Title:	**A New Urbanity: The Relationship between Towers and Urbanism**
Author:	Stefan Krummeck, Terry Farrell & Partners
Subjects:	Architectural/Design Urban Design
Publication Date:	2010
Original Publication:	Proceedings of ICE
Paper Type:	1. **Book chapter/Part chapter** 2. Journal paper 3. Conference proceeding 4. Unpublished conference paper 5. Magazine article 6. Unpublished

Proceedings of ICE
Civil Engineering 163 November 2010
Pages 4–11 Paper 10-00002

doi: 10.1680/cien.2010.163.6.4

Keywords
buildings, structures & design; town and city planning; transport planning

Stefan Krummeck
Dip Ing Arch, BayArch G HKIA

is a director of TFP Farrells and Hong Kong representative of the Council for Tall Buildings and Urban Habitat

A new urbanity: the relationship between towers and urbanism

The prevailing skyline of the world's developed and developing cities demonstrates an ever-increasing prevalence of tall buildings forming a new urban model. This paper examines the relationship between towers and urbanism. It considers the typology of new tall buildings and how they are interconnected with their urban context and how high-rise buildings can be a sustainable model for urban growth. The integration of high-rise and mixed-use solutions is considered along with the importance of integrating public transport. The paper also outlines technical considerations when designing tall buildings.

In ancient times the first tall buildings were built as defensive towers or annexes of palaces. However, they have always had symbolic value, connoting the prestige, wealth and boastful aggressiveness of kings or nobles (Gutkind, 1969). Presently towers have expanded their range of functions to residential, commercial, industrial, hospitality and so on in response to high land costs (Heathcote, 2007) and today's market-driven demands for maximum investment returns. They are no longer the sole asset of people with high social status, but are occupied by the general public.

Not only are tall buildings growing in number, both in developed and developing cities, but new tall buildings are reaching heights never before contemplated. The world's tallest building, completed in 2009, is Burj Khalifa, Dubai standing at more than 828 m and more than 160 storeys (CTBUH, 2010) (Figure 1). Burj Khalifa is the result of architects and structural engineers striving to expand the meaning of the word 'tall' in this context.

In addition to its aesthetic and functional advantages, the spiralling 'Y'-shaped plan was utilised to shape the structural core of Burj Khalifa. This design helps to reduce the wind forces on the tower, as well as keeping the structure simple and fostering constructability. The structural system can be described as a 'buttressed core' and consists of high-performance concrete-wall construction (Aldred, 2010). Structural engineers are principally concerned with the structural form of a building, whereas architects are concerned with the harmonious integration of the building's functions, forms and mechanical systems, as well as the building itself (Sev, 2001).

Tall buildings, high-rises, super-high-rises, super-tall buildings and skyscrapers all define buildings that ascend into the sky. Depending on which city or continent you are in the definition of a tall building changes relative to context. A 14-storey building in Hong Kong is comparatively short in its surroundings and not considered tall, but the same 14-storey building in Paris would be tall in context to its neighbours.

Although internationally opinions dif-

Figure 1. The 828 m tall Burj Khalifa dominates the Dubai skyline as the world's tallest structure by far (www.imresolt.com)

fer as to the clarification of tall or not tall, structural technology changes with the increase of height – including vertical transportation and mechanical, electrical and plumbing requirements. According to the Council for Tall Buildings and Urban Habitat (CTBUH) website, 'Burj Khalifa exemplifies four major trends in current tall building construction, with respect to location, function, structural material and height' (CTBUH, 2010). Since the 1990s the trend in building tall buildings/towers has moved away from North America to the Far East, from single-usage buildings to mixed-use facilities, from steel structures to composite materials and from high-rises to the increase in the number of super-tall buildings (Figure 2).

But how do these tall buildings relate to urbanism and how are they located in their urban surrounding? Modernism in this, and the last, century was about buildings standing in isolation in a characteristic, transparent open space. However, an actual site has a surrounding environment, its own seasonal, social and cultural climates and its own histori-

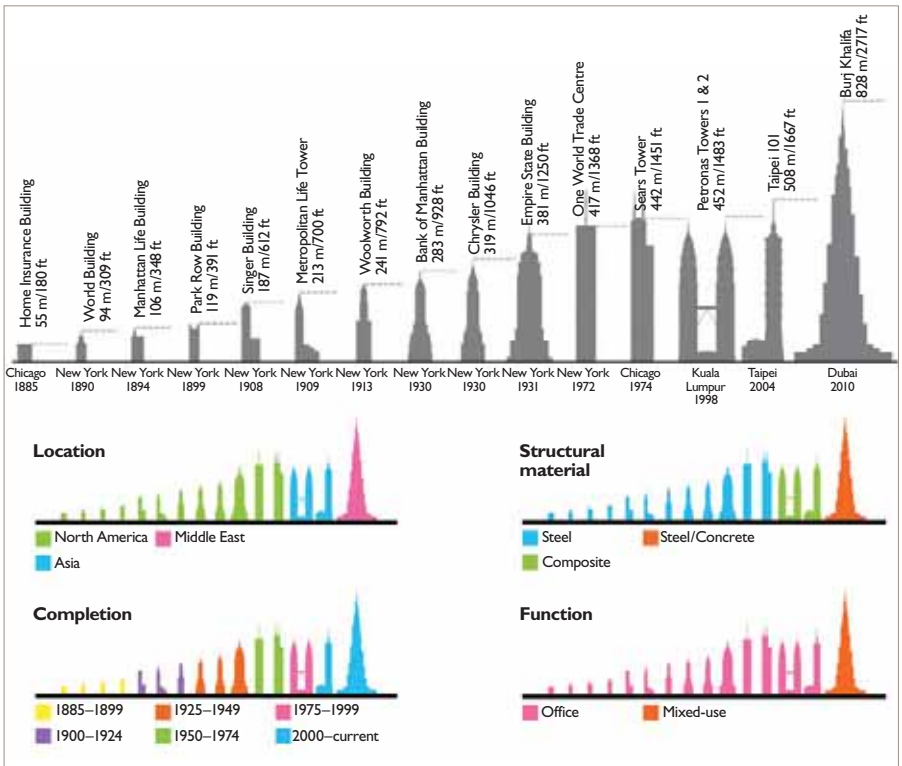

Figure 2. Since the 1990s the trend in towers has moved away from North America to the Far East, from single-usage buildings to mixed-use facilities and from steel structures to composite materials (CTBUH)

cal background (Gutierrez and Portefaix, 2003). Increasingly it is felt that buildings, both low- and high-rise, should not be isolated against the surrounding environment: the urban context includes both buildings and the space between them. In an urban sense all buildings are additive; they are additional points in the urban chaos of the modern city.

Towers as signifiers

As US and European cities snag 'starchitects' and the Middle East pushes the limits of height, eastern Asia continues to dominate in sheer density of residential towers as it has ever since Hong Kong embraced the idea in the early 1970s. Surprisingly, the former British colony has nearly 8000 skyscrapers, around 2000 more than New York (Heathcote, 2007).

Although perceived oppressive crowding and lack of public space have discouraged some Chinese cities from following Hong Kong's example, there is no question that high-rise is still seen as the modern solution. Shanghai, Guangzhou, Chongqing, Shenzhen and Beijing continue building skywards so that available property can keep pace with the demands of China's ever-expanding economy (Moore, 2006).

Le Corbusier's model

According to the UN Department of Economic and Social Affairs in 1955, the world's urban population lived in cities in the northern hemisphere. By 2005 it was apparent that people were moving to the cities from the countryside especially in cities across the southern hemisphere. This trend is continuing and by 2015 most of the world's largest cities will be in the developing world such as Africa, South America and Asia. Global urbanisation and migration result in the need for high-density development in cities.

Hong Kong is a prime example, as one of the densest cities in the world due to its large population and limited source of land. In addition Hong Kong's insistence to maintain its rural areas culminates in designing and constructing high-rise apartments and offices to accommodate its vast population. Emporis, the professional website on global building, states that 36 of the world's 100 tallest residential buildings are found in Hong Kong (Emporis, 2009).

In 2008, according to the Hong Kong Department of Statistics, the population of Hong Kong Island stood at 1·3 million covering an area of 20 km² of developed land. The total area of Hong Kong Island is 80 ha, of which 75% is country parks and mountains. In comparison, inner Paris has a population of 2·2 million over an area of 86 km². This results in a density of 65 000 people/km² for Hong Kong Island compared with 25 000 people/km² for inner Paris.

Le Corbusier's (1925) *Plan Voisin* was a theoretical proposal for an efficient city but most of all a more salubrious one. It had a new revolutionary typology of standalone buildings to contrast and resolve the health issues of the infamously derelict and lightless Parisian courtyard block. The plan emerged in response to acute urban housing crises in the city of Paris, which had resulted in overcrowded flats and the development of slums. It proposed demolishing the whole part of central Paris and replacing it with Le Corbusier's 60-storey cruciform towers in an orthogonal city grid and park-like green space, so as to provide an efficient and healthy environment with improved standards of living.

Le Corbusier went on to design *Ville Radieuse* which segregated traffic and utilities. The city was composed of highly centralised and densely populated standalone blocks while most of its ground surface was given over to open space and parks. The pedestrian circulation was segregated from the roads, a concept of vertical living zones (the modern high-rise) urban space and layering of traffic movements.

After World War II, the model of standalone semi high-rise towers surrounded by large undefined open spaces and segregated traffic was implemented on a large scale both in the UK and France. It was a way to resolve the housing crisis and lack of infrastructure due to destruction during the war and acted to preserve a green belt around the city centre while providing large amounts of housing units in dense developments.

The new model was in fact far less dense than the previous typologies of the Parisian urban courtyard block or the English terraced street, as the large expanses of green space surrounding the blocks lowered the density level to that of a suburban house and garden. These proved to be unpopular in the long term and achieved varying degrees of success. This is due to several main 'design' flaws: the lack of transport connections, the lack of definition of the open spaces and the creation of single-use residential blocks ruptured the urban fabric and sealed their fate as unsuccessful neighbourhoods.

More recent examples of high-rise buildings in places like China and Dubai uncover different sets of reasons why the model started to be seen as the way forward for twenty-first century urbanisation. In the case of cities like Dubai, the emergence of the high-rise as the preferred model of development can be explained by a conjunction of needs and constraints; geographical constraints of a city located on the coast and also surrounded by desert, and the need to create an urban/economical phenomenon.

Dubai required a money-generating solution to attract investors and capital, to build high-rises with their address and access located on major transport infrastructure. Dubai is becoming a more exaggerated version of its own original model in its efforts to create a manmade economic asset for a country aware of its dwindling natural resources.

China currently has the largest number of built high-rise towers. The growing redevelopment of Chinese city centres into high-rise districts is often compared to the postwar re-housing schemes in Europe. Both examples were planned to house vast populations relocating from the countryside to the city in search of employment in relatively short time spans. The displacement of these people created the issue of informal settlements and overcrowding in urban areas. China has now reached another stage of development by utilising the Hong Kong model, popular with investors in the mainland, of high-rise, high-density, mixed-use development integrated with a transportation hub.

In a tough economy inevitably people move to where the work is and create new lives there. Inevitably, the high-rise will

 ISSN 0965 089 X

be a welcome solution to the needs of a growing and maturing economy and society as towers present a very efficient and sustainable way of integrating increasingly complex requirements into one place.

The idea of building density is explored in various parts of the world and Hong Kong has a long history of developing high-density, mixed-use urban development since the 1960s due to its restricted land-use policy and large population. Unfortunately, Hong Kong's first attempts at high-density living along the waterfront were not an instant success due to the lack of a transportation infrastructure. A city is an entity that is ever-changing; city-making requires an efficient, clear infrastructure network that provides the framework for future growth.

In 1989, Hong Kong had the opportunity to plan a new airport which allowed the development of integrated rail and road networks. Kowloon station, the largest station on the railway line, integrates the air-rights property development above with station development below. The revenue generated from the air-rights property development was used to support the building of the whole railway line and set a prototype for future Hong Kong station developments.

An estimated 40 000 people live and work in the Kowloon station development and when compared with major urban areas such as central London or Venice, Italy, we can see that in order to accommodate the same amount of people it would require either a large volume of space or a vertical living zone. The inner city model can have an extremely dense footprint and can also be more sustainable, efficient and well connected.

Figure 3. Kowloon station masterplan, Hong Kong (TFP Farrells)

Towers as urban hubs

Focusing on the immediate neighbourhood or area in which a tall building is located, how does a tower react to its surrounding district? How can it positively affect and enrich the district?

It is generally thought that tall buildings can only grow in one dimension and the strict linearity of this extension accounts for its characteristic poverty of connectivity (Thomas, 2002). However, developing residential and commercial accommodation in ever dense clusters has become a growing trend. This concept in urban development has been tremendously successful and has had a great influence on much large-scale development on the Chinese mainland (Luk *et al.*, 2006).

So how do such buildings meet the ground where they make significant impact on the urban fabric? The quality of the public realm in, and around, tall buildings is a combination of the character of the spaces themselves and the activities they support. The engagement between these spaces and the surrounding city must be carefully judged in terms of their scale, character and permeability (Strelitz, 2005). Buildings in the public realm that do not create the possibility of a connection with the world outside and do not invite the public near will present an image of being aloof, territorially private and exclusive. Such buildings add nothing to the amenity of the urban environment (Thomas, 2002).

The height and density of tall buildings have led to the ever-increasing demand for better transportation networks and more amenities. There is an increasing requirement for the urban fabric to become multi-functional and for tall buildings to become urban hubs and mini cities.

Kowloon station masterplan

An embodiment of the urban cluster type of development is Kowloon station masterplan and property development in Hong Kong, now known as Union Square (Figure 3). The concept of turning the area into a transport 'super city'

Figure 4. The 441 m tall Kingkey Financial Tower in Shenzhen, China (TFP Farrells)

was the basis of the development of a number of tall buildings including the International Commerce Centre mega-tower (formerly known as the Landmark Tower). These buildings sit directly on top of Kowloon station with both metro and airport rail connections.

The original design of Kowloon station was extremely dense until airport height restrictions were relaxed and a new masterplan was developed. Cities are by nature, dynamic evolving places: in Hong Kong the rate of change in the city fabric matches that of the volatile economy which drives it. The Kowloon masterplan embraces a flexible strategy that allows for change at any time during the design and implementation process. During the station design and construction, the masterplan for the surrounding development went through five cycles of adjustment, including the first design for a low-rise airport height restriction scheme.

The strategic solution to planning the site lay in the recognition of the need to plan three-dimensionally, with a number of separate functional layers forming a podium – a platform carrying towers. The various tower designs followed the master planning structure, which requires that they should not merely create nodes of similar typology but should also adopt a three-dimensional design in which the infrastructure is organised in layers above the mass transportation centre.

The flats, offices, community facilities, hotels and service apartments are linked together by air-conditioned shopping streets and public areas in the podium levels, and by gardens, squares and vehicle- and pedestrian-circulation routes on the podium above. All parts of the design work together in the formation of an integrated, balanced city. The main tower is a signature statement of the masterplan scheme, marking the importance of Kowloon station on the airport railway while at the same time in tandem with International Finance Centre tower on Hong Kong Island forming a symbolic gateway to the harbour. Standing atop the entrance to the Western Harbour tunnel, with its proximity to the harbour and rail connections to the city and airport, the development is a land, sea and air regional transportation hub.

In other words, the development is a vertical city, with the horizontal development of the podium (mostly retail, parking and transport facilities) as a counterpoint. The compact composition offers great convenience, speed, accessibility, and efficiency to users and occupiers who live here or visit – essentially this convenience is what urbanism is all about (Luk *et al.*, 2006).

Shenzhen, China

In the original high-rise cities, New York and Chicago, the design of buildings was dictated by the city grid. A similar case can be found in Shenzhen, the first special economic zone of China. Still a rural village just 15 years ago, Shenzhen has developed itself at an incredible pace into a modern metropolis in the Pearl River delta, an area which is home to over 14 million people (Demographia, 2009).

The urban planning of Shenzhen was based on the Hong Kong model of dense urban-oriented development. Luohu, the old central business district bordered Hong Kong largely due to the fact that the area's fortunes were tied to Hong Kong's economy. It is now gradually being replaced by a new central business district extending eastward to Futian. As China becomes an economic powerhouse, Shenzhen's urban development is beginning to look towards Guangzhou and Beijing via a new high-speed rail network. This is expected to shape the city's design as well as further increasing the number of high-rises in the area.

This phenomenonal growth has led to the linear development of the Shennan Road which links Luohu and Futian. Strung along this road are groups of tall buildings – and many more are still to come, including the Kingkey Financial Tower, which will be the tallest building in Shenzhen upon completion in 2010 (Figure 4).

The 3·6 ha site featured mainly the dwellings of Caiwuwei village. The developer took the initiative to form a company with the villagers, Caiwuwei Co. Ltd. to

 ISSN 0965 089 X

design a new model for the district. The existing buildings were mainly housing that was quite run down and living conditions were poor. Small houses were replaced by resettlement housing and provision was made for a resettlement office creating an urban mixed-use environment (Figure 5).

The development has created an area that provides a higher quality of life for the original residents and not only provides them with their own space but also a rental space for them to invest in. This joint development initiative takes up a fair amount of the site and therefore, in order to be financially viable for the developer, the most effective solution was to build a mixed-use high-rise tower to offset the costs. Planning work was initiated by Shenzhen government in 2002 with the goal of redeveloping the area into Shenzhen's main financial district.

A number of tall towers are already placed along Shenzhen's civic and commercial axis of Shennan Road. Kingkey Financial Tower is a 98-storey, 441 m high building. It is a mixed-use complex containing offices, trading areas, conference and business facilities and a fitness centre, topped off with a six-star hotel complete with a sky garden. The height and distinctive silhouette of the tower provide an identifiable marker of its presence both in its local environment and in the city skyline. As well as being one member of the series of towers along this road; it is also a signifier of the way to the dense urban fabric of the central business district (Strelitz, 2005).

Towers as beacons

Ever since the word 'skyscraper' entered architectural vocabulary in the late-nineteenth century, architects and engineers have strived to push the boundaries of structural possibility. Now those boundaries are not only concerned with height but also with form itself (Webb, 2006). Tall buildings can act as beacons expressing economic success. They signify prosperity and expand the supply of office space where there is demand but scarcity of land or insufficient space suited to contemporary requirements and expectations. Visually, they have the potential to improve the appearance of city centres (Strelitz, 2005).

For building occupants and residents, modern high-rise buildings around the world have become corporate icons, symbols of progress, economic activity and prosperity while functionally they offer appropriate accommodation to house the international businesses for which cities compete.

Tall buildings have become default devices for making places (Heathcote, 2007), whether in the west as in Europe and the US, or in the east like China or the Middle East. Additionally, to act as beacons in the city, the design of tall buildings is not only driven by purely functional considerations, but must also respond to increased levels of social and urban complexity, specific and distinct to the surrounding site. Tall buildings have special potential to establish a new urban focus or enhance an existing building cluster. They can assist urban quarters in meeting the requirements of modern commerce, and help to define and strengthen urban localities that are centered on particular activities (Strelitz, 2005).

Walton Plaza, located in Shanghai, can also be seen as a 'beacon' in the city (Figure 6). Shanghai is divided into two distinct areas by the Huangpu River – Puxi represents the more traditional Shanghai, trying to establish itself as a Chinese-style modern city. Pudong on the other hand identifies itself with Shanghai's future, and is almost a competitive arena for architectural celebrities to showcase their talents.

Walton Plaza is situated in the Xuhui district of Puxi. Rising to 40 storeys, the development includes an 80 000 m^2 office tower, three high-rise buildings and four low-rise apartment buildings. The

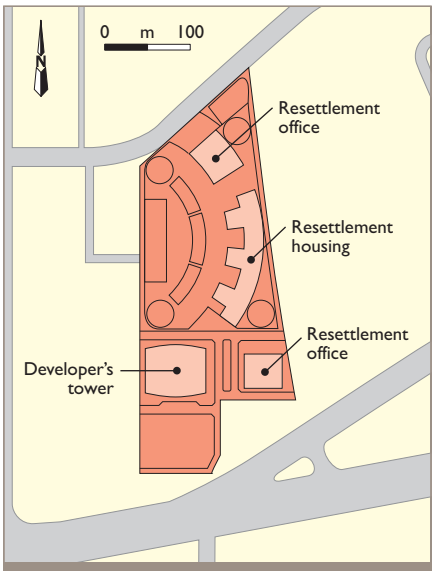

Figure 5. Local villagers were resettled in lower high-rise apartments around the Kingkey Financial Tower, creating a balanced mixed-use urban environment (TFP Farrells)

Figure 6. Walton Plaza, Shanghai – the main 40-storey tower serves as a beacon for the modern Puxi district (TFP Farrells) (photograph: Carsten Schael)

Figure 7. The BEA Tower in Shanghai has different cladding designs on each elevation (TFP Farrells) (photograph: Paul Dingman)

tall office tower has four curved planes resembling shields with recessed corner detailing that extends to the uppermost point of the office tower's structure to create a unique silhouette. On the sides, fin-like glazing projects 300 mm from the façade, providing a sense of transparency and lightness to the façade and reducing solar heat gain and glare. The lighting on the top of the building generates striking effects and was designed with the concept of a beacon firmly in mind.

Conclusion

The multiple and diverse functionality of today's tall buildings enriches the tower typology. Skyscrapers can either be developed as signifiers, as urban hubs, or as beacons in the city. The final goal perhaps is to have buildings in the city that are three-dimensional and porous, not simply competitive for the sake of height alone. Height is never the only means to create icons. When the most basic aspects of urbanism are re-examined, it is clear that the desire for connectivity rather than simple quantity of space is the primary concern.

Today's tall buildings incorporate contemporary aesthetics with modern, sustainable, technologically advanced building forms. Architects, planners, designers and engineers make greater efforts and advancements in creating buildings from the ground up that will be more energy-efficient and address climate and sustainability issues. Tall buildings also have to address greater solar, wind, and seismic issues.

For example, the design of the BEA Tower in Shanghai followed detailed analysis into solar insulation, resulting in four types of cladding, each of which is designed to deal with a specific environmental impact (Figure 7). To minimise excessive solar gain and building heat overload on the south-west and south-east elevations, the percentage of glazed areas is reduced, horizontal shading devices are provided and low-emissive glass is used (see Figure 8).

Glare protection from the low-setting sun is required on the north-west side but, because the principal views of the local park are in this direction, maintaining an open, glazed vista was important. Large

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areas of the north-west façade are glazed and vertical fins introduced to shade the interior. The north-east façade has neutral solar gain and is mainly glazed with low-e glass to maximise views. The use of energy-efficient systems was a main intent of the design and the building has a responsive building management system. This controls the interior environment to achieve optimum use of energy resources and maintains the internal air temperature and air quality.

Project sustainability is also about the improvement and continuity of the social, economic, environmental and cultural aspects of our society. This is achieved through development densification and providing comprehensive transit-oriented development zones where people can live, work and play all in close proximity, limiting travel distances and giving life to the area 24 h a day.

In a comprehensive development everything is nearby and easy to access; one can walk or ride a bike for local journeys, which helps to reduce the carbon footprint of the city through the efficient use of resources and reduced fossil-fuel dependency.

The primary foundation for the longevity of the built environment is the creation of 'place'. Place-making through urban design creates spaces and places that are enduring in peoples' affections and also provides economically beneficial relationships between their uses. The towers of the twenty-first century are about flexibility, proximity and accessibility – each of these elements create a sustainable environment.

More than ever, the task of architectural design is about the transparent articulation of relations for the sake of orientation and communication. The projects illustrated in this paper could be seen as 'urban', not defined by their heights, but by the details and qualities of design which truly responds to the urban context.

It is now a global fact that land is scarce and with the greatest pressure for urban growth taking place on the most fertile and productive land, there should subsequently be a re-examination of the benefits of urban density. For the newly urbanising countries of Asia, Hong Kong and super-high-density Kowloon in particular, offers an alternative model for the benefits of dense urban living, including land and ecological conservation and convenience.

The modern city requires tall buildings, but not all of them should be tall. This image of the city will demonstrate how built environment professionals may arrest the incessantly spreading city, while creating a new stage for urban culture in the future.

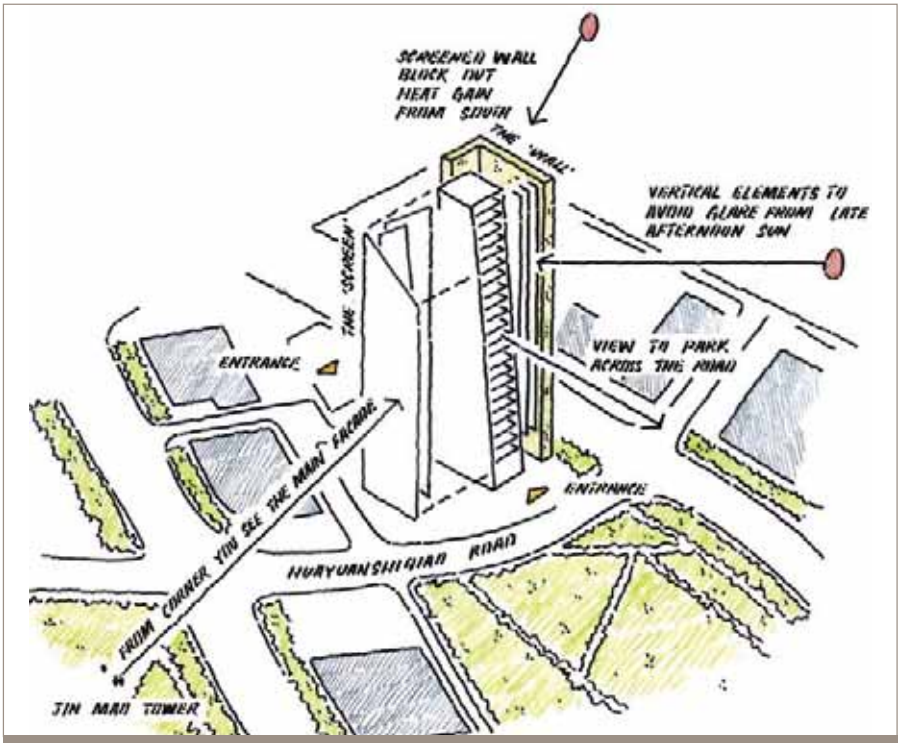

Figure 8. Different solar and amenity requirements governed the cladding design on each elevation of the BEA Tower in Shanghai (TFP Farrells)

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