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- Authors:** Moshe Safdie, Founder, Safdie Architects
Jaron Lubin, Principal, Safdie Architects
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Dense Urbanism: The High-Rise Tower as a Building Block for the Public Realm

Moshe Safdie, Founder & Jaron Lubin, Principal, *Safdie Architects*

Though the skyscraper has been with us for a century, we are yet to discover how to deploy it as an effective building block for contemporary urbanism. Before the age of towers, we could take for granted that buildings aggregated to create boulevards, streets, squares and crescents—wholesome places for the public realm. Today, the dominant typology of towers is a singular, autonomous structure—experienced as a sculptural object. Alternatively, and becoming more common, are clusters of mixed-use towers atop a podium, predominantly designed as self contained, introverted, and privatized environments. Planning, zoning, and urban design have not provided the tools to accommodate and regulate the great inter-dependency of towers in the city, the impact on light and view on each other and their surroundings. The challenge going forward is to recognize that towers are highly interdependent and require new planning tools to resolve their relationship.

As the dominant building type of the city is the high-rise tower, if it continues to follow its current course, life's sustaining

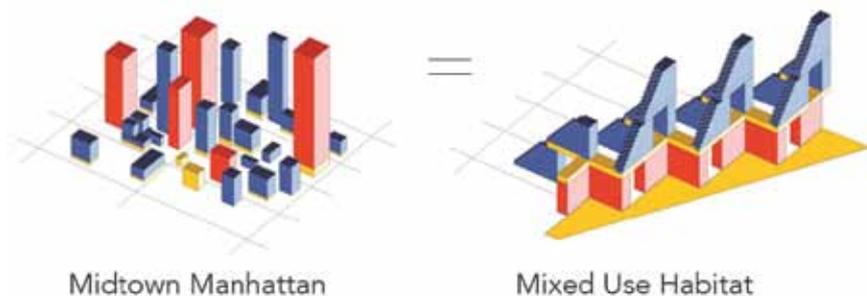
elements are threatened: light, air, a sense of identity, contact with nature, privacy, as well as community. Neither the privacy of a house nor the community of a village is possible now without major new inventions which transcend individual buildings. They demand a new urban vision.

As a case study, the Habitat of the Future Project came about in 2011 as part of an in-house Research Fellowship program. The research revisited the concept of the original Habitat '67 project in Montreal, almost a half century after it came to prominence as a new model for prefabricated housing. Habitat '67 was, above all, based on the theme "For everyone, a garden," which is a metaphor for making an apartment in a high-rise structure into what connotes "house," a dwelling with its own identity, openness in a variety of orientations, and adjacent personal garden space set within a community. One of the charms of Habitat was that it maintained the feeling of an agglomeration of houses, not of high-rise apartment living. The individual identity of the house is maintained – its autonomy within the whole, its abutting garden

open to the sky, its multiple orientations transcending the decades-old malaise associated with apartment living.

The lessons from Habitat '67 were the starting point for investigation. These speculations focused on typological exploration of lifestyle, social interaction, construction technologies, and real estate economies for further application in dense urban environments.

The research queried how to rethink a very dense city block; in this case it looked at stacking, linking, and bridging functions within a 3D "matrix" of space. The research team evaluated the density of a midtown Manhattan city block, a floor area ratio (FAR) of 12, and reshuffled the program into a series of stepped, tall building blocks that stack together both horizontally and vertically. The individual slab buildings – which are sometimes rectangular, sometimes stepped to form roof terraces – are stacked corner to corner and can accommodate offices, hotels, or residences. As these slabs are stacked vertically, trusses allow for the slabs to span from core to core, forming large-scale windows that are 50 meters



Left: Habitat of the future comparative diagram. Source: Safdie Architects

Opposite: Raffles City, Chongqing, China, an example of mixed-use integration in dense urbanism. Source: Safdie Architects





wide by 80 meters high. The resulting mass is exceedingly porous, framing views of city and sky and providing open views from within. The extraordinary achievement here is the reliance on completely traditional, vertically stacked slab towers, with the exception of the trusses that enable them to span from core to core. The building economics of such a proposal are familiar and predictable, yet the level of amenity offered greatly exceeds that of traditional mixed-use complexes of similar densities. Compared to the amenities of the original Habitat '67, this scheme undoubtedly does not provide as consistent, as generous, or as private of accommodations. On the other hand, it promises to be much more affordable and capable of application to a great variety of urban development sites today.

What was important here was not only the formal aggregation of residential units as in Habitat, but also a further diversification of program. Mixed-use integration into the three dimensional order was essential to create a long-term and sustainable model for the future, activating designated levels with community and recreational opportunities day and night at ground level and in the sky. From this research, the study concluded that a stacked, mixed-use scheme has numerous advantages over the predominant single tower scheme, allowing street life to expand vertically into the building, provide porosity, and enable connections to be made between towers. What has emerged from this realization is the concept that the public realm could be elevated from an isolated podium level experience, and knit together in three dimensions.

Based on the Habitat of the Future fellowship as first principles, and using recent building projects as benchmarks, this paper further explores three themes that inform the application of the skyscraper as a building block for mitigating excessive urban density:

- Stepping façade strategies, including fractalization, to break down the building mass and create opportunities for terraces and gardens.
- Bridging and connecting towers at multiple levels to increase connectivity and create new community amenities.
- Expanding the public realm at the urban scale by diversifying and



integrating extroverted building podiums (with a mix of uses) and their site conditions.

The findings of the research fellowship provided immediate application in our practice. Two residential projects coming to completion, one in Singapore and one in China, provide a new model through stacking, bridging and terracing.

Sky Habitat is located in the neighborhood of Bishan, a residential area in the suburban heartland of Singapore. While the prevailing typology for high-density, high-rise, middle income housing has been a tower or cluster of towers sharing common amenities at the ground, this 38-story residential complex breaks down the scale of typical singular tower residential development by the fractalization of the building form. Three bridging sky gardens link two stepping towers and create a series of interconnected streets and gardens in the air, which provide a variety of areas for common recreation and congregation.

As a result, the overall mass is porous and open, allowing breezes to flow through

and daylight to penetrate deep into the structure. The fractalized geometry of the stepped building envelope provides residences with gardens, lush vertical greenery, multiple orientations relative to the sun, naturally ventilated units, and generous views. At the ground plane, above a sunken parking podium, more than 70 percent of the site is developed into a series of gardens, which offer additional outdoor event areas, swimming pools, a tennis court, and walking paths.

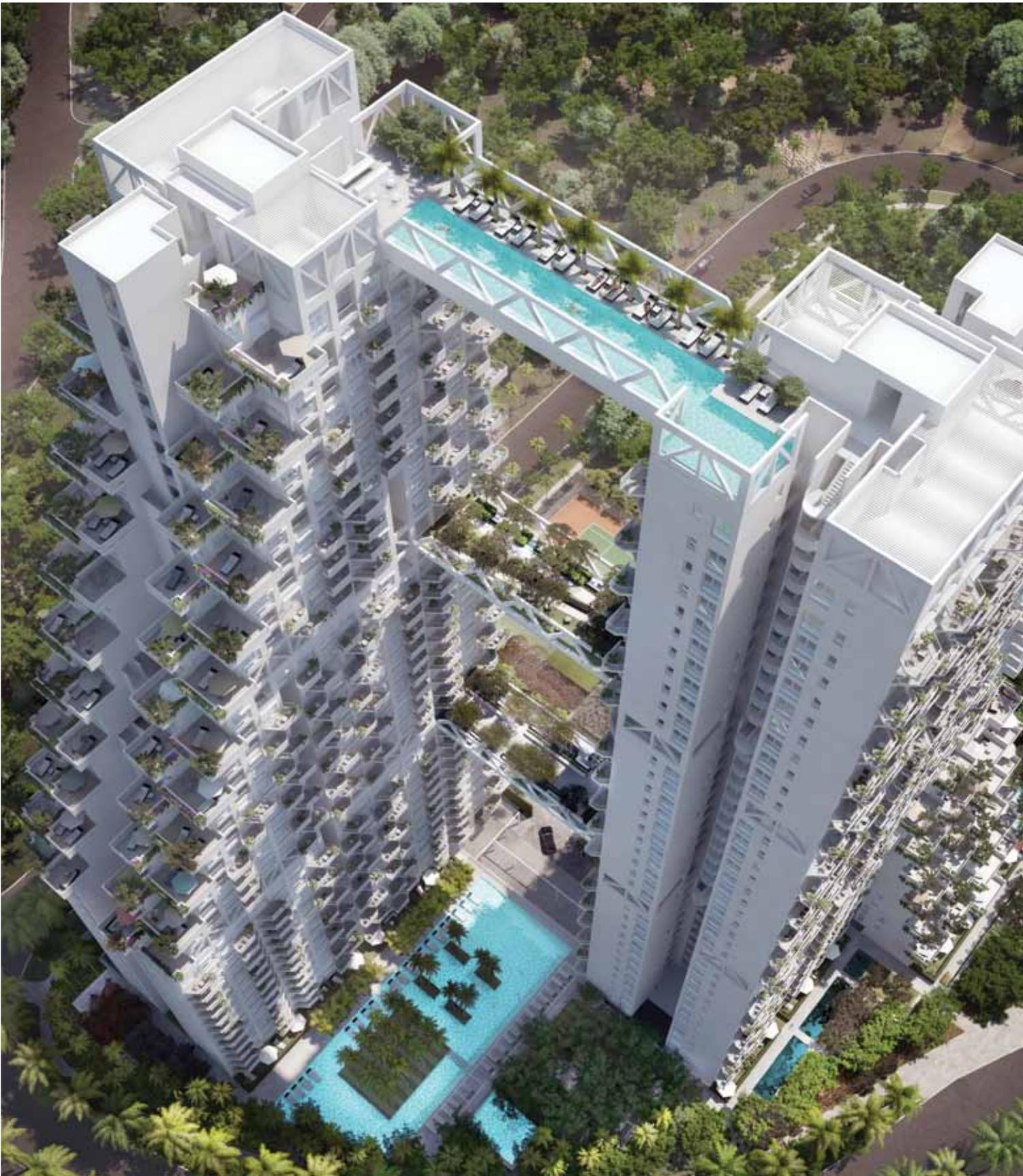
To take the design typology of Sky Habitat forward, from the research fellowship study through to reality, the key challenge was primarily that of unit type organization and efficiency. The client brief for the project demanded a mix of studios, 2-, 3-, and 4-bedroom units stacked together in as efficient a form as possible.

A stepped building presented a great challenge in terms of creating a system of unit-stacking that was as efficient as the vertical tower form basis. At each level of the towers, the terrace units are located at the end of each tower face, the terrace itself representing a formidable 30 m² of outdoor

Top: Overall view of the Habitat of the Future, Study No. 2, Urban Window Habitat. Source: Safdie Architects

Opposite: Aerial view of the stepped terraces and bridges. Source: Safdie Architects

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Bottom: Terracing and stepping at Sky Habitat.

Source: Safdie Architects

Opposite Top: View of Sky Habitat's stepping and bridging arrangement, with bridges at levels 14, 26, and 38.

Source: Jonathan Choe for urbanARCHnow

Opposite Bottom: Sky Habitat's rooftop pool at level 38.

Source: Jonathan Choe for urbanARCHnow



space; over one-third of the units were given this luxury which is typically granted only to the top level of a vertical tower stack or the top level penthouse. Even with this plan arrangement, Sky Habitat maintains a high-density FAR of 5.39 and a high net-to-gross efficiency of over 90 percent.

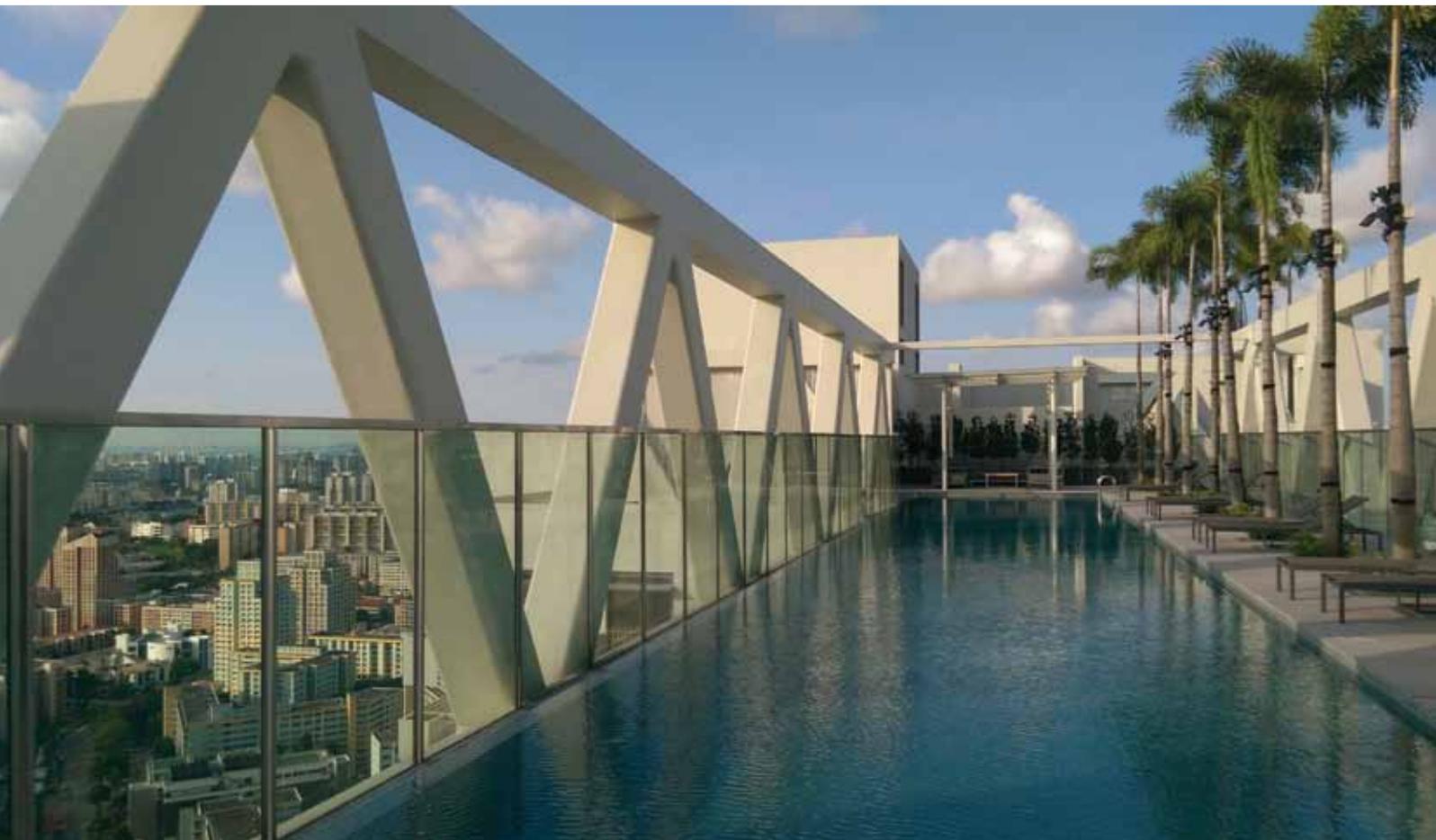
In addition, steel bridges were inserted in three places along the height of the building, containing gardens spanning between the two towers, and providing the opportunity for open-air common amenities for the residents. With a constrained site area and limited space at the ground, the bridges create opportunities for gardens in the sky.

Working in collaboration with Shane Coen & Partners Landscape Architecture, one bridge was designed as an earth-mound landscape park, connecting fitness rooms located at the same level within each of the towers. At a second bridge level, a landscaped platform supports pockets of outdoor dining spaces along its length, connecting function rooms and commonly accessible kitchens. And finally, at the rooftop level bridge, a swimming pool and sundeck observation space overlooks the entire project below, as well as the city beyond.

Separately, in Qinhuangdao, China, these lessons of bridging and stepping the façades to create large-scale openings and views are explored in densities not yet seen before.

Located three hundred kilometers east of Beijing on the Bohai Sea, the 459,000 m² residential development in Qinhuangdao is organized along a beachfront boardwalk. With 3,566 residential units on 32 stories, the folding pattern plan maximizes views from each unit to the ocean, and like the original Habitat of the Future research study, utilizes multiple story openings or urban windows to protect views to the water and break down the overall massing of the project.

The design creates a city-garden environment, combining numerous private





and public gardens in the sky. Bridges hold gardens and swimming pools above, and inside the bridges loft-style units with tall ceilings are made possible by the spanning concrete-encased steel trusses. As opposed to the typical extruded tower form, the edges of the building are terraced to open up to large private garden roof decks, creating a series of stacked penthouses along the full height of the building. The cast-in-place concrete grid structure systematizes the stepping of the form lending itself to simple and efficient construction, and dedicated diagonal chase-ways within the building accommodate common service paths for mechanical services.

As the scale of residential projects continues to grow, particularly in Asia, the imperative of looking at towers as connected blocks within the city becomes more pressing, given their impact on the public realm. The strategy of fractalizing the envelope and creating massing porosity combined with connecting or bridging between towers, ushers the next development in tower design. In order to pursue this agenda, we must recognize that towers do not function as freestanding objects in the urban landscape.

They cast shadows, block light, and impact their surroundings. Therefore, they must be conceived as additive, connectable elements that define and intertwine active and passive pedestrian places. Since the traditional method of land parcelization, with individual building projects composing the urban fabric, does not seem workable at these high densities, it begs the question of what planning methods or regulatory systems must be put in place to enable better development; it raises the issue of private- versus public-sector responsibility and action.

In the past, the parcelization of land constituted the public act of planning. Within the rules in place, the private sector built individual buildings. The infrastructure was, by and large, a public responsibility, while the construction of buildings was mostly private. While we have come to accept, almost universally, the public role in the parcelization of land, with the accompanying zoning regulations as the act of master planning, we have yet to develop, let alone accept, the expanded public role of master planning in the three-dimensional city.



Opposite: Pedestrians enjoying the bridge garden at level 26 of the Sky Habitat. Source: Jonathan Choe for urbanARCHnow

Top: Habitat of the Future, Study No. 2, Urban Window Habitat. Source: Safdie Architects

Bottom: Construction view of large stacked towers with porous urban windows framing sea and city views. Source: Safdie Architects



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The seed of the possibility of public intervention beyond traditional zoning can be seen in Singapore, where the Urban Redevelopment Authority (URA) has labored to establish guidelines and invest in infrastructure toward the goal of connecting the parts into a greater whole. These guidelines go further than most others in attempting to define qualitatively the nature of public space and its character within development parcels. At Sky Habitat, for example, the stepping terraces are supported by a Singapore government incentive to increase available outdoor space for residents. The landscaped bridges are also deemed exempt from GFA calculation, encouraging their proliferation. In Qinhuangdao, units were required to receive at least three hours of daylight per day, measured at the lowest point of the winter solstice, lending itself to the stepped and folding building forms.

Marina Bay Sands offers an example at a wholly different scale. Here, the design was in response to mandatory guidelines at the urban scale, issued to all developers by the URA at the outset of the competition phase. The URA guidelines required a major promenade at the water's edge and two

view corridors connecting to the subway perpendicular to the promenade. Inspired by vital public thoroughfares in the planning of ancient cities, Marina Bay Sands is ordered around two principal axes that traverse the district, guiding and orienting pedestrian movement. The main thoroughfare, or *Cardo Maximus*, is a grand waterfront promenade with two view corridors that connect the city to the bay. Combining indoor and outdoor spaces to provide a platform for a wide array of activities, this re-imagined *Cardo* also connects to the subway and other transportation systems.

The expanded *Cardo* with the promenade forms a single grand, indoor-outdoor urban space of unprecedented scale, partially air-conditioned, partially open to the sky. The view corridor perpendicular to this spine connects the site with the view of the bay and the downtown to the mass-transit rail station. Recognizing the challenges of single-loaded retail, we proposed a multilevel spine with two levels of double-loaded retail under the promenade and a single-loaded stretch along the promenade itself, complemented by a row of kiosks.

The solution stacks the lowest mall two floors underneath the promenade, creating a double-loaded Galleria with three levels of retail, integrated visually into the whole along with the other program components. The top level is accessible from surrounding streets and the promenade. The middle level connects to the subway and extends under the road toward the hotel. The bottom level also connects to the subway as well as the two parking levels underneath it. Thus, all levels were vitalized by different entry points.

In keeping with Singapore's image of a garden city, a dynamic layer of green spaces adorn the spine, tracing through the promenade. Fifty percent of the roof surface of the entire project was mandated to be green and landscaped – a requirement that supported a series of gardens at multiple levels throughout the project, culminating in the concept of the Skypark. The Skypark is the world's largest public cantilever and combines a public observatory, lush gardens, restaurants, and an infinity-edged swimming pool, all in a two-hectare site bridging the three 55-story hotel towers.

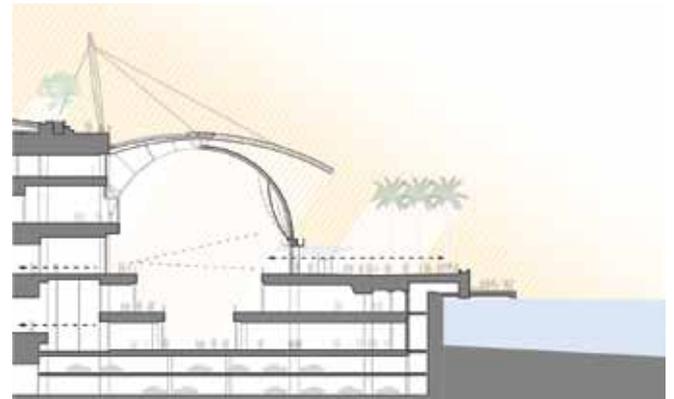
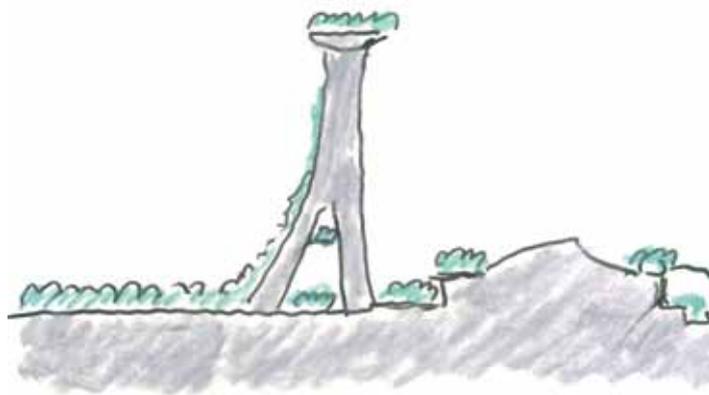
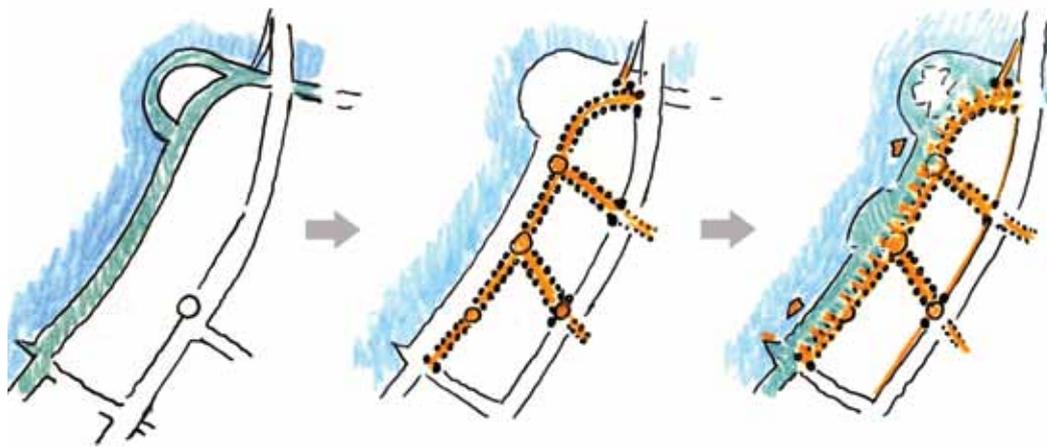
Opposite: Rendered view of entire Sky Habitat complex from the waterfront. Source: Safdie Architects

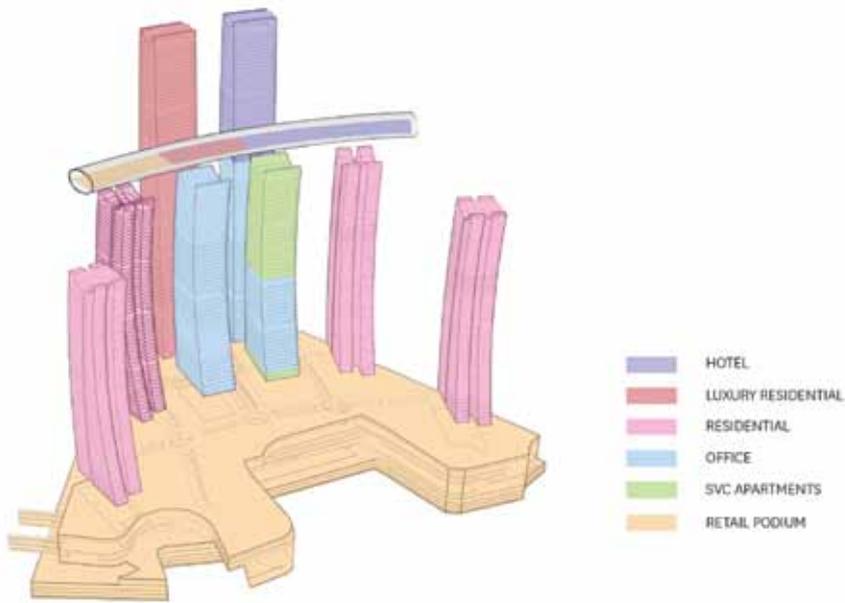
Right: View of the Skypark at Marina Bay Sands, Singapore, an example of the new public realm. Source: Frank Pinckers

Middle: Town planning diagram of Marina Bay Sands showing axial connections between bayfront and interior streets in Singapore. Source: Moshe Safdie

Bottom Left: Diagram illustrating how landscape and green amenities are connected throughout multiple tower levels all the way to the bayfront in Singapore. Source: Moshe Safdie

Bottom Right: Section through promenade at the bayfront at Marina Bay Sands, Singapore, showing multi-level podium and waterfront connections. Source: Safdie Architects





Many other guidelines addressed the public interest, and the URA established the Special Review Committee as the design evolved following the project selection to assure conformity with its requirements. As a model of private-public partnership, this project demonstrates the foresight of the government of Singapore – the difference in outcome, the value to the people of Singapore who benefit from the preservation and expansion of the public realm, cannot be overestimated.

Another case study for consideration is emerging in Chongqing, China, where the scale of the 1.1 million m² mixed-use development required a reinvention for a dense urban project. Raffles City, designed for CapitaLand China, and currently under

construction, is a collection of eight high-rise structures linked at its mid-point intersection by a spanning conservatory bridge. The collective of towers sits atop a landscaped podium building below, the podium itself carved with 'street' view corridors that connect directly through to the super dense city surroundings. The complex has a GFA of 817,000 m², with an FAR/Plot ratio of 8.9.

Raffles City moves away from the proliferation of indoor malls, those that turn their back on the city, as distinct environments not connected to any other experience in the dense fabric of the city. Here, the district is entirely extroverted and connected to existing flows and lines of the city, significantly interwoven to the city

grid. Although the individual towers feature a mix of uses, with two towers containing residential and retail, four towers with a mix of residential uses, and two towers of mixed use office, hotel and retail, there are also many layers of fully integrated public space.

The south-facing façades of the interior towers center on the axis of Chaotianmen Plaza, forming stepped gardens that meet the ground. At the base of the towers, an expansive park knits together the greenery from the building façades with gardens, pools, and public circulation. This large landscaped park gently slopes to the north, offering dramatic tower-framed views of the water and more intimate views of the city to the south. Beneath the park level, a podium contains five levels of public space defined by

Opposite Top: Exploded perspective showing program distribution, Raffles City, Chongqing, China. Source: Safdie Architects

Opposite Bottom: Cross-section of the conservatory bridging between towers showing the multi-level program for the public realm. Source: Safdie Architects

“As a further expansion of the lessons learned from the research fellowship, these stepping and bridging concepts when deployed within a commercial mixed-use project, offer many more opportunities to expand the public realm both horizontally and vertically within tower design.”

interior day-lit streets and active public nodes, including retail and cultural facilities as well as land and water transportation hubs.

While at the Marina Bay Sands the Sky Park is discrete and devoted in large part to outdoor amenities, at Chongqing the large-scale horizontal elements are expressed as parts of an overall networked system.

The quarter-mile-long bridging glass “tower” is a mixed-use building in its own right that is set horizontally, and duplicates the function of a vertical building to more efficiently network building services shared by the towers above, as well as those below. As a further expansion of the lessons learned from the research fellowship, these stepping and bridging concepts when deployed within a commercial mixed-use project, offer many more opportunities to expand the public realm both horizontally and vertically within tower design. In Sky Habitat, the bridges act as a circulation loop weaving and connecting the two mirrored towers, and create a gateway into the city. The bridges support egress duplication and garden amenities for residents. But in a commercial complex that is made up of multiple supertall tower

forms, the possibilities are extended further. A systematic array of bridges can do more to interconnect public spaces and further activate the experience on multiple levels.

A case in point is the conservatory in Chongqing, a fully programmed horizontal structure complete with internal streets, a building program (a hotel lobby and ballroom sit within the building form), expansive building amenities, and gardens.

Capitalizing on its location in the sky, it is designed as a transformable indoor/outdoor space with large glass areas which open to reveal views to above. The new opportunities with these building types are the unexpected vantage points of the city, and the further integration of the public realm into the high levels of a building. The challenge today for architects and urban designers is to rethink the experience of the public realm as a vital part of the planning process, regardless of privatization. The consequence of private commercial developments which are not in communication with one another is that the connections between them are frequently an afterthought. These haphazard connections

are mostly programmed with second rate retail, and often buried in the ground without daylight, lacking reference to the streets above, or sense of connection to the world.

The effect is that neighboring developments are disconnected from the city altogether, separated by busy streets, all of this creating an island effect. In both Singapore and China, on the other hand, an integrated policy and planning approach allowed for individual towers to be seen as a greater connected whole.

Going forward, we must recognize that towers are highly interdependent and require new planning tools to resolve their relationship with their habitats. Moreover, their impact as they meet the ground is enormous, with or without podiums. Only powerful concepts for how earth meets tower can begin to bring about an urbanism – supported by architects, urban planners, and government agencies – in which the public realm is continuous, truly public, and possesses the appropriate environmental conditions to support a vibrant community.

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