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> "In this global society in which citizenship might transcend traditional political borders, skyscraper symbolism is distinctly provincial, a source of jurisdictional pride and power."

Christopher Michaelson, page 20

Global News

Visit the daily-updated online resource for all the latest news on tall buildings, urban development, and sustainable construction from around the world at: ***http://news.ctbuh.org***

Americas

From August to October 2014, the Americas continued to raise eyebrows in the skyscraper world, as multiple projects redefined skylines and kept heads gazing upwards.

After nearly 10 years of planning, **53W53** is finally ready to begin construction in **New York City,** as the necessary air rights have been granted for its parcel, which sits directly adjacent to The Museum of Modern Art in Midtown Manhattan on West 53rd Street. This highly-anticipated project, designed by Pritzker Prize-winning architect Jean Nouvel, features a striking cross-bracing system that lends a touch of complexity to its metal and glass façade. The 82-story, 320-meter tower will comprise 140 luxury condominiums, 28 serviced apartments, and a 3,600 square-meter gallery space expansion for the Museum of Modern Art below. Completion and initial occupancy are expected to take place in 2018.

53W53, New York. © Ateliers Jean Nouvel

Journal Squared, Jersey City. © Handel Architects / HWKN

Elsewhere in Manhattan, revised plans have been uncovered for **125 Greenwich Street,** a superslim tower that may boast an impressive height of 413 meters upon completion. Original designs for the development called for a 293-meter tower designed by Rafael Viñoly. While Viñoly has been retained as the architect, new designs reveal a much taller finished product, one that will top out 3.5 meters shy of One World Trade Center's rooftop. At 77 stories, the tower will feature unusually high ceilings and will offer a total of 10 penthouses, the highest of which will be a duplex that will contend for the title of Manhattan's most expensive residence.

Across the East River, the Atlantic Yards mega-project has been rebranded as **Pacific Park.** The announcement comes after developer Forest City Ratner Companies struck a partnership with China's second-largest property developer, Greenland Group. The developers have selected COOKFOX to design two new towers at the site, **550 Vanderbilt Avenue** and **535 Carlton Avenue.** The high-rise at 535 Carlton Avenue will be completely devoted to affordable housing, providing much-needed economic relief in one of the United States' most expensive real-estate markets.

160 Folsom Street, San Francisco. © Studio Gang

Pacific Park has also made headlines with news that construction on the world's first modular high-rise, **B2,** has been halted due to a dispute between the builder, Skanska USA, and Forest City Ratner. Skanska claims that the modular techniques set out by Forest City were flawed, while the developer claims that the entire construction process was mismanaged by the builder. Regardless of who is to blame, the development world is eagerly following the debate, as it could provide major insights into the viability of modular construction techniques for high-rise buildings.

Alternatively, things are moving smoothly across the river in **Jersey City,** as crews continue construction of **Journal Squared,** a massive three-tower high-rise complex that will include the tallest residential building in New Jersey. The lower floors of the complex will accommodate smaller units and commercial spaces that respect the development's low-rise surroundings, while the upper floors feature larger, higher-end residences. The first phase is expected to complete in 2016, while the second phase will complete in 2021.

On the US West Coast, planning permissions are moving along in **San Francisco** for **160 Folsom Street,** a 40-story residential tower designed by Studio Gang, offering a unique interpretation of

Park Grove, Miami. © OMA

Torre BBVA Bancomer, Mexico City. © Lego Rogers

Victoria One, Melbourne. © Elenberg Fraser

the city's iconic bay windows. At a modest height of 122 meters, the tower features stacks of windows and balconies that twist along its height, creating an elaborately textured façade that catches the eye. Details of the project are still evolving and the desired skin material is still being researched, but architect Jeanne Gang says she is certain that it will be a material that is light in color in order to reflect the vibrancy of its locale.

Aspirations remain similarly high in **Miami,** where OMA has revealed designs for a three-tower luxury condominium complex, **Park Grove.** Sited on a six-acre plot, the towers are cylindrically shaped, with gently undulating floor plates revealing a curved façade. Large concrete columns separate each unit's balcony, producing a greater sense of verticality for the towers. Among the most notable features of the project are the bases, which will accommodate commercial tenants and incorporate accessible rooftop gardens.

Gardens at height are a central theme in **Mexico City,** as the **Torre BBVA Bancomer** inches nearer to completion. Standing as a symbol of Mexico City's global presence, the 235-meter office tower is poised to become the tallest building in Mexico. The design of the building places a high priority on social interaction and promoting a sense of community. Sky gardens at every ninth floor create valuable outdoor spaces that take advantage of the tower's 360-degree views. The design of each office floor is varied, as each responds to the service core that runs diagonally along each ascending floor plate. The resulting layout provides a variety of unique, efficient office spaces.

Asia and Oceania

Australia shows no signs of slowing its upward trajectory – a trend made apparent by the hefty development pipeline of **Melbourne.** In early September**,** Elenberg Fraser revealed its designs for **Victoria One,** a tower that would become the city's tallest residential skyscraper. The 241-meter tower is to be clad in refulgent green glass and a series of layered architectural fins that reduce downdrafts at the street level, while providing solar shading for residences. At a distance, the orientation of the fins lends a fluid aesthetic to the building's façade, complimenting the sleek, high-end character of its interiors.

The luxury trend is not exclusive to Melbourne, as a stately trio of Zaha Hadid-designed towers has been presented for the **Brisbane** suburb of Toowong. The **Toowong Development** will comprise three towers rising from the site of the abandoned studio complex of the

Toowong Development, Toowong, Brisbane. © Zaha Hadid Architects

Going for Green, Heading for the Light

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Jean Nouvel
Jean Nouvel obtained his degree from the Ecole Nationale Supérieure des Beaux-Arts in Paris in 1972. Soon afterwards, he became a founding member of the "Mars 1976" Movement and was a founder of French Architecture Union. His works have gained world-wide recognition. In 2000, Nouvel received the Lion d'Or of the Venice Biennale. In 2001, he received the Royal Gold Medal of the Royal Institute of British Architects (RIBA), the Premium Imperial of Japan's Fine Arts Association and the Borromini Prize for the Lucerne Culture and Congress Centre in Lucerne. Nouvel was the recipient of the prestigious Pritzker Prize in 2008.

Bertram Beissel
Beissel joined Ateliers Jean Nouvel in 1998 and became a partner in 2002. He has directed a variety of European and international projects, including 53 West 53rd Street in Manhattan and the Guthrie Theater in Minneapolis, Minnesota. Both of these projects are featured in the selected works of the Pritzker Prize, which was awarded to Jean Nouvel in 2008. Beissel recently completed the design and construction of One Central Park Towers in Sydney, Australia. This project achieved the highest Green Star rating and takes a unique approach to urban solar power and organic shading. Currently, Beissel is AJN's US Project Director and is overseeing the construction of the 53W53 residential tower until its planned completion in 2018.

One Central Park was developed as a response to growing demand for residential accommodation in downtown Sydney. Its developers and designers used the opportunity to make a powerful and visible green statement with a tall building that is environmentally responsive on multiple levels. The project challenges the Modernist resistance to surface accretion, both with a planted veil that cleans the air, provides shade, and speaks of a naturally-integrated urban vitality, and a technologically-assertive apparatus that guides the sun's rays where they are most needed.

Global Overview

The United Nations predicts that the world's population will increase by 2 billion between today and 2050, and the number of people living in cities will rise from 50 to 75%. Inevitably, rural populations will be shrinking, and almost every urban center in the world will be growing. Twenty-first-century Australia is not exempt from this trend: Sydney could grow from 4.6 million inhabitants today to 7 million by 2056, Melbourne from 4.1 to 6.8 million, Brisbane from 2 to 4 million and Perth from 1.7 to 3.4 million. In this demographic scenario, all these cities will have to house one million or more new people within the next 20 years, or 4,000 per month. Australia's natural resources, arable land area and economic outlook make such a population increase very possible. The Australian government welcomes foreign real estate investments to cope with the existing shortage of 300,000 homes nationwide. Simultaneously, it encourages the immigration of wealthy retirees, students, and highly skilled workers from abroad. The steady influx of funds and knowledge has given Australia one of the world's top 10 GDPs per capita. Four Australian cities have recently risen into the top 10 of *The Economist's Global Liveability Ranking of 2014*.

One Central Park (OCP) near Central Station in Sydney is one development that demonstrates how Australia's urban growth is materializing (see Figure 1). Until recently, rapid new construction and short housing supply fueled a conservative culture of cheap and fast projects that favored minimal risk over design quality. But this tradition is being challenged by three factors: political pressure to invest in Sydney's future, international developers willing to invest in higher quality architecture, and buyers' growing demand for signature design. OCP benefits from all three of these drivers. It is classified as a "State Significant Development" under the direct approval authority of the Minister of Planning, and as such has become a public quality benchmark.

As an indication of new buyers' confidence in innovative design, 90% of OCP's initial

Figure 1. One Central Park near Central Station in Sydney. © Atelier Jean Nouvel / PTW Architects

Figure 2. One Central Park, Sydney – overall view of tower from northwest.

apartments sold off-plan within a three-month record time, and the project was completed on schedule and on budget at AU$ 5,400 (US$4,743) per square meter.

Planning and Design

One Central Park (see Figure 2) is the first stage of the AU$2 billion (US$1.76 billion) Carlton & United Brewery site redevelopment near Central Station in Sydney. The master plan was created with the understanding that Sydney's population will keep growing and that residential towers near inner city traffic

> "OCP reduces its cooling energy load with a five-kilometer-long system of linear slab-edge planters that function like permanent shading shelves and reduce thermal impact in the apartments by about 20%. Additional shading from the plant foliage itself can further diminish heat gains by an additional 20%…"

The Competition for the Tallest Skyscraper: Implications for Global Ethics and Economics

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An iconic skyscraper has aesthetic significance that may have meaning for other aspects of human experience – serving, for example, as an expression of cultural and ethical values and a symbol of economic power. This study examines the competition for the world's tallest skyscraper as a symbolic, but also substantively significant, window through which to understand the relationship between economics, ethics, aesthetics, and human well-being. The study consists of an empirical component, analyzing skyscraper economics; and a philosophical inquiry on the social and ethical implications of the empirical data. The empirical component connects architectural data on the world's tallest skyscrapers to indicators of economic and ethical performance. The philosophical component explores the relationship between economic power and aesthetic and ethical values, raising normative concerns about the race to growth, without succumbing to the cultural paternalism that often pervades contemporary Western commentary on Eastern economic practices.

The Skyscraper as a Window on the World

If the Kingdom Tower in Jeddah is completed according to plan, it will become the world's tallest building in a few years time by a long margin. At more than a kilometer high, it would eclipse the Burj Khalifa, less than a decade after the Dubai landmark became the world's first megatall (600+ meters) building. Together, the buildings represent a shift in the center of tallest skyscraper gravity, which from 1998 had visited Malaysia in the form of Kuala Lumpur's twin Petronas Towers and then Taipei 101 in 2004. The one-upmanship has not been this intense since it played out on a much smaller field in Manhattan during the Great Depression. In the aftermath of the Great Recession, the contest to build the world's tallest skyscraper will continue as long as new entrants are intent on announcing their fitness for a manufactured competition for global supremacy.

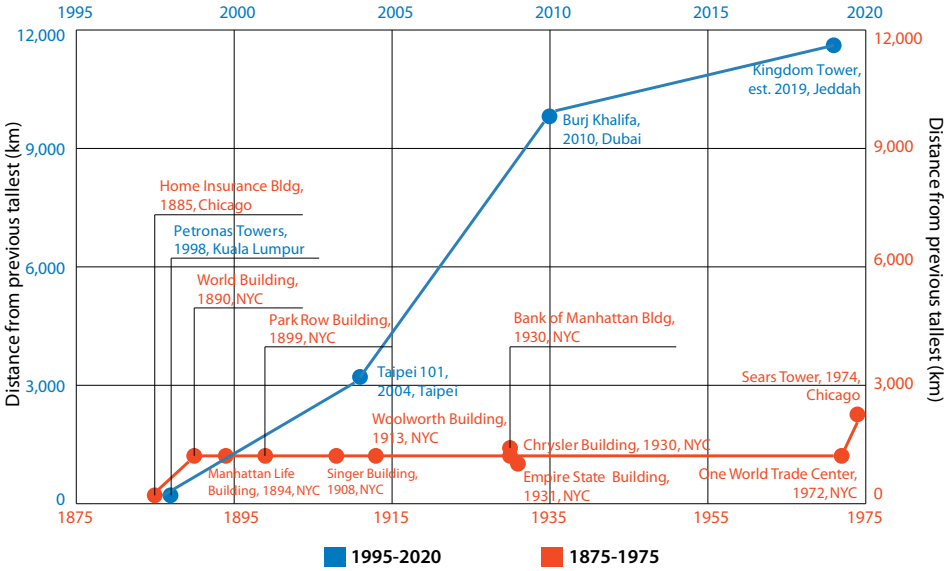

Figure 1. In the 25 years from 1995–2020, the location of the world's tallest skyscraper will move about five times the distance it moved in the entire century before (1875–1975). Source: Skyscraper data from the CTBUH Skyscraper Center; distance data from Distance Calculator, www.timeanddate.com

Increasingly, skyscraper construction is occurring in developing markets, and on one hand, the shifting center of skyscraper gravity appears to represent increasing economic development. On the other hand, these same skyscraping ambitions invite ethical criticism about misplaced priorities, emphasizing primitive spiritual aspirations to the heavens and rudimentary biological aspirations to size at the potential expense of well-being. The Burj Khalifa became a financial liability for an emirate needing outside assistance to weather a global recession. The Kingdom Tower is rising in a city woefully lacking in basic infrastructure, where in 2009 floods led to death and destruction, merely because the city did not have a basic drainage system (Al-Ahmed 2009).

The recent history of the skyscraper is a product and symbol of industrial advancement, and thus provides a window on the world through which to examine some of the most important ethical challenges arising from economic growth in developing markets. These challenges include such tangible issues as corruption, for which opportunities and incentives multiply as markets grow in size and complexity; and the natural environment, the stewardship over which is complicated by externalities and competing priorities. They also include intangible philosophical questions with practical consequences, including how to preserve cultural values while engaging in a global marketplace, and how to balance future investment with present needs. Much as the skyscraper competition transposes the inherited value of "growth for growth's sake" into the economic present, these challenges have been confronted over and over throughout history and proliferated with industrialization. Can the skyscraper help societies learn from the mistakes of the past, or are we doomed to repeat them?

The Skyscraper as Symbol of Economic Ambition and Ethical Values

Symbolically, a skyscraper communicates meaningfully through its size, design, and technology to biological, aesthetic, and ethical values of human beings (De Botton 2006, Goodman 1985, Kingwell 2008, Petit 2002). Like literature and other arts (Michaelson 2012), a skyscraper may reflect cultural values at the same time that it influences them. Unlike other arts, however, a skyscraper is necessarily and always will be a major public-private venture, requiring aesthetic disinterestedness and economic interest, architectural imagination and practical engineering, and financial capital and resource coordination. In today's world, as a product of political, economic, social, technological, and environmental negotiation, the skyscraper is arguably a market's most audaciously tangible evidence of achievement and intangible representation of ambition. As a species of the technological sublime, the skyscraper evokes "awe and wonder, often tinged with an element of terror" (Nye 1994: xvi) whether standing near the top looking down, at the base looking up, or even from afar, contemplating the magnitude of the enterprise.

> "As a species of the technological sublime, the skyscraper evokes 'awe and wonder, often tinged with an element of terror' whether standing near the top looking down, at the base looking up, or even from afar, contemplating the magnitude of the enterprise."

The biological aspiration to achieve, and the respectful fear of size, have roots in animal psychology, as demonstrated by the alpha male chimpanzee who deploys tree branches to enhance his stature when displaying (De Waal 1998, Goodall 1971). In ancient remnants of human civilization, height elicits awe, deference, and spiritualism, from the Great Pyramids at Giza, to the location of the Parthenon on the Acropolis, to the tiered form of Ming Dynasty pagodas (Dupré 2008). In scripture, the Tower of Babel represents reaching for the seat of God. But another reason the skyscraper stands as a particular and compelling symbol of contemporary power and values is that its technological possibility dates back only as far as the dawn of modern industrialization.

Although much of the positioning for ultimate supremacy occurred early in the skyscraper's life – 10 of the 16 world's tallest buildings were completed in the first 50 years (CTBUH 2008) – the skyward competition has accelerated dramatically in the past two decades. This changing landscape of skyscraper construction is part of an urbanizing trend that renders the city an important locus of economic and, potentially, democratic, life (King 2004). It is also reflected in skyscraper vocabulary: the term "skyscraper" was applied to the first steel-framed buildings, but more recently, the CTBUH coined the term "supertall" to refer to buildings over 300 meters in height, and now uses "megatall" for buildings at least twice that height. Among completed skyscrapers, 7 of the tallest 10 in the world in 2014, and 72 of the tallest 100, were completed in 2000 or later. Although only two completed megatalls existed in 2014, five more were in progress (CTBUH Skyscraper Center). Twice as many supertalls were completed in 2010 than in 2000, and nearly four times as many will be completed in 2020 as in 2010, and the average height of the top 20 skyscrapers in 2020 will be almost megatall, at 598 meters (CTBUH 2011).

The shift in the geographical center of the skyscraper's gravity is equally dramatic. As shown in Figure 1, in recent history, in roughly one-fifth the time, the location of the world's tallest skyscraper will move approximately five times the distance that it did in the span of the so-called "American Century." The changing geography of the skyscraper is a fairly sudden shift from West to East. From the 1930s to the 1970s, more than 90% of skyscrapers were in North America, dipping slightly to about 80% in the 1980s and 1990s. By the 2000s, more than half were outside North America – mostly Asia – and by the 2010s, more than 75% were outside North America, about equally distributed between Asia and the Middle East (CTBUH 2011). In this global society in which citizenship might transcend traditional political borders (Frey 2003), skyscraper symbolism is distinctly provincial, a source of jurisdictional pride and power.

The Emergence of Asian Supertalls


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Chan joined CBRE in mid-2010 as senior analyst of the Asia-Pacific research team. She has been working closely with local research members to conduct fundamental analysis for the retail and industrial sectors from a regional perspective before a recent focus on the office sector. She is also assisting in the delivery of regional occupiers' strategy to CBRE's key clients in the region. Before joining CBRE, Chan worked as an equity research analyst to cover listed conglomerates in Hong Kong. Prior to this, she started her career as an analyst in real estate direct investment.

Within Asia, a high density of tall buildings is viewed as being synonymous with being a successful financial hub. It is widely believed that constructing supertall office buildings can enhance the competiveness of a city's business environment. Authorities in a number of markets have pursued this strategy as a means to establish their city as a financial center or to reposition their economies. This "build and they will come" approach has been adopted in several emerging financial markets across the region, with limited degrees of success.

Introduction

The creation of financial centers has traditionally underpinned the development of tall buildings in major cities worldwide. Prior to the advent of computers and the adoption of the Internet, there was a strong need for accounting, auditing, consultancy, and law firms to be in close proximity to each other in order to service key clients, such as large financial institutions and major corporations in other industries. As the financial sector expanded, the size of supporting industries increased in proportion.

This led to rapid growth in demand for office space and stimulated the expansion of Central Business Districts (CBDs), vertically and/or horizontally. The adoption of the safety elevator and advent of steel-frame construction facilitated the vertical development of office space to accommodate growing demand. Examples of vertical expansion include New York, which is home to the largest number of tall office buildings in the world.

Increasing demand for CBD space, combined with the gradual rise in construction costs, resulted in higher rents, which predominantly financial sector tenants were able to afford. This meant that supporting industries had to move out and locate themselves some distance from the clients they served. Financial sector occupiers therefore came to dominate CBDs, and financial hubs began to emerge.

The pattern of vertical development is best illustrated by the Manhattan borough of New York City, which has been the leading global financial center since the 1920s. Over the past century, the skyline has evolved with the completion of numerous tall office buildings housing large financial institutions and major corporations. New York City continues to have the highest number of tall office buildings in the world, followed by Shanghai, Tokyo, Hong Kong, and Chicago (see Figure 1). With the exception of Shanghai, all of these cities are traditional financial centers.

New York, London, Hong Kong, Singapore, and Tokyo all rank highly on the Global Financial Centres Index (GFCI),[1] a ranking of the competitiveness of global financial centers. Three out of the top six cities are in Asia, and all these cities have a large number of tall office buildings. The high profile of these cities has created the perception that mature global financial centers are comprised of tall building clusters. In Asia, a high density of tall buildings is viewed as being synonymous with being a successful financial hub. Numerous city leaders are seeking to mimic the success of the likes of New York, Hong Kong, and Singapore. They do

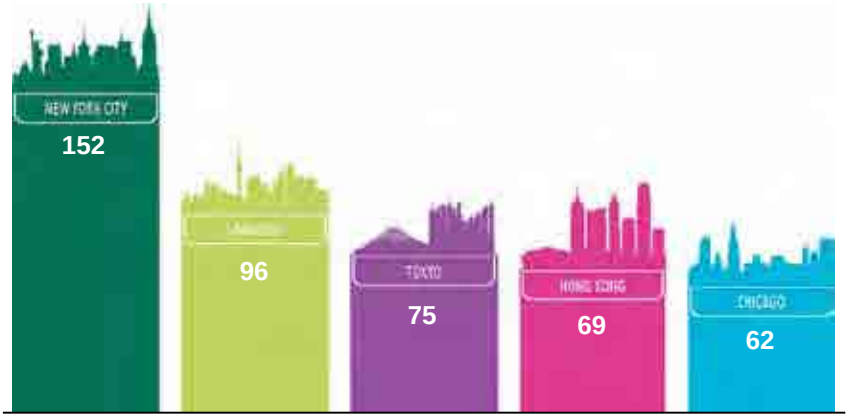

Figure 1. Cities with the largest number of tall office buildings (150+ m). Source: CBRE Research/CTBUH, June 2014.

[1] The Global Financial Centres Index is a ranking of the competiveness of 83 financial centers based on over 25,000 financial center assessments from an online questionnaire, together with a total of 103 instrumental factors from organizations such as the World Bank, Economist Intelligence Unit, and the United Nations. Ratings in the GFCI 15 range from 423 (Athens) to 786 (New York).

so by adopting a "build and they will come" strategy of constructing tall office buildings with high specifications to attract financial sector companies as a means to establish their city as a regional financial center (see Figure 2).

The Emergence of Asia as Hub For Tall Office Buildings

The development of tall office buildings in Asia began relatively recently, at the end of the 20th century. Construction accelerated dramatically in the early 2000s, with completions growing at an average of 40 new tall office buildings per year. In comparison, the United States currently sees the completion of an average of six new tall office buildings per year. As of June 2014, Asia was home to 55% of the total number of tall office buildings globally (see Figure 3). On a country level, China accounts for around one-third of existing tall office buildings worldwide.

In recent years, governments in a number of countries in Asia have supported the construction of supertall office buildings, defined as a building with a height of 300 meters or greater (see Figure 4). Supertall office buildings are viewed by authorities as a means to enhance the competiveness of their business environment so their city can establish itself as a financial center. Shanghai World Finance Center (SWFC) and Guangzhou IFC were constructed in accordance with this strategy.

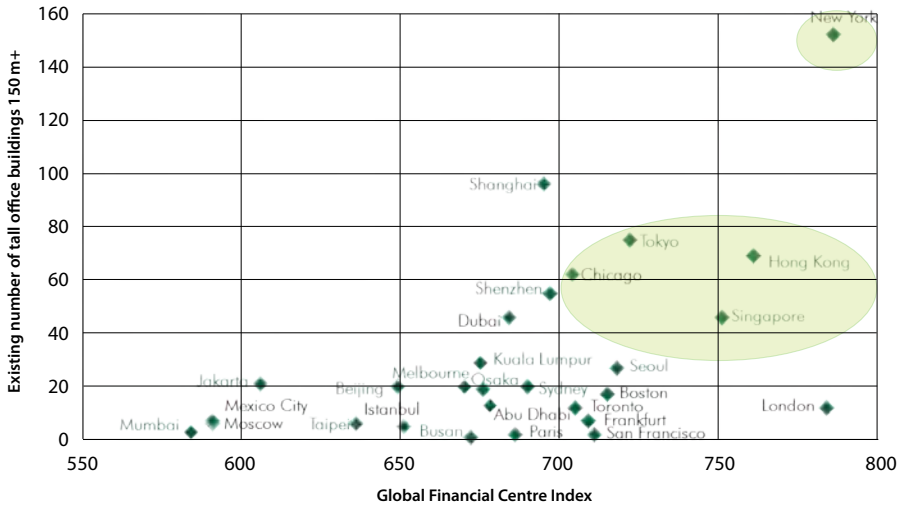

Figure 2. Global financial centers and their tall office-building numbers.
Source: CBRE Research / CTBUH / Z/Yen Group, June 2014

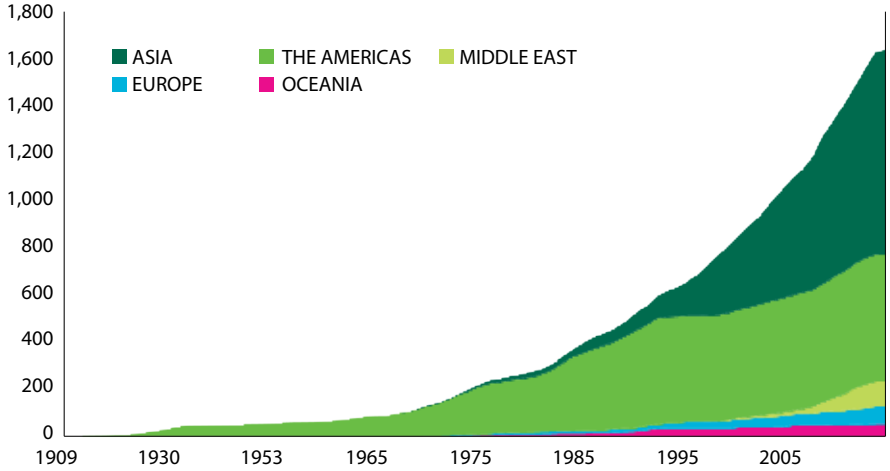

Figure 3. History of the construction of tall buildings. Source: CBRE Research / CTBUH, June 2014

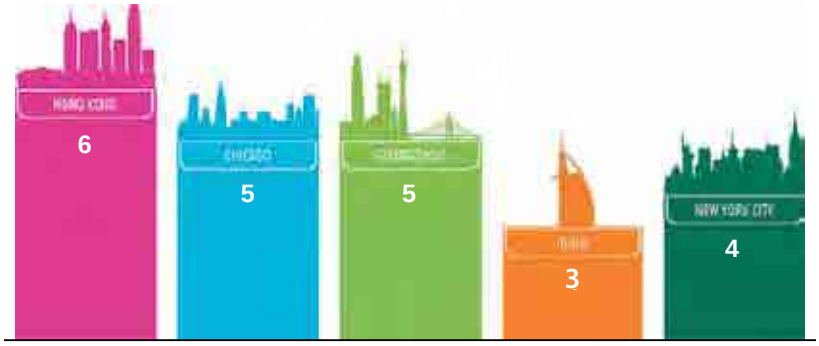

Figure 4. Cities with the largest number of supertall office buildings (300+ meters).
Source: CBRE Research / CTBUH, June 2014

Steps to success: Leverage strong relationships

Supertall office buildings in Asia tend to be developed with a high degree of government involvement. Guangzhou IFC was primarily developed by Yue Xiu Properties, a company established by the Guangzhou government to pursue economic and trade development opportunities in Hong Kong. Shenzhen KK 100 was constructed by Kingkey Real Estate Development Company Limited, whose founder is a high-profile member of various civil service organizations, such as the Chinese People's Political Consultative Conference and the Guangdong Political Consultative Conference.

That said, the challenges and complexity involved in constructing a supertall office building often necessitate the participation of a more experienced partner from overseas. For example, Shanghai World Financial Center was developed by Japan-based Mori Building Company and constructed by the Shanghai State Construction Group, which is currently developing the Shanghai Tower, a new supertall office building in the same city.

Achieving a Six-Star Rated Tall Building In Sydney's Central Business District

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The ANZ Tower in central Sydney not only represents the commercial office sector's recovery from the 2008 financial crisis; it is also a strong example of a high-performance tall building. This was the culmination of an ongoing partnership from the early design development stage onwards. An enlightened owner wanted to differentiate the building through green efficiency, and a design team committed to extensive modeling and testing of multiple, interrelated building services and architectural elements, in the interest of reducing overall carbon impact.

Background

Rising 212.6 meters above the street, the ANZ Tower at 161 Castlereagh Street, part of the precinct known as Liberty Place, was one of the first buildings to emerge from the 2008 global financial crisis in the central business district (CBD) of Sydney. The development reinvigorates a previously run-down site with a design that emphasizes the public domain and a richness of activity.

Located in the retail district between the business and legal precincts, the site provides competitive leasing rates and is easily accessible to public transport. Once inside, above the low-level floors, the northeasterly views of Sydney's magnificent harbor become apparent. The building form responds well to this view, its shape focused on the eastern harbor with a prominent northeast façade designed to maximize daylight and views. The tower takes advantage of the site's particular planning constraints to develop its distinctive form, which also ensures that nearby Hyde Park is protected from shadows at key times of the day.

Originally conceived prior to the 2008 crisis, the site was acquired by Grocon as part owner, developer, and builder in April 2010; the design resolution commenced with anchor tenants ANZ Bank and the Freehills law firm.

Design Evolution

The environmental targets of the original design were set to achieve a five-star Green Star Design & As Built development rating, along with a five-star National Australian Built Environment Rating System (NABERS) energy target.

The developer secured a major bank and a legal firm to occupy up to 75% of the building's Property Council of Australia office premium-grade space prior to financial close in April 2010.

The team charged with designing the building included architect Francis-Jones Morehen Thorp (FJMT); building services design including mechanical, electrical, communications, security, specialist lighting, sustainability, and building façade services by AECOM; and Aurecon on structural engineering.

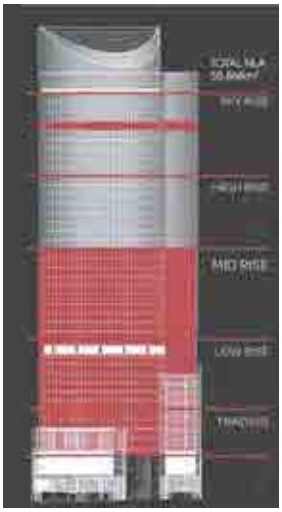

Figure 1. Liberty Place development stacking diagram

Figure 2. Typical floor plate – demonstrating access to views. © FJMT

Towards the end of the design development stage, the developer recognized an opportunity to differentiate this building from many of its competitors by raising the environmental standard to a six-star Green Star World Leadership rating. The building services engineer provided Green Star and energy performance consultancy and designed the building services to meet target during the early design stage. The building services engineer was then charged with continual refinement of the energy model, with the inputs generated by the development team, along with the services and façade design and construction subcontractors during the construction documentation stage.

Architecture

The final arrangement of the building provides a 44-story, premium-grade office tower containing 55,963 square meters of office and 2,800 square meters of retail space. On the northeastern part of Levels 43 and 44, there is a single residential luxury apartment which is owned by the site's previous owner; the remaining floor area on these levels is plant room.

The building is divided into four groups, consisting of low-rise (Levels 5–14), mid-rise (16–25), high-rise (26–33), and sky-rise (34–42) floors (see Figure 1). Each group is served by dedicated elevators. Major air-handling plant rooms are located on the podium levels (1–3), Levels 14–15, and Levels 43–45.

The lower levels of the building comprise:

- Basements 1: Loading area, service rooms, and short-term parking
- Basements 2, 3, and 4: Long-term car parking, tenant facilities, and service rooms
- Pitt Street Level: Retail, foyer lobby, and vehicular access
- Castlereagh Street Level: Retail and foyer lobby

The floor plates are arranged to take advantage of the spectacular views across eastern Sydney harbor towards the open ocean. The architect achieved this by developing a triangular floor plate, with the hypotenuse directed towards the harbor (see Figure 2). The remaining façades are separately articulated with rational rectilinear forms and align to the city's orthogonal grid (see Figure 3). The elevator shaft, amenities, and services risers are located on the southern façade.

A triangular structural element is located centrally on the floor and encloses the internal fire stairs and additional services riser space. The center core also accommodates the freight elevators. The building has been designed with a floor-to-floor height of just 3,700 millimeters for typical levels and 4,675 millimeters on the lower-level trading floors. The structural slab on each floor is designed to accommodate a 200-square-meter inter-floor void, should tenants require the construction of a communicating stair.

A key component of the development involved the enhancement of the public domain and provision of a new "pedestrian street," which provides a mid-block city link to connect to the wider city environs.

The site is an amalgamation of five sites, with frontages to both Castlereagh and Pitt streets. The Castlereagh Street frontage included Legion House and the adjacent Angus & Son Building, dating from 1902. Legion House was retained and refurbished, while the Angus & Son Building was demolished to allow for the through-site link.

Figure 3. Liberty Place development, Sydney. © Grocon Group

The planning of the foyer resolves a number of conflicting requirements, including negotiating level changes between the two streets without creating onerous access conditions, and differing tenant requirements for security control.

At the base of the tower is a retail complex of sunlit, public open spaces, with the new plaza and pedestrian lane connecting Castlereagh Street and Pitt Street. These landscaped spaces, ringed with café, restaurant, and bar opportunities, create an extension of the city into the heart of the development.

The floor plates are designed to maximize daylight, and accordingly the majority of the occupied space is no more than 12.5 meters from a glazed façade.

> "As the Sydney electricity supply is primarily generated from black-coal-powered thermal power stations, the carbon content of the mains grid is high. The strategy to reduce carbon emissions substantially for this building was to minimize the consumption of mains electricity and, where possible, replace it with gas-fired equipment."

Designing High-Rise Housing: The Singapore Experience

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There is a land shortage in Singapore, compelling the search for different models of high-rise housing. Singapore's experience breaks with the dual stereotypes that high-rise construction is expensive, and that an apartment in a skyscraper is a privilege of the rich. Reflecting the strategy of providing the average consumer with affordable and comfortable housing, there is a rapid growth of design and construction of high-rise residential complexes in Singapore. This process is based on the principles of sustainable urban development, minimizing environmental impact, and maximizing energy efficiency. A clear standard of comfort for public housing has been developed, including a set of required improvements of the site, in the structure of residential towers and in apartment layout.

According to many researchers, the most dynamic and vibrant housing markets are those where public and private sectors coexist harmoniously. Singapore has managed to develop conditions that support a high standard of living by way of a set of required elements and system quality criteria for different consumer strata embedded in high-rise residential complexes, innovative technologies and "green standards," based on the principles of energy efficiency and environmental friendliness which have become available for mass consumers.

It should be noted that Singapore has reached such a high standard of living in a very short period of time, based on its unique climatic, political, regulatory, and economic conditions. The history of public housing in Singapore began in 1960, when the Housing and Development Board (HDB) was formed, the main purpose of which was to provide affordable housing in a high-quality environment for the masses. In order to become the owner of an HDB apartment, the applicant must meet certain requirements concerning nationality, age, and marital status. Also, there are limits on the average gross monthly household income that can be earned by residents of a given type of apartment.

Development of Multiple Financing And Occupancy Models

Public housing in Singapore was originally intended to be for-rent only, but the policy was quickly adjusted to extend applicants the opportunity to buy apartments. The government attached great importance to allowing the popular majority to become owners. Those lacking sufficient income to purchase homes, but who were eligible for HDB housing, could receive preferential mortgages, housing subsidies, and savings from the Central Provident Fund (CPF). The CPF is a state fund in Singapore to which every working citizen and their employer pays monthly. The public pension, medical services, and home loans are fully financed by these contributions. In general, the system works quite efficiently, as more than 80% of Singaporeans live in public housing, and 95% of public-housing residents are owners. As a result of the housing program, the country has provided every citizen with comfortable housing in a very short time. The wealthy have also overwhelmingly chosen high-rise

> "More than 80% of Singaporeans live in public housing, and 95 % of public-housing residents are owners. The wealthy have also overwhelmingly chosen high-rise condominium ownership through their own means."

condominium ownership through their own means.

The range of available housing types is improving for HDB owners and renters. For example, Executive Condominiums have been introduced in order to accommodate the needs of young professionals who can afford more than a HDB flat, but for whom private commercial housing remains out of reach. Such flats are comparable to market-rate condominiums in terms of design and amenities.

The Design, Build, and Sell Scheme (DBSS) was launched in 2005, involving private developers in a substantial way. Under DBSS, developers are responsible for the entire design and construction process (including purchase of land, design development, construction, and sales). Apartments built under this scheme are intended for public housing. They are developed by private companies, which are free to design and implement their projects as they see fit, so long as they do not jeopardize the objectives, principles, and basic features of public housing. This means that, while providing sufficient flexibility in design, finishes, and sizes, tight control is nevertheless exerted over the developments' integration into the urban environment, so as to support favorable social and aesthetic interaction with the surrounding existing HDB buildings. To date, 13 DBSS projects have been constructed in different parts of Singapore on 10 sites. Notable projects include City View @ Boon Keng, Park Central @ Ang Mo Kio, Natura Loft @ Bishan, and The Peak @ Toa Payoh.

HDB Town Features

When the HDB took over in 1960, the agency adopted the "new town" planning concept on a large scale, building entire towns from scratch in locations all around Singapore. There are now officially 24 "HDB Towns", compact and contiguous areas with a deliberate mix of residential, commercial, and institutional uses (see Figure 1).

Figure 1. Map of HDB residential areas in Singapore.

Figure 2. People's Park Complex, Singapore

Figure 3. Golden Mile Complex, Singapore

Each HDB town is designed to be self-sustaining. There is no need to venture out of town to meet the most common needs of residents. Employment can be found in industrial estates located within several towns, and each has education and health care facilities, sports complexes, recreation zones, multistory car parks, and other common facilities. All HDB residential areas are connected to a well-developed public transport infrastructure, including underground, buses, and Light Rail Transit (LRT).

Every residential complex has well-equipped outdoor sports fields, embodying the state's commitment to the good health of its citizens. Children's playgrounds are an integral part of the living environment and employ a great variety of designs, advanced materials, variations in age-appropriate equipment, as well as areas equipped for parents. The covered walkway is the calling card of Singapore's living environment, a piece of infrastructure necessitated by the pressing need to protect citizens from the scorching sun, which can instantly turn into torrential rain. All residential areas have such walkways, which are ramped to account for the requirements of a barrier-free environment.

In the initial years following the establishment and development of the concept of HDB housing, in addition to housing groups and estates development, the idea of building multifamily residential complexes in the high-density areas of Singapore was also encouraged. Some examples of the resulting experiments with integrating various functions in "megastructures," include: People's Park Complex, (1973, 31 floors, 103 meters) (see Figure 2) and the Golden Mile Complex, (1974, 16 floors, 89 meters) (see Figure 3). These were designed by Gan Eng Oon, William Lim, and Tay Kheng Soon, who subsequently founded DP Architects. These were among the first high-rise facilities in Singapore, built as part of a reconstruction program that cleared dilapidated buildings and installed new public housing. Both complexes are multi-use buildings with apartments, catering establishments, trade enterprises, social amenities, offices, parking lots, and other facilities.

In recent years, several high-rise complexes have enhanced the status of public housing,

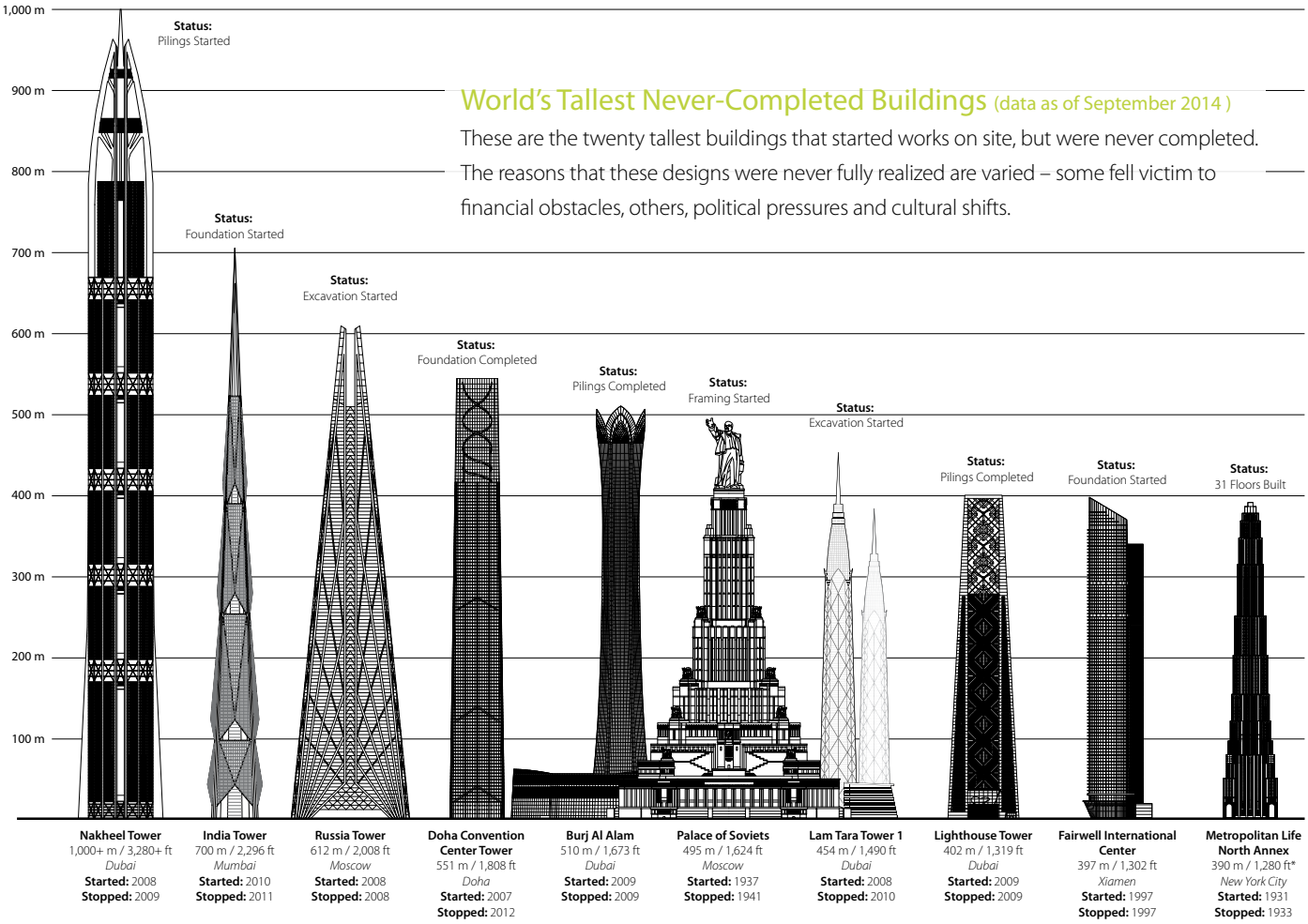
Dream Deferred: Unfinished Tall Buildings

Without big dreams, there would be no tall buildings. Conceiving, financing, designing, and constructing a skyscraper is no simple feat, even under the best of conditions. Many projects have had torturously slow gestation periods; many more have failed to start or were interrupted and cancelled. Naturally, we began to wonder how many tall buildings were started and not finished, and which held the records for longest construction time. Rumors of resurrections persist, and today's long shot is tomorrow's sure thing…

Note:
In this study, a building is considered to be "Never Completed" when site works had begun, but were completely halted, and no reports indicate that construction will continue. The site may go on to accommodate a new building, different to the original design, that may or may not retain the original construction.

50

The total number of 150-meter or taller buildings currently **on hold** (i.e., construction had started and stopped, but is planned to resume) around the world.



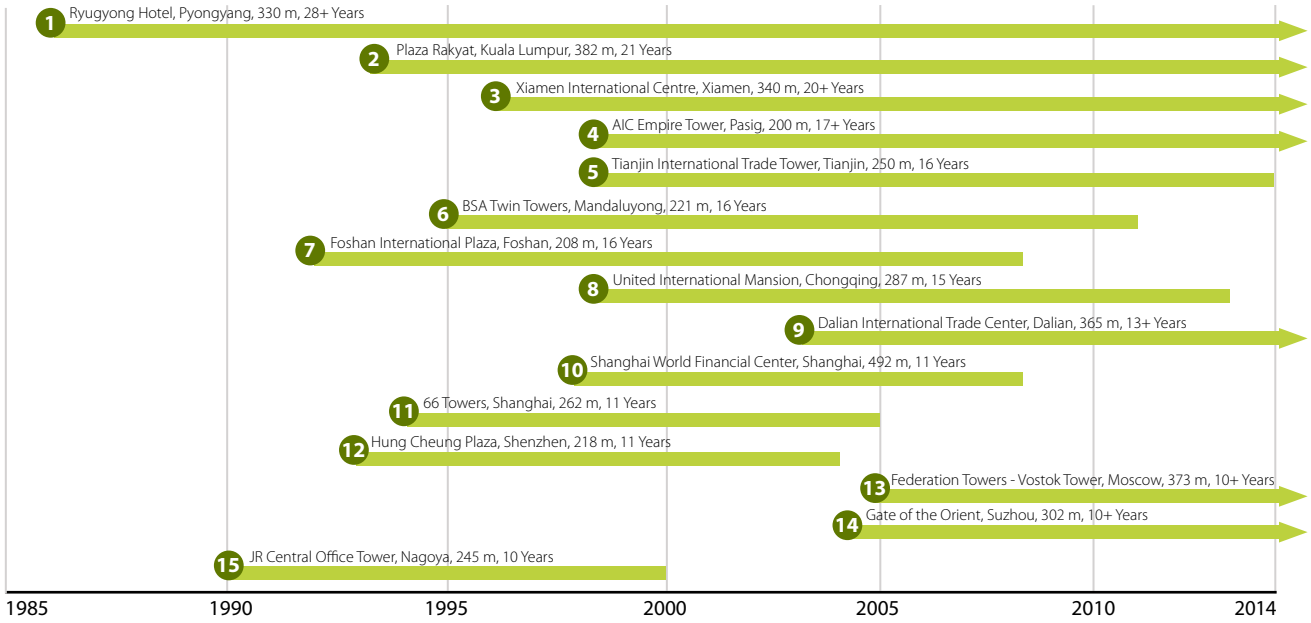
The Metropolitan Life North Annex in New York was intended to have 100 stories, but construction was halted in 1933 at the 31st floor. It was finally completed at that level in 1950.

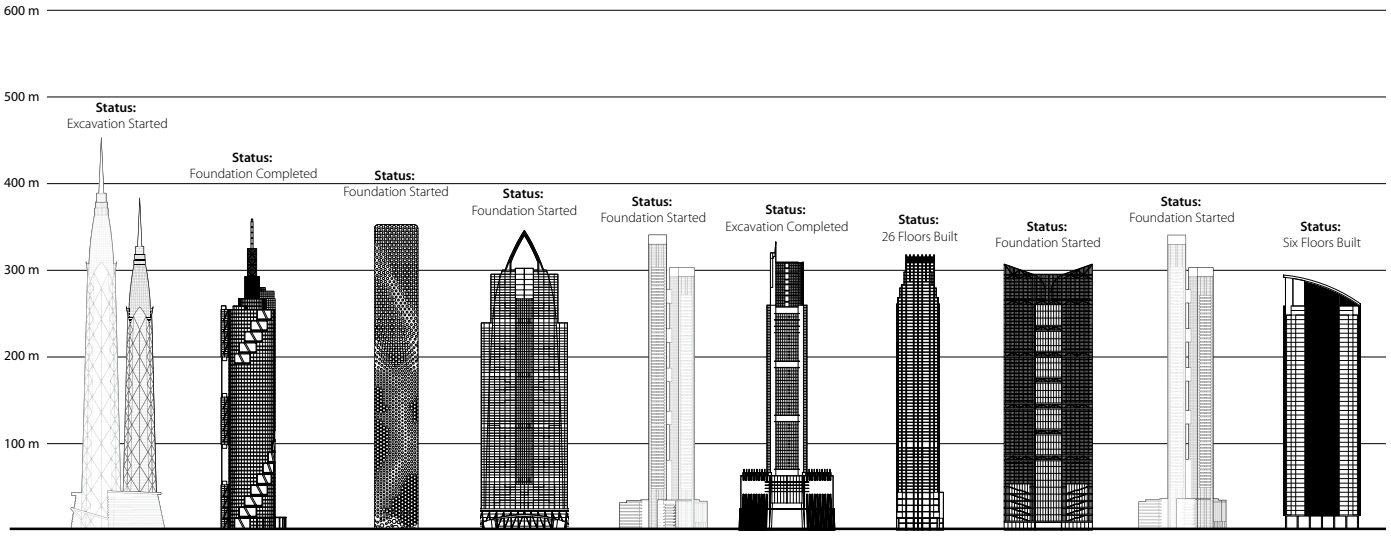
The Palace of Soviets in Moscow was actually started in 1937, but construction was halted during frame construction with the coming of World War II. It would have been topped with a statue of Joseph Stalin, making it the world's tallest structure.

The Waterview Tower in Chicago started construction in 2006 and was intended to be 319 meters tall with 89 floors. Construction was halted in 2008 at the 26th floor. It was eventually redesigned and completed at the shorter height of 188 meters, and renamed OneEleven.

The Fifteen Longest Construction Periods From 1985 to Date

The graph below displays the buildings (200m+) with the longest construction times. Some projects are still under construction (as indicated with an arrow).





* Height Estimated

Although never built, Nakheel Tower, which would have been the tallest building in the world, is remembered for its innovative design that included four continual vertical wind slots along the height of the tower.

Begun in 1990, but abandoned mid-construction due to financial constraints, the incomplete Centro Financiero Confinanzas (aka Torre David) in Caracas was occupied by several hundred Venezuelan families in need of shelter. In July 2014, residents were relocated.

If built as intended by 2014, Pentominium would have been the second-tallest building in the world. The project began construction in 2008, but was put on hold in 2011 after 30 stories had already been built.

From Block to Blob and Back Again

Ben van Berkel

Interviewee

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Ben van Berkel is the Co-founder and Principal Architect of UNStudio in Amsterdam and Shanghai. UNStudio is a network of specialists in architecture, urban development, and infrastructure. Current projects include restructuring the station area of Arnhem, the Raffles City mixed-use development in Hangzhou, over 30 stations for the Doha Metro Network in Qatar and the design and restructuring of the Harbor Ponte Parodi in Genoa. Currently he is Professor of Conceptual Design at the Staedelschule in Frankfurt am Main, and was recently awarded the Kenzo Tange Visiting Professor's Chair at Harvard University Graduate School of Design. Central to his teaching is the inclusive approach of architectural works integrating virtual and material organization and engineering constructions.

"I've never been so worried about individual buildings, but rather the collective skyline. [In a good skyline] you don't mind that some buildings are quite close to each other, because they have an identity as a group."

United Network Studio (UN Studio) is a Dutch architecture firm founded in 1988 by Ben van Berkel and Caroline Bos, which in the 2000s established offices in Shanghai and Hong Kong, partly to accommodate the firm's increasing number of highly detailed and demanding tall building projects on the Asian continent. One of these projects, the Ardmore Residence in Singapore (see Figure 1), was a finalist in this year's CTBUH Best Tall Building Awards program. Van Berkel paused to chat with CTBUH Editor Daniel Safarik on a recent whirlwind visit to the Illinois Institute of Technology, Chicago.

We've seen a lot of creative projects in Singapore in the last couple of years, and I'm wondering what kind of client commissioned the Ardmore and what made them interested in having such an intricate design? How were they convinced on the morphology of that building?
The beauty of that client is their architectural background; they have worked with many interesting architects like Philip Johnson and Paul Rudolph. Also, four of the brothers of this client live in a Paul Rudolph residential building called the Concourse, so they have developed an incredible interest in architecture. Also, I like Singapore. When I was there I was fascinated with the city, its culture, and its regulations. They are quite tough in terms of their organizational needs; for instance, landscaping needs to come into the first floor of the building. These requirements are tough, and can make it very challenging to design such an articulated building, but are ultimately beneficial.

Clearly, a client that had an appreciation of Paul Rudolph would also have an appreciation of sculptured concrete, curvilinear organic shapes, and rough materials.
Exactly, and then of course we came up with the organization of the building based on the optimum views we could get within the units. So the living room area is a column-free space, with an incredibly nice span of more than 12 meters. Each apartment also has double-height windows with a longitudinally interlocking double-height balcony set into the concrete structure. This worked really well.

There is still a stigma about tall concrete buildings in North America, and to some degree in Europe, whereas people in Asia have completely accepted them. Then again, you don't often hear "double-height windows," and "concrete" in the same sentence. So you must have resolved that with some pretty interesting engineering.
Yes, but with the incredible knowledge of this client, I've noticed that collaboration is key. We also do everything digitally now – and we test these things out very early in the design process. I do it more and more, where I come up with a proposal in the preliminary and schematic design phases, and we test the slenderness of the building or the column-free living areas, and see what we can do for the sustainable components of the building. For instance, this building is totally open on the side where you have little sunlight, and it's

Figure 1. Ardmore Residence, Singapore.
© UN Studio / Iwan Baan

very much closed on the side where the sun moves around the building. So the building doesn't get oversaturated with heat, but you also have thermal heat retained into the evening. Another thing that's nice about the double-height balconies is that they collect wind into the evening. After 5:00 p.m., that really helps to cool down the building.

It was a wonderful project to work on and we only had 1.5 years to build it. The client took a lot of time to develop the project, around three years, but we had very little time to build it.

Figure 2. Canaletto Apartments, London – neighborhood in the sky concept. © UN Studio

So once you began construction there was no going back?

Correct. For that reason I could show you in detailed drawings that there are 16 modular elements for the entire façade structure that could be pulled and twisted in many different ways. They were repeatedly used in different areas of the building. In this way, we developed a highly efficient strategy for making quite a complex building.

The appearance of the building suggests that it is hewn out of a solid piece of rock, but it seems that nothing could be further from the truth. Did you use modifiable formwork, or did you pre-cast the concrete and raise it up?

We precasted it, but it was interesting, because the Japanese contractor that was used had techniques to move up the casting while they were moving up the building, and they did a lot of casting on the spot. They said that it was the quickest way for them to operate. So they moved upward every day, and the crane would lift the next piece into place while workers completed the previous section.

You mentioned that you like Singapore and the constraints that it presented. It seems like a very civilized place. I have seen a statistic that 80% of people in Singapore live in high-rise public housing, and probably close to another 10% live in market-rate high-rise housing. Why do you think they have taken so well to high-rise living in Singapore?

You know, it's the opposite of high-rise living in Europe, where it used to be more common. Today, to lure tenants, high-rises are complemented by increased services and amenities. On the other hand, in Singapore, they are better controlled. There are people that take care of the public spaces, and tenants pay fees to ensure proper maintenance. A sense of community is also generated when long-term tenants agree on new ways to maintain their building. So it's quite well organized.

It sounds a little bit like the New York co-op model.

The advantage that many clients like when they buy a high-rise unit is that they have, as a community, a say into how they would like to maintain the building. This concept can be very beneficial for some projects.

It is one that I am trying to instill in another project we are working on in London, called Canaletto (see Figures 2 and 3). It's another high-rise we are doing in the area of Islington, which we characterized as a "neighborhood in the sky." While developing the project, we thought a lot about context, where, in this case, there are a lot of startup companies. The whole area has been an inspiration, as has the client. They want to include all kinds of crazy amenities, like a restaurant on the ground floor where people can meet and interact with their neighbors.

How is it different facilitating a community environment in London rather than Singapore?

The thing that's so nice about the market in London is that it is younger, if more commercial. So when I proposed to them the idea of a neighborhood in the sky, I presented it as a type of social enterprise that informs how the building could be used. We want the young entrepreneurs to be able to buy these units, and the price structure of units in this building helps with that. There are affordable units and also very expensive units, and they all share these types of amenities like restaurants, a cinema for families, a gym, a pool, and a club. So we took a contemporary approach when looking at how we could fill in the commercial component.

What I've learned over the years, even when we do a department store, we say to the client, "Why don't you think of a department store that looks like a museum?", because objects in a museum are also fetish objects. When Andy Warhol talked about his fascination with shopping, he talked about

Figure 3. Canaletto Apartments, London. © UN Studio

About the Council

The Council on Tall Buildings and Urban Habitat, based at the Illinois Institute of Technology in Chicago and with a China office at Tongji University in Shanghai, 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.

Council on Tall Buildings and Urban Habitat

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