing safe, affordable housing and facilitating access to social and community services. While admirable in its scale, NYCHA's deteriorating and isolated campuses have not lived up to the agency's mission.



Figure 1. Visual comparison of Plan Voisin, 1925, by Le Corbusier (left) and NYCHA Housing (Alfred E. Smith Houses, 1953) (right). © Fondation Le Corbusier (FLC-ADAGP) (left), © Microsoft Bing Maps (right)

Today, a trio of pressures is impacting the status quo of these developments:

1. The pressing need to maintain and improve the existing building stock.

The age of the average NYCHA building is about 60 years, and 70 percent of the portfolio was built prior to 1970. Due to the vagaries of public funding—including a steep four-decade decline of the proportion of NYCHA’s operating budget derived from federal funding, from 70 to 10 percent—there is a chronic lack of maintenance. According to the STV-AECOM Physical Needs Assessment (2017), NYCHA faces US\$31.8 billion in unfunded capital improvements for building envelope, infrastructure, and interior fit-out over the next five years. Due to rapid deterioration, that figure grows to over US\$45 billion over the next 20.

The costs figures are only a single measure of the burden the aging, poorly maintained buildings have on the residents, the community, and environment. Leaking pipes and roofing create ongoing chronic mold infestations. In 2015, 171 children in New York City public housing tested positive for elevated lead, spurring greater scrutiny and testing. Chronic mismanagement has led to the residents’ deep distrust of the Authority, which will undoubtedly frustrate attempts to improve the status quo. In addition, the complexes have failed to keep pace with energy modernizations, and represent an outsized contributor to the city’s greenhouse gas emissions.

2. The pressing need to increase the productivity of these properties for additional affordable housing.

To ease the crisis in affordability facing New York, Mayor Bill de Blasio’s housing plans call for the preservation of 200,000 units and construction of an additional 80,000 new units over a decade. These 80,000 units—housing the population of the equivalent of Kansas City—will require many development sites: a challenge in a crowded and expensive city. As part of their efforts to clear this hurdle, the administration is facilitating private development on properties owned by NYCHA. The existing NYCHA

complexes are generally well-situated in relation to transit and services. However, despite their height and imposing presence, these campuses are generally less dense than their surroundings. They are “underbuilt,” and with the increase of surrounding real estate values, are therefore a highly attractive resource.

3. The pressing need to make these properties more resilient to storms and other effects of climate change.

Many of these complexes were built near the waterfront, replacing the block-pattern neighborhoods whose residents worked in the nearby waterfront-centered industrial areas. Of the 325 NYCHA campuses, 71 fall within the 100-year flood plain, exposing their vulnerable population to storm risk. Many are also in areas that have poor air quality and are heat-vulnerable, due to locations near highways, heat-island effects, and other local ecosystem conditions.

Infill Development: A Critical Part of the Solution

Focused private development on the NYCHA properties can simultaneously address all three pressures outlined above. The De Blasio Administration has determined that 12.5 percent of its new affordable housing goals can be achieved on NYCHA infill sites, and has initiated a program, dubbed “NextGen NYCHA.” In addition to sheer numbers of new units, there are significant ancillary benefits to the policy. Building new mixed-income housing (50 percent market and 50 percent subsidized) dilutes the monoculture of class found in existing developments. Infilling buildings in gaps around the perimeter of these campuses breaks down their insular nature, creating connections to the surrounding contexts. New, service, and community-oriented ground-floor uses are created. Implementation of forward-looking, high-performance standards such as Passive House results in lower bills for the tenants and lower overall carbon emissions.

Undergirding this approach is a clever financial design. Valuable perimeter sites are leased to private-sector developers for 99 years. The market-rate units partially subsidize the affordable



Figure 2. Rendering of The Bellwether. © FXCollaborative



Figure 3. The Bellwether will transform underutilized land and integrate into the existing campus fabric through its massing, landscape, and most significantly, its community programming. © FXCollaborative



Figure 4. Podium ramp and playing field at The Bellwether resolve its positioning on-site and provide a welcoming face to the neighborhood. © FXCollaborative

housing and the community uses. The balance comes from other generally available incentive and financing programs for affordable housing. An associated advantage is that a private developer, freed from large bureaucratic constraints, operates and maintains the newly created affordable units. Finally, the lease payments are earmarked for helping to bring the existing campuses into a state of good repair. According to its own plan the Authority anticipates that US\$300–\$600 million will be generated by the NextGen NYCHA program.

Despite its many benefits, the infill strategy has some significant challenges. While the campuses are underbuilt, they were conceived under a zoning paradigm tailored to towers-in-the-park planning. The proposed developments generally need some form of discretionary approvals, including waivers to height and setback regulations. In addition, any form of new development in dense urban areas faces the headwinds of normal concerns of change, loss of light and air and green space. These are amplified and politicized by the residents’ deep-seated distrust of the Authority, including fears of ulterior motives such as displacement.

Even with these challenges, the infill approach stands up to comparison with other strategies. Some housing advocates and urbanists have argued for sweeping tear-down-and-rebuild schemes for the campuses. There are many advantages to this approach, including more densification and the opportunities for better site planning and urbanism. However, with the vast majority of the NYCHA building stock still able to be productive—albeit with significant investment—the costs (and embodied energy) of replacement are significantly higher. (It is worth noting that if repair is not carried out over the next decade and buildings continue to deteriorate, this calculus is likely to change.) Socially, infill has the distinct advantage of keeping anxious and skeptical residents in place, within their communities.

NYCHA issued Requests for Proposals (RFPs) for the first two in its infill “NextGen” housing program in 2016. Not surprisingly, the selected campuses were in neighborhoods with high land values, making them attractive to developers: one in Brooklyn and one in Manhattan.

Holmes Towers

The Manhattan NextGen site is located at the John Haynes Holmes Towers, in the Yorkville section of the Upper East Side. The 2.8-acre (1.1-hectare) campus is located between 92nd and 93rd Streets on the east side of First Avenue. Just to the north is the neighboring NYCHA Isaacs Houses, which shares services and common facilities. The campus is bordered on the south and west with a typically Manhattan eclectic mix of brownstones, mid-rises, and towers. The area has seen a recent spurt of growth due to the opening of the long-delayed Second Avenue subway line.

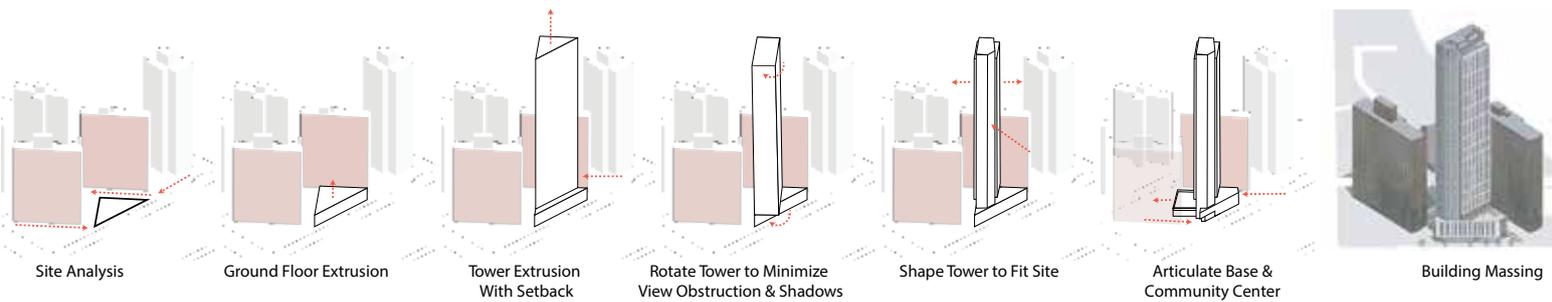


Figure 5. The building massing strategy positions the new tower centrally between its predecessors, while adding street frontage. © FXCollaborative

The Holmes Towers campus includes two 25-story slab-form buildings containing 537 apartments, a community center, and ample open space featuring playgrounds and mature trees. The site planning is typical of the towers-in-the-park paradigm, with the towers offset from the surrounding street grid by 45 degrees. The undistinguished buildings were completed in 1969. The complex is currently facing approximately US\$35 million in unfunded deferred maintenance to bring it to a state of good repair.

Prior to issuance, NYCHA's staff met extensively with Holmes Tower residents and gained consensus on the specific development location within the campus, overall design goals, and community desires for new facilities. Three sites were reviewed for the tower location, resulting in a selected site on the south edge of the campus, facing 92nd Street. This selected site had the advantage of preserving both the residents' views of the East River and a large triangular green space at the prominent First Avenue corner. However, a playground was located on the selected site, which will be replaced in a new location. The community also identified the desire for a new indoor and outdoor sports facility.

Fetner Properties, an established local developer-builder with several residential towers in the immediate neighborhood, assembled a team and led the creation of a design to respond to the RFP. The team included design architect FXCollaborative, executive architect SLCE, MEP consultant Cosentini Associates, landscape architect Starr Whitehouse, and sustainability consultant Vidaris. The design proposal, named The Bellwether, incorporated a careful site-planning approach, a robust recreational facility, and commitment to Passive House standards. These features, coupled with an attractive financial offer, allowed Fetner to win the rights to develop the site. For NYCHA and the residents, the developer selection process featured unprecedented community engagement, including 23 resident meetings, over 1,000 notices, and more than 400 face-to-face resident engagements.

Program

The new tower will be 50 stories and contain 340 new apartments, 50 percent of which will be market-rate and 50 percent of which will be subsidized and earmarked for households earning 30 to 60 percent of the area's mean

household income (AMI). Also planned is 10,000 square feet (929 square meters) of interior and 4,000 square feet (372 square meters) of exterior residential amenity spaces.

Critical to Fetner's successful offer is the inclusion of 14,500 square feet (1,347 square meters) of both a new playground and an on-site 18,000-square-foot (1,672-square-meter), state-of-art recreational and community center. The facility will be operated by Asphalt Green, a well-established local non-profit. Asphalt Green opened in 1984 a block away from the Holmes Towers, on the site of the former Municipal Asphalt Plant, with its distinctive parabolic arch design (designed by noted skyscraper architect Ely Jacques Kahn). It provides high-quality sports, swim, and fitness instruction and programs to children and adults of all skill levels, from the first-time exerciser or new swimmer to elite athletes training for the Ironman competition. The Holmes project offers Asphalt Green an ideal location to expand its services.

Also central to the offer is the commitment to build to Passive House standards. When completed, The Bellwether will be amongst the tallest, if not the tallest, Passive House-certified building in the world.

Design

The design of The Bellwether enhances the existing superblock campus, strengthens connections to the neighborhood, and creates an elegant tower on the skyline.

The architectural concept starts with a triangular footprint, creating three distinct adjacent spaces (see Figure 2). To the west, a corner entry court addresses both the street frontage and the existing, tree-lined diagonal walkway, as well as establishing a setting for the residential entrance. To the east is a similar space that faces the eastern walkway, creating a forecourt for Asphalt Green (see Figure 3). Running along the edge of the building and animating the walkway is an inviting ramp leading up to a raised playfield. On the north side, outside of the footprint of the tower above, is the half-sunken gym capped by the raised playfield (see Figure 4).

Filling out the triangular footprint is a four-story base (see Figure 5). In its design, every measure has been taken to create a contrast with the existing campus' preponderance



Figure 6. The rear of the podium features a multi-purpose recreational field.
© FXCollaborative

of vertically-extruded building forms, which had resulted in an overly rigid separation between public/private and green/building. With The Bellwether, green spaces are intertwined with the architecture. The public is invited onto the raised space. Light, luminous materials are employed. Corner lobbies with large expanses of clear glass dissolve the barrier between interior and exterior. By virtue of its uses and architectural treatment, the base conveys a civic and extroverted character.

Rising out of the base is the tower, a thin “slab” set perpendicular to the existing buildings and 45 degrees from the street grid (see Figures 6 and 7). Its placement and configuration results from both interior requirements of an efficient double-loaded corridor with no inside corners, and the external pressures of maintaining distances from the existing buildings, critical to sustain the light and air that the tower-in-the-park paradigm promises. In addition, great care was taken to minimize the impacts to the existing residents’ views by orienting the long aspect of the slab away from their windows. The result is an elegant, slender profile, especially at the building’s “prow” facing the building entry.



Figure 7. Typical floor plans of The Bellwether, from bottom to top: cellar, ground floor, second floor, and typical tower floor. © FXCollaborative

To further subdivide and tailor the form, the *parti* incorporates a composition of planes and volumes. Planes clad in light silver-colored metal panels surround a central volume, separated by a series of copper-colored reveals. The planes have a vertical window pattern and appear to float above the base. Augmenting the window pattern is an asymmetric pattern of copper-colored “shutters,” which add visual interest to the composition. They also amplify the impression of the amount of glazing, which has been limited to 20 percent of the façade to assist with Passive House energy goals. The copper-colored highlights serve to anchor the building to its neighbors, while the luminous silver panels lighten the presence of the building in its surroundings (see Figure 8).



Figure 8. Typical façade detail of The Bellwether. © FXCollaborative

Landscape

The landscape design transforms the NYCHA Holmes Towers campus into an amenity-rich landscape benefitting all the residents and welcoming the community at large (see Figure 9). Dreary, paved areas are re-envisioned as verdant promenades and plazas. The two main tree-lined walkways traversing the site are transformed into vibrant and leafy social spaces, enhanced with new, hand-set pavers, comfortable benches, and new under-story plantings. The walkway on the southwest corner connects residents of the new building diagonally towards the Second Avenue subway station. The pathway east of the new construction is defined as a recreation-oriented promenade, providing direct access to the new Asphalt Green community recreation center, with a generous ramp up to the second-level sports field. New benches enhance this space, along with play sculptures located under the existing trees. New playgrounds are evenly spread out across the site, so all residents have a playground near their apartments.

Sustainability and Resiliency

Robust sustainability and resiliency strategies are essential to the conception of The Bellwether (see Figure 10).

Central to this approach is the objective of an ultra-low-energy building that will achieve Passive House certification through the international Passive House Standard (PHI). PHI targets a very stringent whole-building source energy use intensity of 38 kBtu/sf/yr, a maximum heating demand of 4.75 kBtu/sf/yr, and a maximum cooling demand of 5.39 kBtu/sf/yr.



Figure 9. Site plan of the Holmes Towers campus, showing the location of the new Bellwether tower. © FXCollaborative



Figure 10. Sustainability diagram of The Bellwether showing the incorporation of sustainable elements into the architectural design. © FXCollaborative

In addition to the more expected, albeit stringent, requirements of Passive House, the tall building condition creates additional design and planning challenges.

- *Exterior Wall*

The design favors a greater proportion of solid wall to glass, achieving an impressive 20 percent for this building type. Nevertheless, high-quality daylight interiors are created for residents through strategic placement of the windows. The exterior wall (R16.5), windows (R4.5), and roofs (R31.8) have robust insulation values. The unitized curtain wall is detailed to meet Passive House airtightness requirements of 0.6 air changes per hour (ACH), which is over seven times higher than current local code requirements. Panel attachments, roof parapets, and terraces are thermally broken to minimize heat transfer. Windows are triple glazed with insulated frames, to meet both the energy and indoor thermal comfort requirements. Deeply inset from the façade, they reduce southern summer solar heat gain through shading.

- *Energy Recovery*

The project utilizes energy recovery ventilators (ERVs) with very high efficiencies (greater than 75 percent) per the Passive

House standard. Due to the building's height, it is divided into four ventilation zones, with semi-centralized ERVs located every 12th floor. Each serves six floors up and six floors down. This vertical distribution strategy minimizes façade penetrations, duct runs, dimensions, and stack-effect imbalances, as well as floor-to-floor heights, as there will be only one crossover floor.

- *Other measures*

Air-cooled VRV condensing units are located on thermally-wrapped balconies. Units serve either a north zone or a south zone of two floors. This strategy enables optimal zone-by-zone operation, and reduces duct runs. Refrigerant piping is run through apartments via branch boxes to avoid congested public-corridor ceilings, and to reduce pipe sizes. These connect to VRV indoor console units under windows that heat or cool apartments seasonally.

All-LED lighting reduces electricity loads. Interior lighting wattage is 20 percent lower, and exterior lighting wattage is 50 percent lower than allowed by code.

Health and Wellness

Health and well-being of residents is a key component of The Bellwether. In addition to energy efficiency, Passive House certification results in interior environments where thermal comfort, acoustics, and air quality are significantly improved. This is particularly important in a dense urban environment subject to noise and vehicular emissions. Through the ERVs, apartments receive highly filtered, ducted outside air. Triple-glazing and high air-tightness reduce cold exterior wall surfaces, drafts, and outside noise. The building has a non-smoking policy, even within apartments, eliminating second-hand smoke. Every effort is being made to specify low-emitting asthmagen-free materials and to avoid red-list chemicals, with an emphasis on PVC and urea-formaldehyde. Ample plantings at the street and terrace levels help connect people to nature.

Active design is an inherent part of the project. The site and building design employ a range of active design strategies to facilitate the health and wellbeing of residents. The site is close to public transit, the waterfront, and within walking distance of other key amenities. A large bike storage room adjacent to the street enables direct access to nearby public cycling paths. The community recreation areas are directly accessible. The public ramp up to the playing field encourages movement and community use. The fitness center, children's playroom, and lounge connect to the lower outdoor terrace, providing a variety of active and passive recreation uses. A second outdoor terrace connects to a common room on the 54th floor. The project anticipates complying with NYC DDC's Active Design Guidelines.

Resiliency

Water efficiency is targeted for both indoor and outdoor applications. Plumbing fixtures are low-flow and low-maintenance. Terrace and streetscape landscaping will have native or non-invasive and drought-tolerant plantings to minimize demands on water resources. A rainwater harvesting system, coupled with high efficiency irrigation is used to water terrace landscaping.

Though the site falls outside of the most critical flood hazard area, resiliency remains an important issue due to more intense storms, sea level rise, heat waves, and potential power outages. As such, mechanical and utility rooms are situated on the 2nd floor, 30th floor, and the upper roof to ensure that critical equipment is protected from flood damage. Flood-proofing is provided on the ground floor to inhibit water entry. Finally, the high-performance Passive House enclosure will also enable residents to remain comfortable without heating or cooling for an extended duration.

Current Status

The design has progressed with numerous community, agency, and governmental meetings. The construction documents are nearly complete. Because of its location near the perimeter of the campus, the tower pierces the sky exposure plane and violates the as-of-right zoning. It is worth noting that by all other measures—density, open space, building separation, etc.— the building is fully compliant. Since the project is on public land and is for a public purpose (affordable housing), the City has opted to use the prerogative of a Mayoral Override to provide for minor relief of the zoning controls. The override is currently being challenged in court by elected officials, due to concerns about setting precedent for other projects. That The Bellwether is the first of NYCHA NextGen infill program has heightened this apprehension. The case is expected to be resolved in the second half of 2019.

Conclusion

New forms of high-rise, high-density infill housing can improve challenged superblock conditions by providing equitable growth in a highly sustainable way, reconnecting these campuses to the larger context and presenting opportunities for compelling programming and design. The Bellwether is emblematic of the type of creative planning and design needed to repair and elevate these challenged conditions, resulting in a smarter, greener, better-integrated, more efficient, and more humane city.

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