International Journal of High-Rise Buildings
June 2015, Vol 4, No 2, 135-142

International Journal of
High-Rise Buildings
www.ctbuh-korea.org/ijhrb/index.php

Urban Density and the Porous High-Rise: The Integration of the Tall Building in the City - from China to New York

James von Klemperer†

Kohn Pedersen Fox Associates PC, 11 West 42nd Street, New York City, NY, USA 10036

Abstract

As the skyscraper matures as a building type, its role in actively connecting to, and reinforcing, major threads of urban fabric becomes increasingly more important. The creation of public spaces inside of and adjacent to tall buildings allows for significant additions to the public realm, facilitating better connections between varied uses, providing needed access to critical transportation functions.

In this more integrated version of the tall building type, the density afforded by a vertical structure is complemented by strategically devised porosity of plan and section. This paper examines three major tower projects which exemplify a progressive approach to permeable design: the recently completed Jingan Kerry Centre in Shanghai, the Lotte Supertower in Seoul, now half completed, and the One Vanderbilt tower being proposed next to Grand Central Terminal in New York City. These projects suggest possibilities for innovative approaches to private development strategies, public planning processes, and architectural design.

Keywords: Permeable design, Public space, Spatial continuity, Sectional variety, Organic grids, Urban fabric

1. Introduction

Urban density, as measured by the concentration of built area, rate of occupancy, and intensity of user activity, is one of the most important factors affecting our ability to deal with critical opportunities and challenges of today's cities. The potential for high efficiencies of land use, energy consumption, and personal time all point to the advantages of condensed utilization in downtown districts. For more than a century, tall buildings have allowed for high ratios of usable floor area to land area, thus serving as essential components of center city planning and design. However, if not strategically conceived, building density can create major difficulties of an overcrowding of the ground plane, a lack of diversity of use, a scarcity of public space, and a less than optimal access to light and air.

As the converse of density, carefully planned porosity of constructed mass allows for essential relief from some of the challenges arising from extreme compaction mentioned above. The insertion of new public open spaces, the addition of varieties of public use, and the connection to public circulation routes into tall structures can allow city life to flow effectively through otherwise dense environments. In some cases, sectional manipulation makes it possible to replicate the ground plane at multiple levels, adding to capacity of the public realm.

†Corresponding author: James von Klemperer
Tel: +; Fax: +
E-mail: jvonklemperer@kpf.com

The ultimate efficiency of such tall building projects comes with the connection to transport networks and even adjacency to major transport hubs. This remains one of the most important uses of vertical construction, to place large quanta of working and living quarters where users can access their space conveniently without needing to rely on the automobile. Ultimately, this can be seen as a strategy for the management of carbon footprint and other energy use metrics.

In such large mixed use environments, a degree of porosity can also naturally lend a measure of human scale, mitigating the some of the psychological challenges of occupying mega scale buildings. The aesthetic effect of unmitigated mega-masses can otherwise become a deterrent to the happy acceptance of dense living. Porosity becomes the natural enabler of efficient density.

This paper will examine three contemporary tall building projects whose primary design, commercial, and civic goals, include the active integration of a vertical structure with urban networks.

These projects can be listed and characterized as follows:

Jingan Kerry Center (organic grid collage)
Lotte Supertower (vertical city)
One Vanderbilt Ave (a tree with roots)

The three tower projects occur in widely diverse locales (Shanghai, Seoul, and New York), rise to varying heights (270 m, 555 m, and 400 m), and feature broadly differentiated mixes of internal use. The first has been recently completed, the second is half constructed, and the third is

currently being permitted. What they all have in common is that they seek to achieve the strategic balance of density and porosity described above.

2. Jingan Kerry Center Shanghai

The Jingan Kerry Center, a major mixed use project recently completed in Shanghai, tests several hypotheses about the role of the tall building in promoting the goals of progressive urban design. The investigations launched by these questions are both practical and theoretical in nature, and were pursued consistently by architect and client from the first sketch to the day the complex opened. They are as follows:

First that a Superblock consisting of an assemblage of large scale buildings can be used to extend and reinforce the permeable grain of the historical city.

Second, that an integrated cluster of variously scaled building elements can make an effective connection between ground plane and skyline, through a gradual sequence of formal and programmatic connections.

Third, that the rectangular grid, which provides us with an organized basis for planning and construction, can be used to create a heterogeneous, and even organic design, responding deftly to a multitude of uses, visual agendas and contextual idiosyncrasies.

Formulated at the inception of the architectural design phase of the project in 2005, these hypotheses were tested through three years of drawing and five years of construction. Now, with 3.5M ft2 of building area constructed, the physical aspects of the architecture can be observed. More important, the ultimate test of how these ideas will play out over the usable life of the complex has just begun.

2.1. Background

In the early years of the new millennium Kerry Properties, a leading Hong Kong based real estate company, and a sister company to the Shangri-la hotel group, had assembled a double block of land in the Jingan District of Shanghai. This stretch of Nanjing Road, known as China's busiest shopping street, offered excellent exposure to a steady flow of pedestrian life, as well as to the highway traffic to the south. Before the entire site had been acquired, a portion of the 5.7 hectare area had been secured and developed as a pair of structures, one office and one residential building.

The statistical brief for the project was articulated in loose terms as a fulfillment of the plot ratio of 5.1%, consisting of two hotels totaling 800 rooms, 100,000 m^2 of office space, and the balance of retail, entertainment, and conferencing facilities. The core of the urbanistic goals of the project were articulated in the project brief: how can a modern building of significant scale capture the spirit of Shanghai, particularly the area of Puxi surrounding the site, which had grown during the concession era. This spirit of old Shanghai was characterized by the client as a place



Figure 1. Jingan Kerry Center Shanghai (Source: KPF).

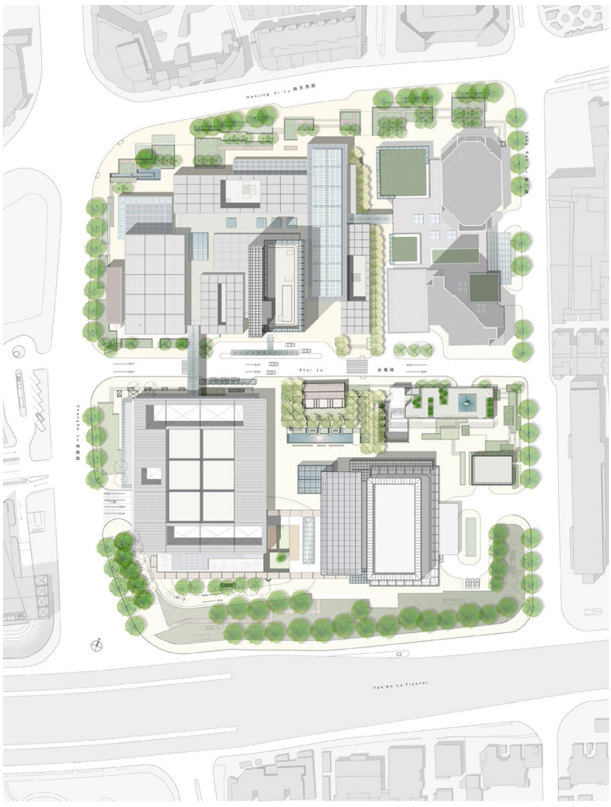


Figure 2. Jingan Kerry Center Shanghai (Source: KPF).

that would feel central and important, but without the traits of obvious symmetry or monumental scale. The varied uses were to be placed in such a way as to de-emphasize their separate identities, and so reinforce a sense of the whole.



Figure 3. Jingan Kerry Center Shanghai (Source: KPF).



Figure 4. Jingan Kerry Center Shanghai (Source: KPF).

2.2. Urban Grain

Key to the design process was an abstract analysis of a few late 19th Century blocks of the International Concession, which feature semi-public open spaced buried deep within an oversized block of shops and residential buildings. These abstract diagrams, figure ground sketches, and examination of historical typologies, underscored the importance of asymmetry, jogged circulation paths, and moments of surprise. Three major elements remained throughout the process as given components of the site plan: the existing Kerry buildings to the northeast; a public street named Anyi Lu which runs east west and thus bisect the site; and a small shop-house in the middle of the site where Mao Tse Tung lived in the early 1920's. Treating the site as a field containing indelible paths and immovable found objects supported the goal of recalling a historical fabric which had itself originally emerged out of a process of serendipitous planning and construction.

The puzzle-like planning idiom worked very well within a design process that required a frequent relocation of program elements and a rebalancing of areas, as the goals of the brief were redefined as the design matured. A good example of this is the succession of different locations proposed for the tall (260m) tower. The first fully developed set of FangAn drawings placed this tower at the extreme northern edge of the site, along Nanjing Road. This followed a basic logic that the major building should be honored by giving it the most prominent address. Just as this design was due to be approved by City officials however, regulations restricting the projected settlement of the foundation changed. This change had to do with the proximity of the raft foundation to a subway tunnel, which would be disturbed by the movement of an adjacent site. Rather than the 10 mm previously set as the maximum amount of settlement allowed due to the new load of the building, a reduced maximum was set at 5 mm. This change, though small in dimension, was profound in its effect. The only way to satisfy this stricture was to move the tall tower far enough from the northern boundary of the property, that it proved necessary to "flip" the plan of the entire complex. Though this caused a 3 month reworking of all of the plans, the basic character of the previous solution was maintained. The "organic" qualities of the design made it possible to reorganize the site plan without great difficulty. There were no rigid axes or symmetrical spatial effects to maintain or disturb.

Just following this plan "flip", the project went through major programmatic changes in response to the world slump in economies and their repercussions in the Shanghai real estate market. These changes too were accommodated with minimum difficulty. In a major adjustment to the program, one of the two hotels was quickly removed in favor of office use. Once again, the collage of grid plans proved reasonably easy to manipulate.

2.3. Graduated Scales

The design of the Superblock is one of the challenges posed by many major urban developments in China today. Large sites, often 4 hectares or more, stretch well beyond the scale of conventional pedestrian habits, building floor plate sizes, and fire code requirements. The need to introduce subdivisions of roadways, passages, building masses, and circulation routes forces the Architect into the role of the Planner, and the owner into the role of a sort of urban caretaker. Large scale is a both a boon to the goal of creating a significant destination, and a bane to the goal of creating or maintaining a sense of human scale.

In addition to the previously mentioned strategy of plan bricolage, the Jingan Kerry Center adopts vertical and volumetric design strategies intended to break down the scale of the overall complex. While such an approach of dissecting the whole, or aggregating it from smaller parts is hardly unique, the consistent use of cubic elements, and the conscious tactic of exploiting their recombinant qualities, are pursued with an unusual degree of rigor.

The goals of this compositional mode are to create a link between the smallest and the largest of program components and architectural volumes. In this sense, the JingAn Kerry center follows in the footsteps of Rockefeller Center, which went to even greater lengths to integrate and coordinate its geometric and architectural motifs. Rockefeller Center served as a frequent reference in communicating the intent of the overall Jingan design to the client and to other collaborators.

In the center of the site, The Mao's house exemplifies this incremental scalar strategy. A fragment of construction typical of the granular elements of LiLong housing, it can still be understood as relating meaningfully to the 280 m tall south tower, and it's 197 m tall hotel component. The dimensionally smaller building elements within the Jingan complex are located close to the ground, where intense variety of program - much of it consisting of retail - is called for. In the urban experience, such smaller components are seen from close up, and thus loom large, while some of the larger components are perspectivally diminished. Between small and large building components are situated a series of middle-scale building masses, including the retail galleria, and the convention center. Building massing follows a strategy of graduated linkage. Thus, components of the project are brought into visual balance, and the experience at the ground level is visually connected to the skyline.

2.4. Organic Grids

Historically, the grid is the most universal mode of planning cities - from Miletus to Chang'an, from Roman military colonies to Lisbon's Baixa, from New York City to London's Canary Wharf. At the smaller scale of the individual structure, the modern building is typically planned, structured, clad, and furnished using the ordering device of regular rectilinear modules. The Superblock offers an interesting opportunity to employ the grid to its greatest advantage in both the micro and macro scale. In such projects, large assemblages of grid structures are by no means unusual. What makes the design of the Jingan project somewhat unusual is the way it establishes a multitude of variations on the grid theme, assigning different modules, materials, and architectural expressions to different uses within the complex. Thus, the hotel is assigned one modular frequency, the office another; retail is subdivided into a series of proportional façade types, public space yet another, and so on. These façade types correspond to underlying structural dimensions which are chosen to house their respective uses (e.g., office at 9 m on center).

While Jingan's many façade types are derived from the same basic modules, each intersecting neatly with its neighbor, the resulting assembly achieves a kind of organic overall effect. One might even find in these compositions qualities of the picturesque, as the concatenation of elements mimics the variegations of a cityscape. Again, this façade collage approach has its precedents, but it may not have been previously achieved at such a large scale in such a way as to balance consistency with variety.

The wall types which clad the Jingan buildings are differentiated by three critical features: modular dimension (as mentioned above), material, and depth. In this design materials graduate, on the whole, from solid at ground level to void at the top of the buildings. The most solid walls are made of travertine, the next most solid of terra cotta, the next of glass with framed heavily by aluminum, then a lighter glass and aluminum frame, and finally aluminum frame with no glass infill. Within the category of glass wall types, three subtly graduated shades of blue-green coating are used.

Variety of depth is another critical differentiator of this building's cladding types. A hierarchy of wall types starts with stone walls divided by grid lines marked by recess/voids. The base of the main tower is distinguished by the use of a robust exoskeleton, a steel reinforced aluminum profile posted out 1.5 meters from the glass surface. The way that this wall throws shadows establishes a very strong grid order, in a manner comparable to the proportional compositions of Renaissance façades. As, for example, in the Sansovino library in Venice, depth connotes strength, nobility of purpose and overall pride of place within a multi building urban context. This tower base is the architectural anchor of the project. The north tower displays a more subtle exoskeleton, while upper façades show an engaged fin. The highest façades are traced with a close-to-flush aluminum detail and the tops of the towers are voided grids. To compare this design to the buildings at the core of Rockefeller Center, the wall-types discussed above are comparable to the varieties of limestone (cleanly dressed, shot-sawn) and of spandrel (stone, aluminum) in the New York landmark. Just as Rockefeller Center poses as a massively consistent body of stone, hewn by many hands yet belonging to the same "geologi-

cal" mass, Jingan is a tapestry of related wall textures, expressing itself as one heterogeneous yet integrated whole.

3. Lotte Supertower

The second tower which I will use to illustrate the potential for the tall building to integrate itself with active urban fabric is the 123 story Lotte Supertower now half constructed in Seoul. The site for the tower can be described as a kind of compacted sprawl - neighborhoods of slab housing and block office structures lacking a cohesive planning context. By piercing the +/- 30 story skyline of its immediate surroundings, the tower gives the Jamsil district a strong center. Having established a central concentration of building mass, the project adopts 2 major strategies to promote permeable urban design.

3.1. Sectional Variety

First, the tower is programmed with a greater variety of functions than is normally found within a tall structure. The sequence of program elements is arranged in section from bottom to top as follows: multi modal transport; parking and automobile drop-off; public plaza; retail; health care; office; conference; hotel; residential; boutique office; observation deck/entertainment; military installation. The common thread of circulation that links these sectional segments, as in all high-rise towers, is the elevator core. Access to the various banks of elevators, and ease of transfer from one to the other is made possible by the multiplication of the ground plane. Primary arrival sequences are experienced below grade, at grade, and at a balcony level above grade.

3.2. Spatial Continuity

In order for these entry levels to function efficiently, it is important that users understand a spatial continuity that allows them to orient themselves. The rabbit warren phenomenon which often results from overly compacted plans is avoided through the use of tall open interior spaces. These spatial "mixing chambers" take the form of sectionally curved vaults, articulated in wood, which also follow the curved plan of the tower. The double curvature and consistency of materials establish a morphology that recalls the form of the hull of a wooden ship.

The base building design of the Lotte Tower calls for this motif of curved space to be repeated in public gathering areas higher up in the building. These include common conferencing spaces, hotel lobbies, residential sky lobbies, and observation deck spaces. This unified armature of design is intended to establish a way for users to understand where they stand relative to the whole building, even as they occupy one specific space far removed in dimension from other program components.

3.3. Base-Tower Continuity

The 123 Story tower has been designed and constructed at the same time as a 10 story base that accommodates as



Figure 5. Lotte Supertower (Source: KPF).

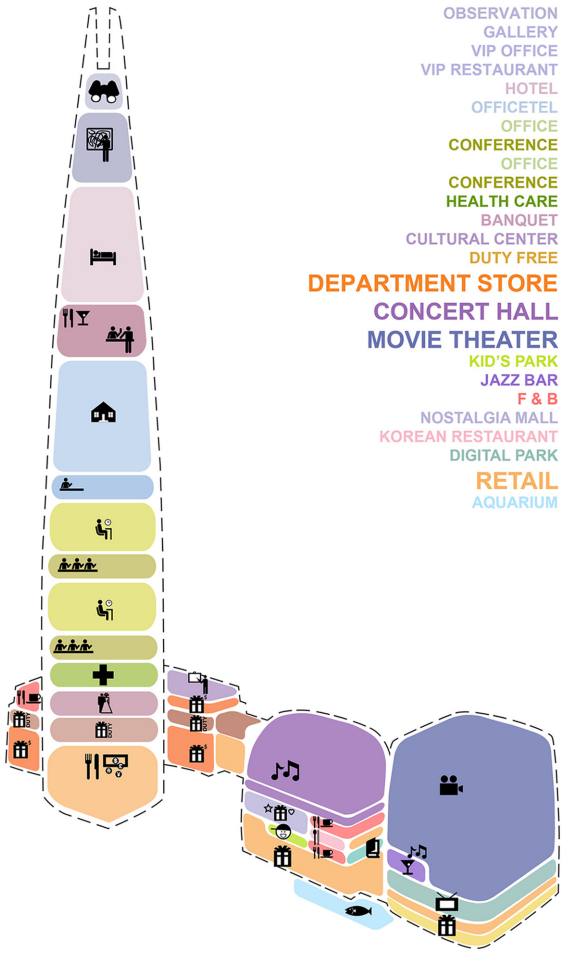


Figure 6. Lotte Supertower (Source: KPF).



Figure 7. Lotte Supertower (Source: KPF).



Figure 8. Lotte Supertower (Source: KPF).

much area as its vertical counterpart. Vertical density is linked to horizontal density, and the range of complementary uses is increased. Connections between the two major building components are made via interior pathways at a variety of levels, but also by active outdoor public space. As has been proven over 80 years ago at Rockefeller Center, the porosity of the urban plan, the interruption of building mass by piazzas, walkways, and landscape areas can promote pedestrian connectivity. To literally connect by swallowing up all available space within covered structures can be counter-productive. Thus, one of the most effective measures taken to activate the tower and connect it to adjacent buildings is the carefully tuned outdoor plaza that rings more than half its periphery. This space forms a sort of outdoor room, compressed enough in its dimensions to encourage visual and pedestrian penetration of its boundary walls.

3.4. Super-Base

One of the most unusual aspects of the Lotte project is the insertion of public cultural institution at the top of the base. Sitting at the 8th floor, the roof level of a large retail and entertainment zone, is a top grade public concert hall accommodating up to 2000 seats. By placing a building type which we rarely see displaced from street level, or from the piano nobile, the project readjusts our normal expectations of the limits of the public realm. We are nudged one degree further into the acceptance and practice of occupying a vertical city. Density and public utility are effectively promoted by means of this construct of sectional continuity.

4. One Vanderbilt

The last project in this trio of tall buildings is a 400 m office tower designed for a site located immediately to the west of Grand Central Terminal in Manhattan. The

surrounding area of East Midtown was the subject of a major up zoning proposal made towards the end of the Bloomberg administration, and defeated just before the end of the corresponding City Council term. The basic argument for the proposal was that downtown urban transit hubs should be enlivened and activated by optimizing the density of surrounding buildings, and that new and advanced building structures might be devised that can increase the connectivity of such districts. The One Vanderbilt site was chosen as a special spot whose strategic location warranted the increase of permittable FAR from 20 to 30.

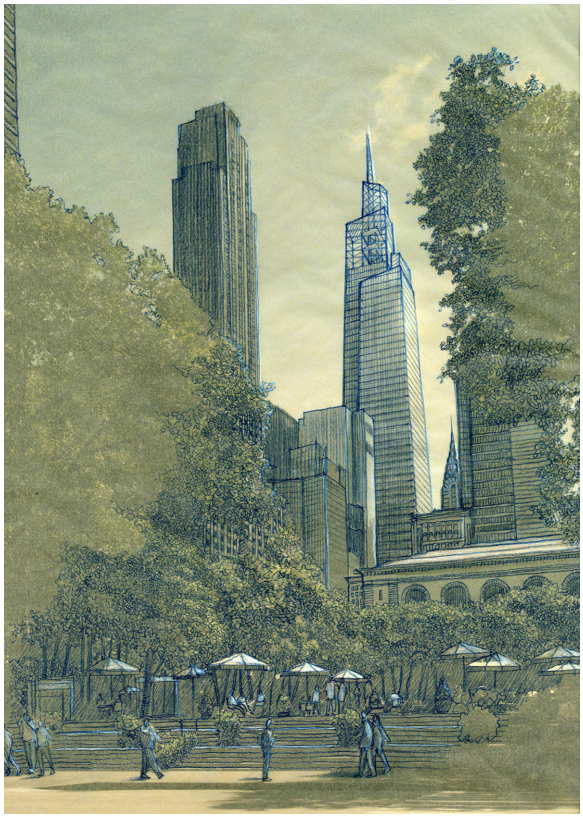


Figure 9. One Vanderbilt (Source: KPF).

Though these larger zoning measures were defeated in November of 2014, the new de Blasio administration, the City Council, and community groups have indicated their support for the specific One Vanderbilt tower, and the developer client, SL Green is proceeding with the planning.

What makes the project remarkable is both the configuration of the public space at the base of the building, including its connection to public transport, and the public process that will make the increased density possible.

4.1. Superior Design

During the Bloomberg administration, a set of complementary measures was discussed that would balance public realm improvements with the increase in FAR. While bonus structures are not unusual in City entitlement practices around the world, this particular linkage between design and vertical density would broaden the possibilities of such a practice in New York. Elements which led to the FAR 30 included the establishment of a public room within the base of the tower, linkage of the building to public transit spaces and circulation routes, helping to establish a major outdoor urban plaza, and the tapering of the tower to allow light and air to come down to street level.



Figure 10. One Vanderbilt (Source: KPF).

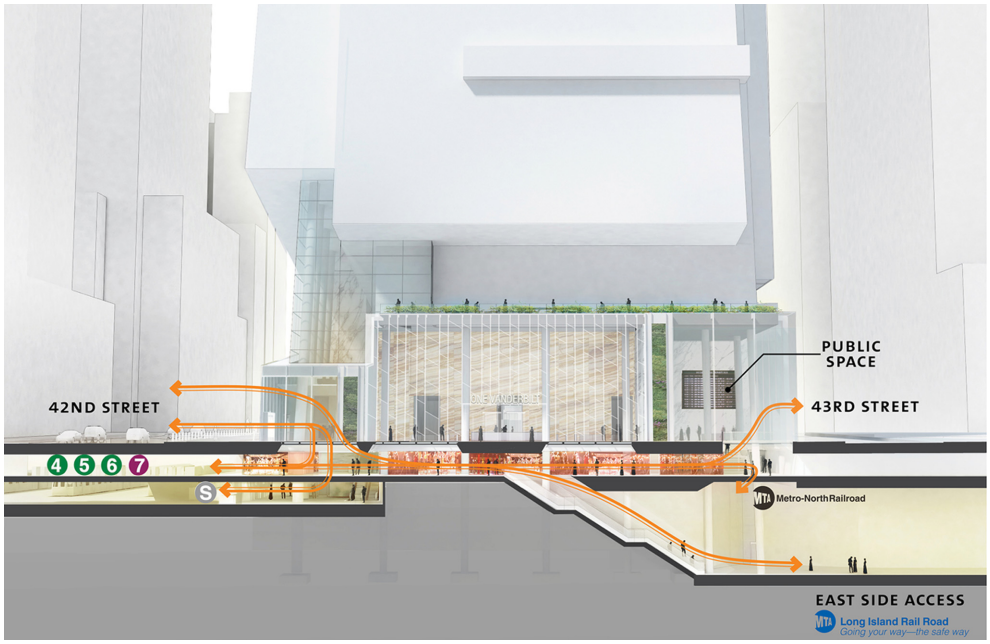


Figure 11. One Vanderbilt (Source: KPF).



Figure 12. One Vanderbilt (Source: KPF).

4.2. The Lifted and Linked Tower

As the developer, SL Green, and the Di Blasio administration move ahead with the review and approvals process, it is evident that a new model of interface between the tall building and the public realm is emerging. Citicorp Tower in New York and Leadenhall Tower in London have advanced radically inventive structural solutions aimed at opening up the ground plane. The One Vanderbilt design is more modest in structural terms, but goes deeper in its linkage to public space. The porosity of the open space at the base of the building, combined with connections to East Side Access platforms 90 feet below grade, and the visual uncovering of the architectural landmark of Grand Central Terminal constitute a uniquely inclusive configuration of urban design elements.

5. Conclusion

The three projects discussed, all consisting of tall structures inserted into mature urban environments, illustrate the effectiveness of balancing urban density with architectural porosity. The goals of connecting large numbers of people to each other and to public transport can be best achieved with judiciously implanted public spaces and pathways. The design of the tall buildings, as they occupy our city centers, will evolve from a more autonomous structures to more spatially inclusive and synergistic environments. If private real estate enterprises and governmental authorities can recognize the collective benefits of an essentially collaborative process, a better city can emerge.