

CTBUH Journal

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Tall buildings: design, construction and operation | 2011 Issue IV

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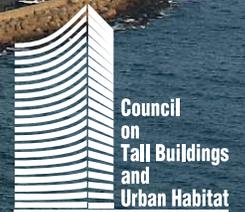
Haeundae l'Park, Busan

Country Report: South Korea

The Subtropical Residential Tower

Integrating Wind Turbines in Tall Buildings

A New Demolition Method for Tall Buildings



This Issue

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Front cover: Haeundae I'Park, Busan
Back cover: Haeundae I'Park – Retail Element
© Studio Daniel Libeskind



Just few months after I assumed the position of Chairman of the CTBUH in 2009, the Burj Khalifa in Dubai was officially declared the latest “tallest building in the

world.” Presently, just a couple of months before I am about to pass the Chairman’s gavel on, the Kingdom Tower project in Jeddah has been announced as the future tallest building in the world, breaking the one-kilometer threshold. If there is one great way to mark the start and end of the term of Chairman of a council on tall buildings, I think this is it.

This, of course, is just a happy coincidence. It only requires a quick look at tall building statistics in recent years to understand that tall buildings have become taller and more numerous, especially in Asia and the Middle East. It is with great pride and pleasure, therefore, that I welcome you to my hometown of Seoul for the CTBUH 2011 Conference, where hundreds of tall building professionals and academics will meet to discuss the latest developments.

Because the publication of this issue of the CTBUH Journal coincides with the conference, we have decided to give it a Korean flavor. Our case study for this issue takes a close look at the Haeundae I'Park project in Busan, of which the tallest of its three towers is currently the tallest all-residential tower in Asia. The project is also a great example of how tall buildings are being shaped within the Korean context. Additionally, the Design Research section of the Journal features the work of CTBUH Executive Director and Illinois Institute of Technology Professor Antony Wood’s Tall & Green Studio, which was organized around a specific development site in Seoul.

As the conference is a great opportunity to share the latest in tall building design, development and construction, this Journal, as always, shares a taste of what’s happening in the tall building world. Green, Safety and Humanity are the main themes for the conference, and these have been adopted in

the Journal. Safety was the topic covered extensively in the previous Journal through the focus on the ten years since 9/11. In terms of “green,” two great papers discussing integrated wind turbines and the natural ventilation of tall buildings in subtropical climates are included. In terms of “humanity,” a paper on humanizing high-rise urbanism confirms that the urban habitat is a vital topic within the tall building world.

In addition to new records and developments in the world going upward, we also include a paper about going the other way. It reports on the demolition of a tower from the bottom up – a rare feat in tall buildings. The paper is another great example of how tall buildings and innovation go hand in hand, beyond just exploring extremes and uncharted territories when it comes to height.

Although my term as CTBUH Chairman is coming to an end, I will stay involved moving forward as Vice-Chair, which is a great position to support our next Chairman, Tim Johnson. In this edition of Talking Tall, Tim and I share our thoughts on tall buildings and leading this great organization. I will also soon be leading a team of co-chief editors of a new research journal, called the *International Journal of High-Rise Buildings*. Focusing on scientific research, this is a great opportunity to share the knowledge created by academics, researchers, and practitioners, to the benefit of all involved in tall buildings.

I would like to conclude with a very big and sincere thank you to all of you who have been involved with the activities of the CTBUH, and have worked very hard to make these past two years a great success.

All the best,

Sang Dae Kim, CTBUH Chairman

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Case Study: Haeundae I’Park, Busan



“In South Korea, there is an emphasis on family and social relationships. High-density residential developments are preferred because they support a strong sense of community.”

The Haeundae I’Park is a 1.08 million square meter (11.6 million square foot) high-rise mixed-use development in Busan, South Korea. It is a prime example of high-density residential development in South Korea, where high-density residential developments are preferred because they support a strong sense of community.

The project was designed as a mixed-use development, combining residential, commercial, and recreational spaces. The development includes a mix of residential units, commercial spaces, and recreational facilities, all integrated into a single, cohesive design.

The project was designed as a mixed-use development, combining residential, commercial, and recreational spaces. The development includes a mix of residential units, commercial spaces, and recreational facilities, all integrated into a single, cohesive design.

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Integrating Wind Turbines in Tall Buildings



“Should turbines be deployed on every building? Probably not, but I’m sure in time there will be more pioneering examples of project collaborations resulting in highly innovative solutions.”

This article explores the potential of integrating wind turbines into tall buildings to generate clean energy. It discusses the challenges and opportunities associated with this technology, including the need for innovative project collaborations.

The article discusses the challenges and opportunities associated with this technology, including the need for innovative project collaborations. It highlights the importance of interdisciplinary collaboration between architects, engineers, and environmental scientists to create sustainable and efficient building designs.

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A New Demolition Method for Tall Buildings



“Using conventional demolition methods, an estimated 20% of materials could have been recycled on the job site, returning a recycling rate of 35%. The C&T method allowed recycling of 20 kinds of material with a 93% recycling rate.”

This article introduces a new demolition method for tall buildings, known as the 'Kajima Cut & Take Down Method'. It details how this method significantly improves the recycling rate of demolition materials compared to traditional methods.

The article details how this method significantly improves the recycling rate of demolition materials compared to traditional methods. It describes the process of cutting and lowering sections of the building, which allows for the recovery and reuse of a wide variety of materials, including steel, concrete, and glass.

“Most of the world’s urban population growth is occurring in subtropical and tropical zones. Designs that oblige people to use air-conditioning for indoor thermal comfort exacerbate the use of fossil fuel energy and CO₂ emissions, and also impose significant long term costs on occupants as the costs of energy rises inexorably.”

Rosemary Kennedy & Shane Thompson, page 24



Kingdom Tower, Jeddah © AS+GG

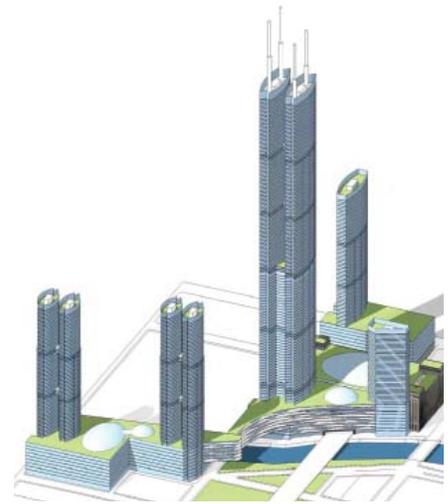
Kingdom Tower

There can be no better way to open the Global News than with the official announcement of a new future world's tallest building! What has been rumored for a while has now been proposed: a tower of over 1,000 meters (3,280 feet). Announced on August 2 by His Royal Highness Prince Alwaleed Bin Talal Bin Abdulaziz Alsaud of Saudi Arabia, and designed by Chicago based Adrian Smith + Gordon Gill Architecture, the **Kingdom Tower** in **Jeddah** is now officially set to become the world's tallest building around 2017.

The tower will be the centerpiece and first construction phase of the Kingdom City development, a 5.3 million-square meter (57 million-square foot) site in north Jeddah. The tower itself will contain 530,000 square meters (5.7 million square feet) of space, featuring a Four Seasons Hotel and apartments, Class A office space, luxury condominiums and the world's highest observatory. The design development of the tower is underway, with the impending construction to begin once complete. Foundation drawings have been finalized and the piling work for the tower is currently being tendered. Kingdom Tower will cost approximately US\$1.2 billion to construct, while the cost of the entire Kingdom City project is anticipated to be US\$20 billion.

Chicago

CTBUH's home town of Chicago has witnessed a number of years recently where development and construction of tall buildings had pretty much grinded to a halt. News that UK developer Bill Davies is



The Chicago Post Office Building redevelopment scheme © Booth Hansen

proposing a US\$3.5 billion-project for the redevelopment of 20 acres around the old **Chicago Post Office Building** in the South Loop area thus hit the local architecture and real estate world with quite a bang. The concept, designed by Chicago architect Larry Booth of Booth Hansen, proposes a 10-story mall and entertainment complex built on property surrounding the old Post Office Building (currently vacant), on top of which five skyscrapers would rise, varying in height from 40 to 120 stories. The tallest tower in this scheme would be a multi-use 610-meter (2,000-foot) supertall building.

The plan triggered a local debate, with arguments labeling the project as either a pipe dream or as a sign of better times. Some international examples exemplify the initial enthusiasm generated for very large and tall designs which have been proposed but does not always result in serious development and financing that needs to go into projects of this scope. An approach on how to categorize these proposed projects is something which will be examined during the meeting of the CTBUH Height Committee in Seoul this October.

Even if the Post Office proposal turns out to be a fantasy, it is one of a number of positive development news that has hit the Windy City of late; a mini tall building buzz. The local press have announced a number of new or revived tall building projects recently.

... evacuation

“If we try to build just horizontal evacuation roads, they won't be enough. But multi-story buildings are one way to save the people.”

Dedi Henidal, Director of Padang's Natural Disaster Mitigation Board discussing on the plan for a multi-story evacuation building. From "Indonesian Officials Looks Up To Save Lives During Future Tsunami Events," Irish Weather Online, August 3, 2011

Apartment buildings especially seem to be leading the way in the recovery of the commercial real estate market due to strong demand. Since 2010, four out of nine buildings delivered in downtown Chicago were originally developed as condominiums. Currently, 19 projects with about 7,400 apartments are proposed.

The best example of a revived project is the **Waterview Tower**, a hotel and residential project on Wacker Drive and LaSalle Street, adjacent to the Chicago River. The project was halted in 2008, leaving it standing with 25 out of the projected 90 floors built. Planned at 320 meters (1,050 feet), the proposed design would have become the 5th tallest building in the city once completed. Together with the Chicago Spire project, it stands as a symbol of the recent financial crisis. The Waterview Tower project was sold in July 2011 to The Related Companies, a New York-based developer which has also developed the 1 MiMa Tower as reported in the Journal 2011 Issue III. Related plans to use the existing structure and convert the building into a 65-story luxury rental building with 500 units, suggesting a redesign for the tower. Construction is set to restart in the first quarter of 2012, to be completed 18 to 24 months later.

Tall Building Preservation

While in Chicago, another interesting trend being witnessed is the growing number of tall

buildings considered as architectural heritage, yet finding themselves under threat of demolition. This is partly the result of a lack of legal or regulatory protections. Some buildings many Chicagoans consider as historic skyscrapers, such as the Wrigley Building and Marina City, are not even officially landmarked.

The 15-story Wacker Tower, better known as the **Motor Club Building**, is a classic example of an early Art Deco skyscraper. The tower, which was completed in 1928 and designed by Chicago architects Holabird & Root, was sold for US\$9.7 million in June at a court-ordered bankruptcy auction. To prevent the building from being purchased by someone who was primarily interested in the central location of the tower, the Chicago Landmarks Commission rushed to grant the building a preliminary landmark protection status. The new owner, the Chicago-based mortgage banking firm Aries Capital, has stated it intends to preserve the building, not knock it down.

Not all landmark buildings are that lucky however. Cost versus benefit is always a consideration when it comes to revitalizing building features, as some older towers require extensive external and internal retrofits to suit future commercial and residential needs. Early 20th century skyscrapers tend to have inefficient floor plans and come with costly renovations to the façade, while some

of the mid-century buildings tend to be very energy-inefficient or are unique because of their architects or architectural style.

An example of the latter is the **Prentice Women's Hospital** in Chicago's Streeeterville area east of Michigan Avenue. Completed in 1975, the seven-story tower sits on top of a right-angled, steel-and-glass base. Architectural preservationists have called the building "a great example of recent modern architecture which motivated many architects to explore other shapes instead of rectangles and squares." It is also an excellent example of the work of Chicago's famous architect Bertrand Goldberg (architect of Marina City, Chicago). Northwestern Memorial Hospital, the owner of the complex and already well represented in the area, has requested a demolition permit to make way for a medical research tower. The building is currently not protected by landmark status, but many individuals and organizations are trying to create support for landmark protection. If Prentice is deemed a landmark, it would be one of the first "modern" buildings to be saved in the city.

Canada

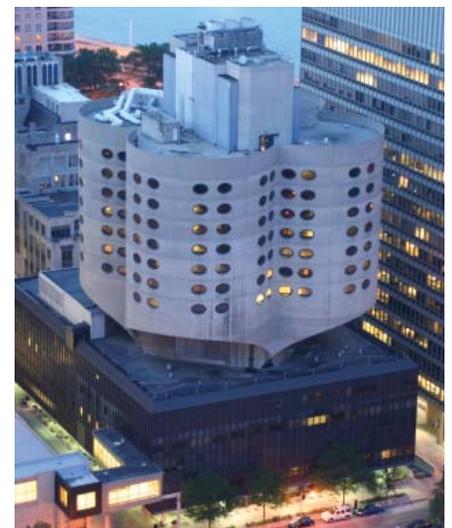
In **Toronto**, the **CN Tower** celebrated its 35th birthday on June 24, 2011. The 553-meter (1,815-foot) tower, which up until the completion of Burj Khalifa in January 2010 could claim the distinction of being the ↗



Waterview Tower, Chicago © Marshall Gerometta



Motor Club Building, Chicago © Antony Wood



Prentice Women's Hospital, Chicago © Jan Klerks

Case Study: Haeundae I'Park, Busan



Carla Swickerath



Peter Tillson

“In South Korea, there is an emphasis on family and social relationships. High-density residential developments are preferred because they support a strong sense of community.”

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Carla Swickerath

Carla Swickerath is a Principal and CEO of Studio Daniel Libeskind. She joined the firm in 1999 when the office was based in Berlin. Carla was the Principal in Charge of the Haeundae I'Park residential development in Busan, Korea and led the project from concept to completion. In addition to the Haeundae I'Park, Carla helped lead the World Trade Center master plan competition and moved with the office to New York City in 2003 when Studio Libeskind was awarded the master plan for the site. She is currently leading a 30 million-square foot master plan in Seoul, Korea, and has residential projects under construction in Brazil and Toronto.

Peter Tillson

Peter Tillson is a structural engineer with Arup, with experience practicing engineering globally in the United States, Australia and New Zealand. He has extensive experience in seismic analysis and the design of airports, multi-story buildings, museums and industrial buildings. This includes all aspects of project management, structural design, phasing and coordination with other specialist disciplines.

The Haeundae I'Park is a 511,805-square meter (5,509,000-square foot) high-density mixed-use development in Busan, South Korea which includes three high-rise residential towers (66, 72 and 46 floors) and a total of 1,631 units. A 34-floor luxury hotel, a 9-floor office building, and a 3-floor retail building have been composed on a landscaped, waterfront site in the second largest city in Korea. Busan, a rapidly growing city with approximately 3.6 million residents, is located on the southeastern tip of the Korean peninsula. It is a bustling port city and a vacation destination, with a dramatic combination of both mountains and beaches as its natural setting.

The I'Park development creates a new, forward-looking image for The Hyundai Development Company (HDC) and a new vision for residential living in Busan. Built on a landfill site along the waterfront, the three residential towers soar to 292 meters (958 feet), 273 meters (895 feet) and 205 meters (674 feet). The highest tower became the tallest residential building in Asia on completion. Essential to the design of the Haeundae I'Park complex is the integration of the development into the Haeundae Marina city site to the west. The marina's development by the same owner (HDC) will

be part of the residential amenities for the project and will serve as a public attraction for visitors and residents.

The project is designed as a unique composition expressed in a series of dynamic volumes on the Busan waterfront that harmonize with the landscape and celebrate the city's spectacular setting of mountains, rivers and the sea. The buildings are sculpted to express the dramatic beauty and power of the ocean. The curvilinear geometry of the buildings alludes to their context; the grace and force of ocean waves; the unique composition of the petals of a flower;



wind-filled sails of ships on the water; and by the subtle, elegant curves in traditional Korean architecture.

Design Context

The Korean residential market is unique and the design of the Haeundae l'Park had to respond in a meaningful way to the specific cultural and economic issues. In South Korea it is considered desirable to live in cities and, as with most major urban centers, land prices are incredibly high. Large scale, high-rise developments are the most efficient and profitable way to provide housing that meets the demands of the market. Therefore the market has very rigorous efficiency standards that are challenging to achieve. Design solutions need to be creative and practical to maximize land values. The market's emphasis on ownership also drives the quality, diversity and quantity of residential units which become more than just a living space, but also a major investment for the future. The quality of design, sense of community and amenities provided not only make for very attractive, livable residential developments, but become assets that help the units hold their value over time.

The main challenge of the project was to create a balanced composition with maximum views and livability with a large

program on a very dense site. The design had to meet rigorous efficiency expectations and moderate construction costs while maximizing sweeping views of the ocean, the marina, the mountains, the Gwang-An bridge and the landscape and the city of Busan.

To find innovative solutions, multiple strategies for the massing of the program on the site were studied. Instead of simply extruding the typical building footprints to their maximum heights, the footprints of the towers are made of a sculpted shape in plan (see Figure 1), the heights are varied and the profiles are tapered to create a three-dimensional composition on the horizon. The varying heights of the buildings help to break down the overall massing of the residential tower complex (see Figure 2). Instead of simply extruding the footprints of the buildings to an equal height, the design redistributes the allowed massing and height of the towers to create variation in the composition of the towers while meeting the maximum FAR for the development.

The balance of the tower composition as a whole also depends upon the breaking down of the large, solid mass of each tower form. By creating an interlocking tower that is made of two distinct forms, the design allows for only half of the mass to be raised as a tip instead of the entire, large mass of the tower. The

intention is to create the most positive effect with the most practical solution.

These strategies not only give the project and the city of Busan a new landmark and a new image of residential development, which in Korea is traditionally quite formulaic, they also help maximize the view corridors of all the apartments as well as bring the most light possible into the site and the developments beyond the site. Redistributing the massing makes the very large development seem more slender on the skyline. Also, the varied forms create unique and exciting spaces between the buildings that add interest and variety to the entire development from inside and out.

The project maintains efficient floor plates and repeatable construction for about two-thirds of the height of each tower. The extruded footprints change shape only at the tops of the buildings, when they taper up, culminating in the tower tips. Even when the tops of the buildings do taper, about half of the floor plate remains the same (see Figure 3). One half of the floor plate is extruded directly to its maximum height with no tapering. The same tower footprint is used in each residential tower, one being a mirror image of the other two, to create the same footprint which eases the efficiency of the development while creating a unique, ↗

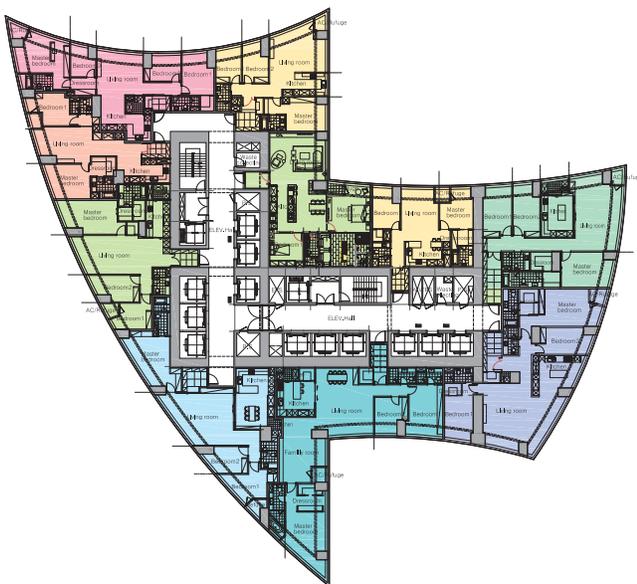


Figure 1. Typical residential floor plan © Studio Daniel Libeskind



Figure 2. Haeundae l'Park, Busan © Studio Daniel Libeskind

Humanizing High-rise Urbanism: Design Strategies and Planning Tools



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Vinayak Bharne directs the urban design efforts at Moule & Polyzoides, and teaches urban design and planning at the University of Southern California in Los Angeles. His professional experience includes numerous new towns, inner-city revitalizations, campus plans, and form-based codes for municipal and private clients in the United States, Canada, UAE, Panama, and Mauritius.

His work has received awards from the American Planning Association, and the Congress for the New Urbanism and has appeared in such books as *New Urbanism: Best Practices Guide* (New Urban Press 2009), and *Great Planned Communities* (UL, 2002). His academic research has focused on the nexus of indigenous infrastructure, urban policy and the global water crises, with ongoing projects on Isfahan and Yazd in Iran, and Goa, Agra and Varanasi in India.

He is the contributing author of many books including the forthcoming *Planning Los Angeles* (APA Press 2012), *Aesthetics of Sustainable Architecture* (O10 Publishers, 2011), *Los Angeles: Building the Polycentric Region* (CNU 2005), and *Hvalnica Senci* (Slovenian for "In Praise of Shadows," Koda Press 2002). Nominated as a Presidential Fellow among 25 "promising future leaders" by USC's Leadership Institute in 1998, he currently serves on the Advisory Board of Global Urban Development, an international non-profit engaged in strategic policy and action on urban issues worldwide.

“From a global standpoint, the high-rise city remains a negotiated territory, a juggling act between private interests, political processes and public good. But while private entities might be entitled to seek their advantage in the urban fabric, the shape of the city should eventually be a collective decision.”

In his 1924 book *The City of Tomorrow and its Planning*, Le Corbusier juxtaposed an image of Manhattan with his alternative version of “the Contemporary City.” In contrast to New York’s compact high-rise district, this new model depicted an airy field of twenty four cruciform towers standing in a park. The street grid had been replaced by a field of gigantic mega-blocks, the street wall obliterated by setting the buildings away from the block edge, and the tower redefined as a freestanding and replicable object rather than part of a continuous, diverse urban fabric.

The Fallacy of High-rise Urbanism

Le Corbusier went on to demonstrate this model’s application by superimposing it on the traditional Parisian grid. In response to what he saw as the congested, unhealthy traditional city, his Plan Voisin erased the intimate horizontal fabric centered on courts and yards, and imposed a new urban order that could not have been less stark.

The project was never realized, but this model and its manifesto – eventually known as the Ville Radieuse – marked a turning point for the formal, social and moral dimensions of city-making. The Central Business District that has come to be identified with the monumental streetscapes of towers now became vivid galleries for these newer high-rise models. Popularized by New York’s Lever House (1952), towers were made with their own plazas linked exclusively to private interiorized office parks. As seen in John Portman’s hotels, glazed high-rises sat on brutalist podia housing parking and service uses that present dead walls to the street. Nothing was more antithetical to this street nihilism than New York’s and Chicago’s earliest towers that while expressing their individuality on the urban skyline had

simultaneously generalized their bases to activate street life (see Figure 1).

Meanwhile, with developers vying for maximum land value, the tower also became a popular production housing prototype, and hundreds of high-rises erupted randomly within finely grained traditional



Figure 1. Mid-town New York. High-density buildings fostering a vibrant street life © Moule & Polyzoides



Figure 2. High-rise development in Shanghai. Note the relentless repetition of the freestanding towers and their angled relationship to the central avenue © Brian McMorro

neighborhoods regardless of the size and scale of their neighbors. Such relentless extrusion was the result of a linear Floor Area Ratio (FAR) based zoning that established the numerical maximum building envelope per zone (A FAR of 3 means that the total buildable area can be up to three times its lot area). In the absence of other guidelines this area could therefore be legally accommodated in a 6-story perimeter block building just as conveniently as a 20-story tower, irrespective of context. With FAR offering assembled lots a considerable buildable area over individual ones, high-rise accumulations are now synonymous with high-end production housing from Buenos Aires to Mumbai. As emblems of an exclusive, elite lifestyle, they are designed as introverted mega-block enclaves with towers and slabs floating in private greens, fostering a vibrant social life within secured walls that seal them from the city (see Figures 2 and 3).

The most dramatic products of this FAR syndrome are the circumstantial hyper-Manhattans of southeast and eastern Asia. In Tokyo for instance, towers are peculiar simply in the way they exist – in fragmented, cacophonous spurts amidst fabrics of relatively miniscule buildings. Standing in anything but an urban grid, they defy any urban logic save their presence on important streets and subway stations. The result of ad hoc piecemeal vertical extensions of historic lots by successive entrepreneurs, they often embody spasmodic configurations as seen in Roppongi or Kachijo, with low medieval

fabrics surrounded by high-rise eruptions creating sharp disjunctions from bustling high-rise urbanity to quiet, small-scale traditional circumstances right next to each other.

Similarly, in Hong Kong, with individual property owners competing for optimum land value, peculiar fabrics of tall thin buildings on small traditional lots have erupted with little concern for light and air. These “pencil skyscrapers” have an extremely low aspect ratio (gross floor area divided by the number of stories) compared to typical high-rise buildings in the United States or Europe. Twenty to twenty-five stories in height, each floor typically contains no more than a pair of 37-square meter (400-square foot) units, with the bottom two floors dedicated to commercial use. They are the result of Hong Kong’s relatively laissez-faire building height limitations, when the British-controlled government traded the discretionary European planning controls for a developer-friendly quasi-mathematical formula. This hyper Manhattan prototype has now spread from Malaysia to China making it the most dominant high-rise urban model in Asia (see Figure 4).

The tower as an urban landmark may contradict the iconism



Figure 3. Lunkad Skylounge, Pune, India. Slabs and towers define a common green in this high-end residential enclave secured by walls and gates © Vinayak Bharne

traditionally reserved for religious edifices or palaces and in some cases a few state institutions such as the Nebraska State Capitol and the Los Angeles City Hall. But Kuala Lumpur’s Petronas Towers, Dubai’s Burj Khalifa and Pudong’s Jin Mao Building also echo the original intentions of the skyscraper as a symbol of commercial competitiveness. The problem however is that few if any of these marvelous icons engage in conscious urbanist responsibilities. The publicly accessible mall at the base of the Petronas Towers is completely internalized with dead street walls and narrow sidewalks. The 99-hectare (244-acre) lake-centered oval mega-block containing the shimmering Burj Khalifa has nothing happening at the block-street edge. And the Jin Mao Building located along Century Avenue neither contributes to any collective thoroughfare form, nor marks any public space. In as much as the endowing of these private monuments with cutting edge technology and symbolism are laudable ➔



Figure 4. “Pencil Skyscrapers” against mid-rise housing in central Hong Kong © Brian McMorro

About the Council

The Council on Tall Buildings and Urban Habitat, based at the Illinois Institute of Technology in Chicago, is an international not-for-profit organization supported by architecture, engineering, planning, development and construction professionals. Founded in 1969, the Council's mission is to disseminate multi-disciplinary information on tall buildings and sustainable urban environments, to maximize the international interaction of professionals involved in creating the built environment, and to make the latest knowledge available to professionals in a useful form.

The CTBUH disseminates its findings, and facilitates business exchange, through: the publication of books, monographs, proceedings and reports; the organization of world congresses, international, regional and specialty conferences and workshops; the maintaining of an extensive website and tall building databases of built, under construction and proposed buildings; the distribution of a monthly international tall building e-newsletter; the maintaining of an international resource center; the bestowing of annual awards for design and construction excellence and individual lifetime achievement; the management of special task forces/working groups; the hosting of technical forums; and the publication of the CTBUH Journal, a professional journal containing refereed papers written by researchers, scholars and practicing professionals.

The Council is the arbiter of the criteria upon which tall building height is measured, and thus the title of "The World's Tallest Building" determined. CTBUH is the world's leading body dedicated to the field of tall buildings and urban habitat and the recognized international source for information in these fields.

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