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# Humanizing the Megascale

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Jaron Lubin is a Principal of Safdie Architects, based in Somerville, Massachusetts, USA. Lubin is central to many of the firm's recent speculative proposals and realized projects. His recent assignments include proposals for the National Art Museum of China in Beijing, a new Chinese opera house in Hong Kong, and the competition entry for the National Library of Israel. He was part of the design team for the Marina Bay Sands in Singapore and is currently responsible for several of the firm's Singapore projects, including the residential high-rise tower Sky Habitat and Project Jewel, a new mixed-use complex at Singapore's Changi Airport.

The principles set forth 48 years ago at the Montreal Expo 1967, embodied in the form of Habitat '67, which proposed an entirely different kind of "modern tall housing project," are now advanced in the 21st century in Singapore, with Sky Habitat. The shifted modules and balconies, combined with communal spaces at height, give the effect of a hillside village as much as a tall building. The Sky Habitat demonstrates what can happen to the tall housing typology when enlightened public policy meets inspired design.

## Introduction

Habitat '67 was an experimental housing project built as a central pavilion for Montreal's 1967 World Exposition (see Figure 1). With the Expo theme of "Man and His World," Habitat sought to reimagine urban housing in an increasingly crowded world. The goal of Habitat was to improve the standard of apartment living, particularly the sector of mass-produced affordable housing in the city. As an alternative to the stripped-down, Modernist towers proliferating in cities around the globe, the approach of Habitat was to "fractalize" the surface of the building, resulting in a structure that is permeable to light and air, with each apartment reading as an individual home within a larger collective organization. The stacking of prefabricated concrete boxes, one atop the next, results in an architectural typology more akin to a village hillside than to a solid wall. Aside from the formal association, the village metaphor also describes the interweaving of interior and exterior spaces. Each home has an outdoor garden terrace on the rooftop of its neighbor below. The building also creates many open, communal spaces, which fosters a sense of vertical neighborhoods not common to this building type.

Figure 1. Habitat '67, Montreal. © Timothy Hursley

However, nearly 50 years later, the predominant residential building type in the city today remains that of a vertically extruded tall tower. Cities continue to be filled with towers that do not address the fundamental conditions of livability on several counts. First, at the urban scale, towers continue to be built as wall-like masses, one next to another, without the sensibility to relate to the surroundings or to the street life below. Second, the apartments within these towers are often small and interiorized, climate-controlled capsules, disconnected from the surrounding environment. At best, the apartments are designed with small balconies that are unusable as outdoor spaces. The social impact of this type of residential tower design is enormous. In addition, the economics of the current model of city building is not favorable, as cities become more crowded and the cost of living increases, while any particular sense of place is eradicated, and one's quality of life is at the same time diminished. Furthermore, there is a glaring lack of planning and regulatory policies set in place, as well as a lack of supporting governance structure, to change the course of this common model for city development.

A research-based examination of the housing typology that emerged from the original Habitat thesis has been ongoing for the past several years. The goal of the authors' firm has been to re-cast the original thesis, based on

Figure 2. Sky Habitat, Singapore. © Jaron Lubin

exploding urban densities throughout the world. A recently completed high-rise residential tower project in Singapore provides the opportunity to test the principles of Habitat in a new light (see Figure 2).

## Concept and Objectives

In 2010, CapitaLand Residential Group acquired an approximately 11,997-square-meter parcel of land, centrally located in Bishan, a neighborhood 11 kilometers to the

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north of the Singapore Central Business District. Bishan is home to many public housing estates run by the Housing Development Board (HDB), and now quickly developing with many new mixed-use retail malls, office projects, and high-rise housing projects. The site is adjacent to a vibrant mixed-use retail development and multi-modal transit hub, surrounded by religious institutions and schools, and is a short distance to a green reserve area called Bishan Park.

The design brief requested true family living, designed not for the luxury market, but for middle and upper-middle income families. A wide range of unit sizes was requested, ranging from 63 square meters to 279 square meters, and with a target unit count of 500–550 apartments. The total gross floor area is 58,786 square meters.

High-density buildings in land-scarce cities often result in small living spaces, compromised amenities, and limited access to outdoor spaces and amenities. While net-to-gross efficiency was important to the project's commercial success, the developer also listed a range of amenities to serve the community, from swimming pools and playgrounds, to gardens and communal spaces for family parties and events.

In Singapore, the objectives for the design were as follows:

- Maximize exterior space for unit owners
- Maximize indoor/outdoor spaces for community use
- Maximize cross ventilation and natural daylight
- Maximize multiple exposures and unblocked views to the exterior

In addition, the client team had objectives to meet local statutory and compliance goals:

- Reclaim 100% green area
- Reach high efficiency goals for saleable area
- Match the revised UD (Universal Design) accessibility criteria
- Attain high GreenMark status
- Match buildability scores to promote prefabrication and lessen the burden on the construction workforce.

The site was organized to place two 38-story, 140-meter twin towers, arranged diagonally and staggered from one another to maximize unobstructed north-south views for all units (see Figure 3). The towers hug closely to the allowable setbacks and green buffers, maximizing the distance between them to 30 meters. The staggered footprint also maximizes the potential of the irregularly shaped site at ground level.

Each tower structure is composed of two seven-meter-wide bars, with a seven-meter-wide space in between. This minimizes the western façade exposure and avoids the tropical sun. As in the original Habitat project, building circulation is organized as a system of outdoor "streets" at each floor level. The openness of the building allows for natural air circulation and cross ventilation,


Figure 3. Site plan.

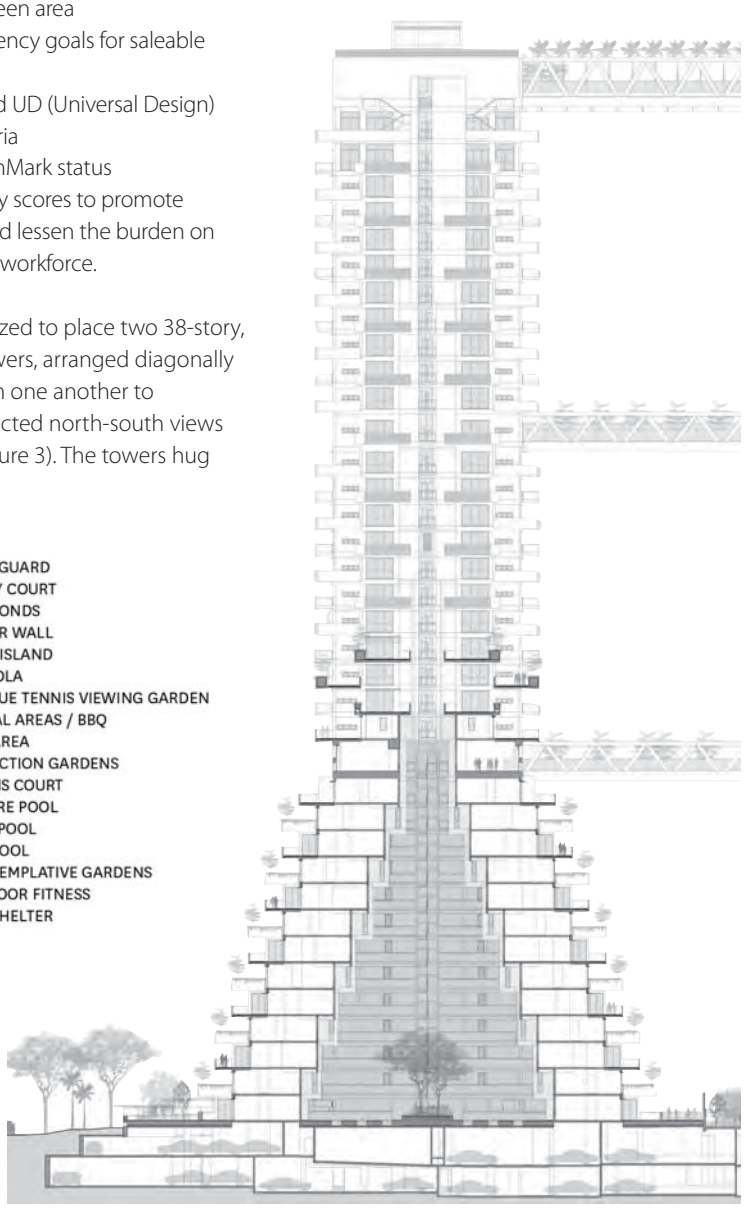

Figure 4. Block 7 section.

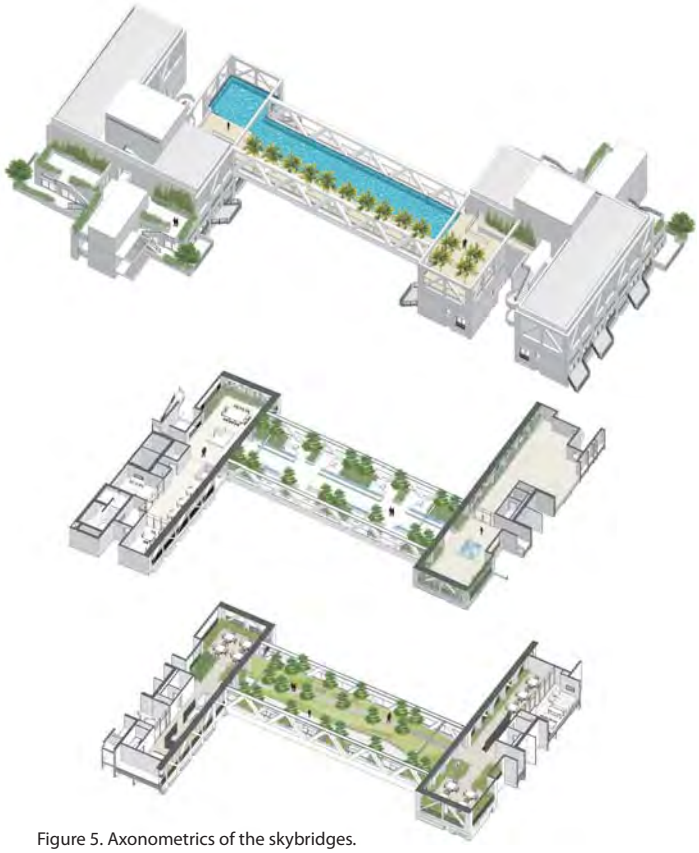

Figure 5. Axonometrics of the skybridges.

> “The design of Sky Habitat responds to the particular culture and context of Singapore, the specificity of site, and to the local regulatory systems of the region. However, the core principles of the project are generic: to provide air and light, to provide windows that do not overlook neighbors, and to provide spaces for both indoor and outdoor living.”

reducing the need for air conditioning and minimizing annual energy consumption.

Perhaps the strongest visual feature of the building is the stepped elevation of the towers. More than one-third of the units are located along the stepping edges, with access to the penthouse-like exterior roof garden terraces (see Figure 4). The north tower splays at its base, resulting in additional terraces all the way to the ground, and containing beneath them a 15-story atrium merging into the surrounding recreational spaces. Allowances built into the state regulatory systems allow open-to-sky terrace spaces to be exempted from gross floor area (GFA), a promotion directed by Singapore’s Urban Redevelopment Authority, and one that matched architectural design intent to a developer incentive. The 20-square-meter terraces are more like outdoor rooms, fully furnishable spaces with planters large enough to fit a tree. Optional shade pavilions are available for purchase at the owner’s discretion.

While stepping and splaying building components may appear unique, these are not technically groundbreaking moves. Simple construction methodologies, such as the use of conventional cast-in-place concrete structure, and standard floor-to-floor heights, ensured the building could be built quickly and economically. Working with the local engineers, the building was optimized so as to reach high buildability scores, a requirement from Singapore Building Control Authority (BCA). Buildability score is improved through best practices, such as the use of prefabricated building components and the utilization of BIM throughout the delivery of the project. The BCA has broader goals with this program to increase safety on building sites, and to become more efficient when it comes to the deployment of manpower.

As the building structure rises, apartments are designed in “pairs,” so that a three-bedroom unit stacks atop another three-bedroom type, aligning structure and plumbing. Each pair offers slight variations in scale as one steps back upon the next, but the typology of the unit remains intact. The open-to-above terraces cantilever two meters in all directions, providing shade to the windows of the unit below, while increasing the usable outdoor area. A bottom unit of a pair has a terrace projecting to the north or south, while a top unit has a terrace projecting to the east or west. These variations recall the shifting module clusters of Habitat ‘67 and also provide an added benefit to the unit layout: that is, to add variety within self-similarity. Many owners enjoy a terrace located directly off of a living space, while others value a terrace as an expanded portion of their dining room and kitchen spaces.

The unit layouts were designed in collaboration with the developer’s in-house design team. While the unit plans came about as a direct result of designing efficient and livable interiors suitable to the local market, it was also important that the building as a whole created the infrastructure to support a sense of overall community. In Singapore, there is a tradition of community living and providing generous communal facilities that originated with the HDB public housing. An example of this “community infrastructure” at Sky Habitat is the provision of three garden bridges that interconnect the two towers (see Figures 5 and 6). The bridges are located on the building “thirds” at levels 14, 26, and 38, and support communal gardens and swimming pools. Interconnecting the towers by bridges

Figure 6. Landscaped skybridge. © Edward Hendricks

Figure 7. Typical communal space.

Figure 8. Swimming pools. © Edward Hendricks

provides egress options, and makes all amenities accessible to both towers. The interconnections also provide more shared space to the tenants, reinforcing the concept of a vertical neighborhood.

A building of this scale would typically require many more stair cores to meet the standard of life safety. At Sky Habitat, the organization of horizontal and vertical circulation allows for the elimination of one egress stair per tower, as the exterior corridors provide redundant exit paths and further resiliency within the stepping form. A single closed stair core at the center of each tower acts as primary egress for the towers and doubles also as a "story shelter." Singapore residential projects require either individual bomb shelters in each apartment or shared shelters within the common areas. A second egress stair is left open to the elements, both visible and accessible to the residents. The open stair connects all levels and doubles as a common shortcut between amenities located at the multiple bridge levels.

> "The towers hug closely to the allowable setbacks and green buffers, maximizing the distance between them to 30 meters. The staggered footprint also maximizes the potential of the irregularly shaped site at ground level."

## Landscape and Amenities

Singapore's tropical climate creates a culture where families spend much time together outside, and especially at night, when people spill out of their apartments to relax in communal space (see Figure 7). In addition, multigenerational and extended family living arrangements are common, so it was important that communal spaces cater to a wide range of age groups. With 500

families living together at Sky Habitat, it was important that active and contemplative spaces coexist. Landscape spaces and amenities were crafted so as to create a great diversity of garden experiences, enhancing the sense of indoor-outdoor living.

The building landscape design features a variety of tropical planting, organized into both shaded garden and water garden spaces. On grade, the gardens fit between, under and around the staggered building footprint, to maximize the available area of the small site. There are two large swimming pools, including a 50-meter lap pool surrounded by palm trees, fitness spaces, and lounge areas. A second leisure pool with a shaded "palm island" is dedicated to children (see Figure 8). A series of reflecting pools extend below the towers, interweaving interior and exterior spaces. Aside from the shade provided by the building and the tree planting, the gardens feature several spaces with outdoor kitchens and barbecues.

One further objective was to avoid the raised car-park podium which separates the recreational space from the surroundings. At Sky Habitat, the entirety of 600 parking spaces are pushed a half-level below grade and spread across the site, resulting in better relationships with the surrounding streets.

The roof of this partially submerged structure is topped by a 1.5-meter soil layer, supporting mature trees and planting across the site. This same zone is also utilized to integrate water features and swimming pools. More than 70% of the ground plane is recovered as garden amenities. The car park is passively ventilated and porous to the garden spaces, even as it is entirely hidden from view.

The garden bridges expand the model of indoor-outdoor living and shared communal spaces. At Level 14, the garden bridge is contemplative, with water features and seating spaces. The garden is shaded by an array of Bucida canopy trees. Adjacent to the bridge are indoor kitchens and other rain-protected lounge spaces; the bridge becomes a useful extension of these amenities side-by-side. At Level 26, the bridge is filled with sculptures on a raised turf-covered earthen mound, with semi-private nooks for outdoor dining. The garden is flanked by fitness rooms and a multipurpose room/dance studio, promoting more active usage. The entire rooftop bridge supports a 40-meter-long infinity-edge lap pool that spans end to end (see Figure 9). The bridge vantage points are breezy overlooks with open views to the east and west.

## Structure and Building Façades

The towers are highly rational structures, constructed of cast-in-place concrete and finished with a skim coat and paint finish. The concrete walls range in thickness from a typical 200 millimeters along the perimeter, to 450 millimeters at the splayed shear walls located at the north tower. The walls are perforated with large three-meter by three-meter openings for windows. Flat-slab, column-free construction provides planning flexibility. The concrete lift and stair cores work in tandem with intermittent shear walls to stabilize the building. The bridges are constructed of welded, built-up box steel members forming 4.5-meter-tall trusses. These were prefabricated and transported to the site, and lifted into place during construction.

The façade design helps to mitigate the tropical heat. The cantilevered two-meter-deep balconies play a major role in shading the windows, and cut down on the direct solar radiation (see Figure 10). Each apartment is designed with a minimum of one balcony, and most units have either two or three balconies. Mounted to the face of

Figure 9. Rooftop bridge pool. © Edward Hendricks

Figure 10. Cantilevered balconies, view from below. © Charu Kokate

Figure 11. Balcony details.

each balcony is a custom railing screen, which serves to further shade the structure. The screen is constructed as an aluminum egg-crate, providing privacy while allowing air to flow through. The balconies shift left and right, one atop the next, which gives each homeowner a double-height balcony space (see Figure 11). As a byproduct of the shifting balconies, the entire façade becomes pixilated, further breaking down the scale. All other openings without balconies have Juliet-style railings, so that homeowners can open the unit entirely to the exterior, to be cool and airy.

The design of Sky Habitat responds to the particular culture and context of Singapore, the specificity of site, and to the local regulatory systems of the region. However, the core principles of the project are generic: to provide air and light, to provide windows that do not overlook neighbors, and to provide spaces for both indoor and outdoor living. These principles would seem fundamental to any building one would want to live in today. The stepped, splayed, and bridging components are the means by which this is achieved. At Sky Habitat, 50 years since its original namesake was built at Expo '67, these principles are applied to middle-income housing at much greater densities.

## Conclusion

As tall towers are the building blocks for the city, it is important that architects continue to challenge the typology as well as study tall buildings' relationships with one another, and to the surrounding urban context. The greatest transformations have occurred when planning authorities lead the charge, providing incentives to builders and owners that match good urban design practices with rewards. Singapore is notable for its allowances for additional height or gross floor area when green spaces and open-to-above terraces are included in a design. In fact, one cannot be competitive as a developer today in Singapore if the end product does not offer sky gardens and common amenities. This is how far the incentive has now elevated the market baseline standard of living.

The next advances can also come in the field of building technology. Habitat '67 tested the limits of production and prefabrication; however, the customized set-up and limited run of such a singular development was not cost-efficient. A focus on more sustainable prefabrication models and intelligence of individual building components, whether they are module boxes, panelized wall systems, or entire bathrooms and kitchens, are all worthy of further investigation. ■

*Unless otherwise noted, all photography credits in this paper are to Safdie Architects.*

## Project Data

**Completion Date:** 2015
**Height:** 133 meters
**Stories:** 38
**Total Area:** 65,000 square meters
**Use:** residential
**Developers:** CapitaLand Singapore Limited; Mitsubishi Estate Asia; Shimizu Corporation
**Architects:** Safdie Architects (design); DCA Architects Pte Ltd (architect of record)
**Structural Engineer:** RSP Architects, Planners & Engineers Pte Ltd. (design)
**MEP Engineer:** Alpha Consulting Engineers Pte Ltd (design)
**Other Consultants:** COEN + Partners (landscape); Coen Design International (landscape)

*"The design here is not to preconceive the form and then see how the units work into it, but actually work from within. So the idea of the pyramid stepping structure comes from the idea of gardens, and because I believe they should be open to the sky, they step back. And the two planes play together against each other to maximize the views and maximize the air flow. Too often, the exciting-looking forms of residential design are also preconceived shapes, and within that, the designer is kind of struggling to arrange the living environment. I think, and I do believe passionately, that architectural forms grow from within, from the organization and spatial requirements of the building, which I think is what this building is all about."*

Moshe Safdie, *Safdie Architects*