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# Coupling of Urban-Value & Mega High-Rise: Ping An Finance Center

## 巨型高层建筑的城市价值协同：平安国际金融中心



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### Abstract | 摘要

*If the city is seen as a giant business, what is driving its market value? The height of the building is clearly one of the factors. Shenzhen was the pioneer of reform and openness, and has since gained global recognition as a “city of design.” In this respect, the emergence of Ping'an Center is indicative of the city's soaring value. Yet there are many lessons to be learned from such a development, not least of which is that the realization of remarkable height needs more interdisciplinary cooperation between the fields of engineering and project management.*

**Keywords: Complicated Engineering, Mega High-Rise, Multi-Collaboration, Urban-Value, Vertical Structure**

巨型高层建筑显然是推动城市价值不断飙升的一个重要因素。深圳这座富进取精神的南方都市正在面临重要的身份转型：从改革开放的实验地迈向新时代的设计之都，平安大厦在特殊的时代背景下展现出独特的视野和价值。本文分析了这座建筑在设计上的重要元素，以及作为复杂工程在设计管理上的多元协作。

**关键词：复杂工程、巨型高层建筑、多元协作、城市价值、竖向结构**

### The Metropolitan Role of Megatall Towers

*Note: As originally designed, Ping An Finance Center was to meet and exceed the megatall (600-meter) threshold. Over the course of its construction, its architectural height has been revised to that of 599 meters. This paper acknowledges and discusses the impact of Ping An Finance Center in the context of its megatall design intent.*

If we take a city as a giant enterprise, then what is the force that drives the continuous improvement of its market value? In some sense, the highest building of a city is like a scale that measures the position of the city relative to other cities. In 1930s, the Empire State Building (1931) and Chrysler Building (1930) took turns to be the highest building in the world, and, in the days when they dominated the world stage of high-rise buildings, New York became the chief financial center of the world. It is hard to imagine how the values of New York would have been achieved without them; It is even harder to imagine how geopolitics would have deviated if they were built in 1930s in China.

As can be seen from many signs, megatall buildings, as the peaks of the skyline, have a coupling effect with the cultural environment of the city where they stand. Skyscrapers are extremely costly, but, starting from the perspectives of unit area and per capita efficiency, they are very advantageous in

### 巨型高层建筑与城市视野的协同

如果城市被看作是巨型企业，是什么推动着它的市值不断提升？从某种意义上说，一座城市最高建筑高度如同一把标尺，衡量着这座城市与其他都市的相对地位。上个世纪三十年代，帝国州大厦（Empire State Building, 1931）和克莱斯勒大厦（Chrysler Building, 1930）曾经先后是世界最高建筑，在它们领导高层建筑舞台的岁月中，纽约这座城市一举成为世界首席金融中心。我们很难想象，如果没有这两座大厦，纽约的价值会打多少折扣；而我们更难想象，假设它们建成在三十年代的中国，世界格局发生如何的转变。

从很多迹象可以看出，巨型高层建筑作为天际线的顶点，与一座城市的文化环境存在着某种协同效应。虽然摩天大楼耗资巨大，但单位面积和人均效率出发，它对能源的消耗也是非常优势的，并且代表着财富和价值的集聚效应。也许我们有很多种方式去检验一座高层建筑的成功，比如楼价和出租率、建筑空间的合理性、出色的结构性能、舒适的内部环境、创新的公共空间……但是在这些因素之外，如果从城市的视野去衡量，那么最根本的检验标准也许可以这样描述：如果巨型高层建筑建成的未来若干年，这座城市依然保持着欣欣向荣的经济活力，并且在世界格局中得到跃升和关注，那么，这座高塔毫无疑问是成功的！

terms of energy consumption and represent the agglomeration of wealth and values. There are many criteria by which we can measure the success of a high-rise building, including property price, letting rate, spatial rationality, structural performance, internal environmental comfort, public space innovation, etc. However, besides these factors, if we start with the urban viewpoint, then the most fundamental criterion can be described as this: Several years after the completion of a megatall building, if the city where it stands still maintains its flourishing economic vitality and receives increasingly higher praise and closer attention in the global pattern, then the building can no doubt be deemed a great success!

Nowadays, the global economic balance is tilting toward emerging cities in Asia at an unprecedented speed. Following this trend, Shenzhen, a southern metropolis full of pioneering and enterprising spirit, is facing an important transition of identity: 30 years ago, it was a pilot area in China's reform as it opened up, shouldering the heavy responsibility of economic development; today, defining itself as the "Capital of Design," it has continuously stimulated design innovation through a well-established competitive bidding system, and has also employed urban space to write the history of contemporary culture, aiming to reinforce its brand image as a city that creates more possibilities for China.

In this historical background, the Ping An Finance Center (also known as Ping An Tower) rises straight from the ground. Its emergence not only represents the development demands of a large-sized financial group for office space, but also mirrors the relationship between Shenzhen and the world as a whole. According to the definition given by the Council on Tall Buildings and Urban Habitat (CTBUH), this is the first megatall building in Shenzhen and the second in China (having a building height above 600m). Echoing the Shanghai Tower (also above 600m in height), it is changing the strategic relationship between Shenzhen and Hong Kong, Guangzhou and other Pearl River Delta cities.

### Reshaping the Urban-Core with Architecture and its Functions

Tracing the dynamics of the urban skyline of Shenzhen, it is evident that, in the core of the regular CBD street grid of the Futian District, there is a plot that is defined as the skyline's highest point. As early as November, 2007, Ping An Life Insurance Company of China, affiliated to Ping An Insurance (Group) Company of China, Ltd., won this commercial land through bidding at the price of more than 1.6 billion RMB. They later used it to build the headquarter building of the group with a total investment of 9.5 billion RMB.

### 全球经济的天平正在以前所未有的速度向亚洲新兴城市倾斜

而在这个趋势中，深圳这座富进取精神的南方都市正在面临一个非常重要的身份转型：三十年前，它是中国改革开放的试验地，背负着经济发展的重任；如今，它将自己定义为设计之都，通过完善的竞标制度激发设计创新，用城市空间书写当代文化，同时强化城市品牌形象，为中国未来创造更多的可能性。

就是在这样的时代背景下，平安国际金融中心（也简称平安大厦 Ping-An Tower）从深圳拔地而起，它既是一家大型金融集团自身发展对办公空间的需求，也反映着深圳与世界的镜像关系。按世界高层建筑与都市人居学会（CTBUH）的定义，这是深圳第一座、中国第二座巨型高层建筑（建筑高度超过600米）。它与同样超过600米高度的上海中心形成南北呼应的格局，也正在改变了深圳与香港、广州等珠三角城市的战略关系。

### 建筑文化与实效的协同：深圳最高建筑重塑都市格局

如果追溯深圳城市天际线的动态轨迹，在福田CBD规则街道网格的核心区位，有一处地块被定义为“龙脊”的天际线制高点。早在2007年11月，中国平安旗下中国平安人寿保险股份有限公司以16亿余元的价格竞得这块商业用地，用于建设中国平安总部大楼，这一项目总投资额高达95亿



Figure 1. Ping An Tower nearly completed (Source: CCDI Group)

图1. 接近竣工的平安金融中心主塔 (来源: 悉地国际)



Figure 2. Urban Context of the Zhu-sanjiao Area (Source: KPF)

图2. 平安大厦在珠三角区域的战略位置 (来源: KPF)

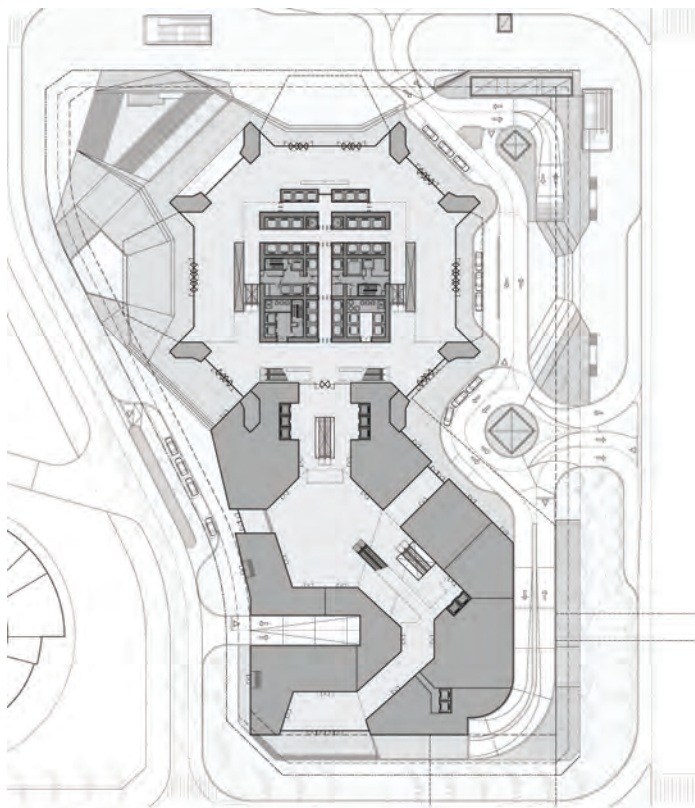


Figure 3. 1st Floor Plan (Source: CCDI Group)

图3. 首层平面图 (来源: 悉地国际)

The organizing principle of the tower design is a symmetrical tapering form. Splayed at the base and rising toward a long, slender spire, the tower reaches a height of 600 meters. Its glass corners and glass and vertical stone facades are all-at-once classic and modern. Recalling the forms of early skyscrapers, the tower's slender profile is also immediately contemporary and iconic.

Typical office floors are approximately 2,900m<sup>2</sup> in size. Arranged around a central elevator core, the typical office space has

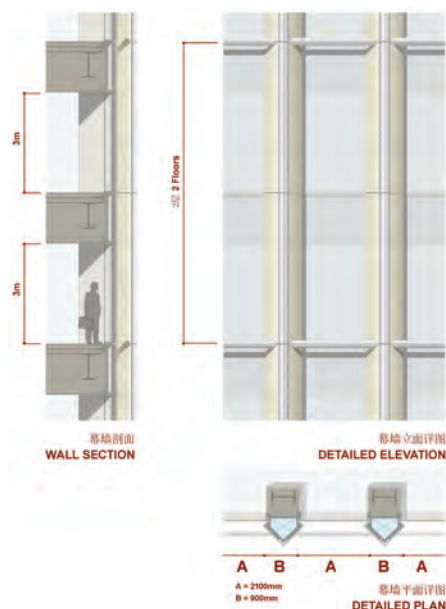


Figure 5. Rhythm of façade curtain wall (Source: CCDI Group)

图5. 立面上的幕墙细部设计 (来源: 悉地国际)

leasing depths of 12m and a floor-to-ceiling height of about 3m. The latest technology in high-performance glass will be used to maximize transmission of visible light while blocking out the infrared spectrum associated with heat gain.

The building's façade is made up of glass, metal and stone. The façade is intended to be elegant yet practical, using a minimal amount of material yet achieving the desired aesthetic effect. The exterior façade is a curtain wall system. The unitized façade allows most components to be sourced and fabricated locally and installed on site quickly and safely, reducing the time and energy required to build it. The non-stone vision and spandrel areas will be of matching low-e insulated glass in order to minimize reflectivity and glare while also providing sufficient shading coefficient and thermal insulation. By using the most technologically advanced curtain wall system the tower's heating and cooling loads can be radically reduced. The spandrel areas will have an insulated back panel to further enhance the wall's thermal properties. In conformance with local and national regulations, all glass will be either laminated or tempered for safety. In the case of tempered glass, all glass will be heat soaked to prevent spontaneous breakage.

The high volume elevator system, arranged neatly in an efficient square core, services the tower's eight above grade zones and

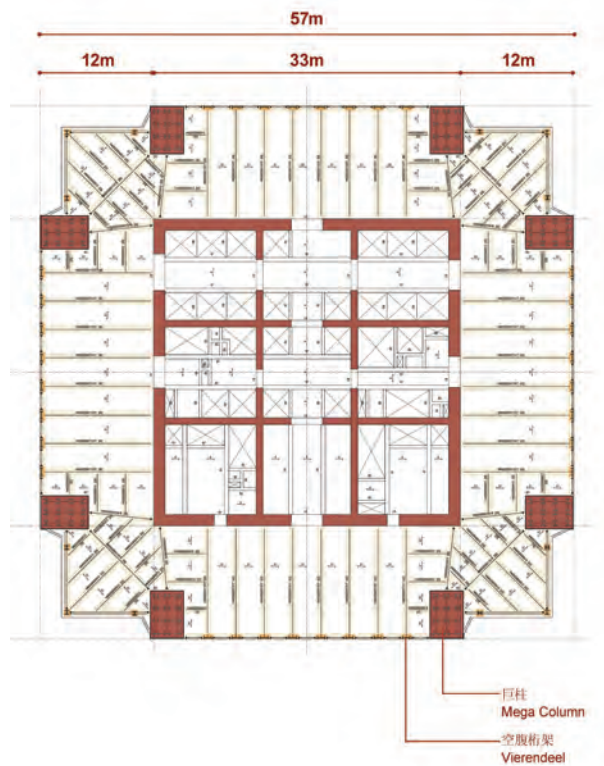


Figure 4. Typical office floor framing (Source: CCDI Group)

图4. 典型办公楼层的结构和平面关系 (来源: 悉地国际)

元。九年之后, 平安大厦的建设已经接近尾声, 它早已不是一家企业的大厦, 而是整个CBD、整座城市的象征。

平安金融中心的建筑意象可以呼唤着对早期经典摩天大楼的记忆: 古典的轮廓、对称的造型、高耸的比例、竖向石材条纹以及长长的塔尖象征着为城市未来的无限期望。建筑在底部较为舒展, 塔楼随着细长的塔尖慢慢升高, 最终在达到超过600米的高度。一气呵成的气势在高塔尖端达到极致并继续冲向云霄。

典型办公平面均为2900平方米左右。围绕着中心电梯筒, 标准层平面租赁宽度为12米, 楼层净高在3米以上。高性能玻璃的最新科技将被用来最大限度得提高可视光线量, 同时遮挡住与增加热量有关的红外线。

塔楼的底部是一个大型商业和会议中心, 外立面由经典而精致的石材覆盖, 裙房的室内空间组织在大型的阳光中庭的周围, 在塔楼顶部还有一个大型的公共活动空间, 人们在这里可以俯瞰都市盛景, 感受从清晨到夜晚的璀璨活力。塔楼结构高效而优雅地反映了建筑的标志性。巨柱以及各个角落的对角斜撑臂, 作为沿四周立面的竖向密排的筒中筒柱子共同形成塔楼结构。筒中筒柱子在外立面包石材, 通过显眼的玻璃四角可看到结构对角斜撑臂。

高效高容的电梯体系, 经过效率极佳的正方形核心筒清晰地组织, 服务塔楼地上8个分区与地下2个分区的客流运送。垂直交通在首层与夹层被划分, 始发层设置于

two below grade zones. Elevator traffic will be divided between the ground floor and a mezzanine level, from which local and express double-deck lifts will depart, servicing even and odd floors respectively. Local elevators servicing Zones 1, 2, and 3 will depart directly from the office lobby ground floor and the mezzanine, while access to local elevators servicing zones 4, 5, 6, 7 will be reached via shuttle lifts to Sky Lobby 1 at the 54th/55th floors and Sky Lobby 2 at the 83rd/84th floors. A dedicated shuttle servicing zone 8 and the observation deck levels will depart from Sky Lobby 2. The efficient double deck elevator system thus requires only one transfer to reach any point in the building from the main lobby.

The podium extends south from the base of the tower, and can be accessed directly from the office lobby's Southwest corner. Entrances from the street to the podium atrium are located along the East and West just south of the mega tower and grant access directly into the central public atrium. People may also filter through the luxury retail stores along Zhongxin Er Road to gain access into the retail atrium. Sheathed in stone and connected to southern sites via a long bridge, the podium not only facilitates movement between the tower and neighboring sites but also creates a destination space in-and-of-itself. At the center of the seven-level podium and fronted by the tower's office lobbies is a large public atrium lined with stores.

The public atrium is the active center of the project. Lined with stores and cascading upwards away from the tower through a series of stepping levels connected with escalators, the atrium is fronted by single and multi-level retail and restaurants. At the ground floor, attractive luxury retail stores will draw people into the podium, and an anchor store at the southeast edge of the mall will draw people further in, and up into the mall. The escalator banks will be located at the northwest near the link to the office lobby and at the southwest near the anchor store, and stack vertically to create two small atria flanking the large central atrium, all of which extend up to the 7th floor and down to B1.

Ground floor entrances to the main lobby consolidate traffic to the site coming from various modes of transportation; vehicular, pedestrian, and rail. From the northwest, where pedestrian traffic is expected to come from neighboring sites as well as from nearby subway exits, people will enter the two-story main lobby under a large canopy and through a wide-open glass entryway spanning between two mega-columns. From the east, people dropped off will enter through the



Figure 6. The center-core construction beyond the ground (Source: CCDI Group)

图6. 钢板剪力墙构成的核心筒跃出地面 (来源: 悉地国际)

two-story covered area into the office lobby on axis with the double deck elevator banks. Additional access to the office lobby and retail atrium comes at the B1 level, where underground concourses link the building's below-grade retail floor to neighboring Coco Park's retail courtyard and to the MRT station's retail concourse link. A taxi lay by is also located at the B1 level to accommodate the high volume of people coming and going from the site.

The regular street grid, parallel to the cardinal directions, calls for a tower which is "locked" into the urban context at its base. As the tower rises up and out of the confines of the street grid, it emphasizes open corner views at 45-degrees to the urban grid. The shift in alignment from the urban grid to the view axis creates a dramatic contrast in which the tower belongs to the city fabric at the lower levels while focused towards the Pearl River Delta at its top. The other major views from the site are aligned along a north-south landscape axis, offering spectacular views to the mountains, and along an east west urban axis for dramatic views of the city at night.

### The Coupling of the Vertical Structure and Energy Optimization Strategies

As a megatall building, Ping An Tower presents a clear logic in its structural system, and the completed building has achieved the coupling of technology and energy.

此的区内电梯与高速双层电梯将分别服务奇数层与偶数层。服务1、2、3区的区内电梯的始发层位于办公大堂的首层与夹层,而4、5、6、7区的区内电梯可经由直达54/55层与83/84层空中大堂的穿梭梯搭乘。服务8区与观光层的专用穿梭梯的始发层位于2号空中大堂。通过上述设计的高效双层电梯系统,客户仅需一次转换即可从大堂到达塔楼的任一层层。

裙房从塔楼底部向南伸展,可从办公大堂的西南角直接进入。裙房的街道入口位于裙房的東西两侧,可直接进入中央公共中庭。通过一条长廊桥与南部基地相连。人们亦可从中心二路一侧的奢侈店铺进入商业裙房。裙房主要材质为石材,通过一条长廊桥与南部基地相连。裙房不仅服务于塔楼与相邻基地的连接,同时自身也成为城市的一个目的地。在7层裙房的中心,面朝塔楼办公大堂布置了一个大型的中庭,中庭两侧为商店。

开放的商业中庭为项目提供公共活动中心。由单层、跃层的商业及餐饮毗邻的商业中庭由自动扶梯串联,并经由一系列的错落爬升自下而上逐层偏离塔楼。塔楼首层设置的高档精品店铺有助于吸引与凝聚人流进入中庭,而位于东南角的旗舰店将更有助于加强人流的引入及向上部商业核心的导向。坐落在东北角与西南角的自动扶梯组群分别与办公大堂及旗舰店相邻,在主体中庭的两侧形成垂直贯通地下一层至地上七层的附属中庭。

连通大堂的首层入口汇集基地周边各种交通模式产生的人流:车行、人行与轨道交通。在基地西北隅,人流主要来自邻近



Figure 7. Construction at 100 meters height (Source: CCDI Group)

图7. 平安中心进行到100米施工高度 (来源: 悉地国际)

The main project consists of a five-story underground garage, a ten-story annex and a 118-story tower (including a ten-story annex). The main structure adopts a mega braced frame, a steel reinforced concrete tube and a steel outrigger structure to resist earthquake and typhoon loads. To be specific, the mega braced frame consists of eight mega-columns (with a section of 6.5m×3.2m at the bottom), steel mega bracing and seven spatial banded trusses; the steel reinforced concrete tube consists of a steel plate-concrete shearing wall tube below the 12th story and a steel reinforced concrete shear wall tube above the 12th story; and the steel outrigger structure consists of four steel trusses located on the equipment layer. The secondary structure consists of H-section steel columns and beams between the banded trusses and mega-columns, and is mainly used to bear the gravitational load.

To guarantee the absolute safety of this tower, the structural engineering technology of Ping An Tower is further embodied in three aspects: A) a "wind-induced response study of super high-rise buildings," B) an "elastic-plastic time-history analysis of rare earthquakes" and C) a "anti-progressive collapse analysis of structures."

a) Based on the hourly near-ground wind records and near-ground and



Figure 8. Construction at 200 meters height (Source: CCDI Group)

图8. 平安中心进行到200米施工高度 (来源: 悉地国际)

upper typhoon simulations made by the Shenzhen Meteorological Observatory in the past 35 years, the structural engineer adopted both the rigid model high-frequency-force-balance technique and the aeroelastic model to conduct the wind tunnel test. As indicated by the results of the test, the shape and section adopted by Ping An Tower, which gradually reduce upward along its height and constantly change at its four corners, can effectively weaken the across-wind sympathetic vibration incurred by vortex shedding, and reduce the wind load applied on the building.

b) The structural engineer adopted the dynamic elastic-plastic analysis method to conduct the time-history analysis of earthquake engineering. Under the seismic wave actions of seven groups of rare earthquakes, the structure of the project has a maximum elastic inter-story drift ratio of 1/177, less than the specified limit 1/100, so it can meet the basic requirement of "no collapse under strong earthquakes". The mega frame, as the primary bearing structural member, can provide a sufficient aseismic bearing capacity.

c) With regard to the progressive collapse by unconventional damages to the structure, analysis was conducted on the failure of a gravitational column on the



Figure 9. Construction at 350 meters height (Source: CCDI Group)

图9. 平安中心进行到350米施工高度 (来源: 悉地国际)

地块及地铁出口，并经过巨大的雨棚与巨柱间宽敞通透的玻璃入口进入高两层的大堂。在基地东隅，下客人流将通过两层高的架空入口门廊沿塔楼双层电梯厅的中心轴线进入办公大堂。其他通往办公大堂和商业中庭的入口位于地下一层，并于此处设置开敞地下广场，实现项目的地下商业与邻近地块Coco Park商业庭院及地铁商业广场的链接。项目于地下一层亦提供一处出租车上下客，以优化配合大量的人流到达与离开需求。

从城市文脉上说，塔楼底部被“锁定”于城市肌理规则的街道网格内。当塔楼升高并且超出街道网格的限定范围时，塔楼特别打开四个角部与城市网格呈45度的视野。这种从城市网格轴线到视野轴线的转换形成了强烈的对比，给人带来耳目一新的跃升感。

### 垂直空间的力量构型：技术与能量的协同

对于这座巨型高层建筑，平安大厦的结构体系呈现出清晰的逻辑性，达到了技术与能量的协同。

主体工程由5层地下库，10层裙房及118层塔楼（含裙房10层）组成。主结构采用巨型斜撑框架、型钢混凝土筒体、钢伸臂桁架结构，以抵抗地震和台风荷载。其中，巨型斜撑框架由8个巨型柱（底部巨柱截面

50th story, on the diagonal rod failure of the circular truss between the 48th story and the 50th story, on the overall failure of the circular truss between the 48th story and the 50th story, and so forth. The results indicate that the structure would not go through large-scale progressive collapse due to local structural member damage/failure.

The current work in sustainable building design reflects a long-lasting need to reduce energy consumption and minimize the building's ecological footprint while still providing first-class living and working environments. Improved access to daylight, natural ventilation, and open public spaces has been shown to improve worker health, productivity and happiness, as have building orientation, façade technology and building systems. The tower façade is a combination of glass and stone. The vertical stone components act as large sun louvers, reducing exposure to direct sunlight. The tower's curtain wall uses the most ecologically efficient glass. Further, operable vents at each floor positioned on either side of the vertical stone components allow for natural ventilation and individual control of the working environment.

### Multi-Disciplinary Collaboration as Integrated Engineering

Building a megatall building in a city less than 30 years old is a "worldwide" project.

By this description we not only mean that its height is world-class, but also refer to the fact that more than 20 technical institutions have participated in its design consultations, including architecture, structure, electromechanical, BIM, interior, landscape, curtain wall, lighting, labeling and lightning protection design, as well as commercial planning, underground transportation, elevator, fire protection, acoustics, property management, generator smoke extraction, basement water-proof, gondola, anti-vibration damper, wind tunnel test, sustainable design, LEED design, and so forth. Simply put, different teams from different countries and regions have joined hands in this project for their "worldwide" cooperation.

In the coordinative process of such a complicated project, CCDI, as the integrated architectural design institution shouldering the greatest responsibility, has closely cooperated with the Owner to conduct a detailed and in-depth control over all the aspects in the whole process of this project. From October, 2008 to November, 2010, more than 4,000 construction drawings were prepared by various specialties for the main building, and within only 1/4 of the whole design-service period.

In the construction coordination stage after 2011, the services involved in design management include technical disclosure, drawing explanation, field technical coordination, special design development (steel structure, curtain wall, elevator, etc.), design alterations of different scales,

达到6.5m × 3.2m)、钢巨型斜撑、7道空间钢带状桁架组成；型钢混凝土筒体12层以下为钢板混凝土剪力墙筒体，12层以上为型钢混凝土剪力墙筒体；钢伸臂桁架由4道位于设备层的钢桁架组成。次结构由位于带状桁架与巨柱间的H型钢柱、梁组成，主要承受重力荷载。

未来确保这座巨型高塔的绝对安全，平安大厦的结构工程技术进一步体现在“超高层的风致响应研究”、“罕遇地震弹塑性时程分析”、“结构抗连续性倒塌分析”三个方面。

1)，结构工程师根据深圳气象台35年逐时近地风记录、近地面层及高层处的台风模拟，采用刚性模型高频测力天平技术及气动弹性模型进行风洞试验。风洞试验研究表明，平安大厦所采用的沿高度向上逐渐缩小及在建筑物四角不断变化体形与截面，能够有效的减小了由漩涡脱落所引起的横风向风振，减小了作用在建筑物上的风荷载；

2)，结构工程师采用动力弹塑性分析方法进行地震工程的时程分析。本工程在7组罕遇地震波作用下结构最大层间位移角1/177，小于规范1/100的层间位移角限值，满足“大震不倒”的基本要求。巨型框架作为主要受力构件能够提供足够的抗震承载力；

3)，针对结构非常规破坏引起的连续性倒塌 (Progressive Collapse)，本工程分析了第50层的一根重力柱失效、48~50层之间的周边桁架的斜杆失效、48~50层之间的周边桁架整体失效等工况，分析结果表明结构不会因为局部构件破坏/失效而引起大范围连续倒塌。整体结构具有较高的抵抗连续倒塌的能力。

在能耗方面，建筑设计包含了对节能的关注，尽量减少建筑对自然生态的不良影响，以提供一流的工作或居住环境。其中，利用建筑朝向，建筑幕墙技术和建筑系统等条件，增加了自然采光，通风与公共空间，以优化员工的身心健康提升生产效率。塔楼幕墙材质包含了天然石材与玻璃，竖向的石材有类似遮阳百叶的功能以减少直射光，且幕墙玻璃采用节能效率很高的玻璃。且各层塔楼幕墙在竖向石材旁都设有可开启窗，为各个租户提供了能独立控制的自然通风工作环境。

### 复杂工程设计的多元协作

在一座发展历史不到三十年的城市建设巨型高层建筑意味着一个“世界性”的工程，这里不仅是说建筑本身的高度是世界级的，而是参与设计顾问的技术机构多达二十多家，包括建筑、结构、机电、BIM、室内、景观、幕墙、照明、标



Figure 10. Construction at 550 meters height (Source: CCDI Group)  
图10. 平安中心进行到550米施工高度 (来源: 悉地国际)



Figure 11. Construction at the top of tower tpire at the end of 2015 (Source: CCDI Group)  
图11. 2015年年底的塔尖施工状况 (来源: 悉地国际)

coordination and cooperation over construction organization scheme, and coordination and cooperation over later-stage operation management plan, as well as regular meetings in numerous fields and special demonstration meetings (including four mayor's meetings, eight power supply bureau meetings, three performance-based fire protection meetings, six aseismic reviews and four railway protection reviews). The quantity of these services is still on the rise.

Thus, the control over the “depth + breath” of professional technologies constitutes the core of the project management of Ping An Tower. To be specific, the project includes many participating parties engaged in frequent information exchanges, and its different international design consultation teams work at different places and in different hours; the situation is also complicated by the tight schedule, the early commencement of construction, etc. As the chief designer, CCDI and the Owner have jointly established a two-level longitudinal management system (“direct management by the Owner + coordination under the architect”), and the specialty designers respectively sign a contract with the chief designer to ensure the coordination of the overall progress; standard

working document templates and technical measures were also separately customized in the project, emphasizing the synchronization of technical coordination and drawing detailing. Starting with design development, the team of CCDI, besides conducting technical review and confirmation, considered also how to properly connect the links of structural member processing, manufacture, installation and field management.

In addition, another important embodiment of the occupational quality of design management lies in how to conduct proper pre-control and prejudgment in this project ensure the interaction conditions between upstream and downstream links and avoid rework and dissociation problems in the building process. At the present time, under the joint cross-national efforts, an urban landmark was ultimately delivered as a satisfactory outcome for the future of Shenzhen city.

识、防雷设计，以及在商业策划、地下交通、电梯、消防、声学、物业管理、发电机排烟、地下室防水、擦窗机、抗震阻尼、风洞试验、可持续设计、LEED认证以及更多的专项顾问公司，不同的团队来自多个国家和地区，可谓“世界范围”的合作。

在这样一个复杂工程的协作进程中，CCDI作为承担最大责任的建筑综合设计机构，协同业主一起对项目的全程各节点进行着详细而深入的管控。在2008年10月到2010年11月的主要设计阶段，主体建筑各专业施工图出图总量多达4000张，而在这时，我们的服务周期其实仅仅完成了四分之一。

在2011年之后的施工配合阶段，设计管理的涉及服务内容包括技术交底、图纸答疑、现场技术协调、专项设计深化（钢结构、幕墙、电梯等）、大大小小的设计变更、施工组织方案协调配合、后期运营管理预案协调配合，以及不计其数的现场例会和专题论证会（包括市长办公会议4次、供电局会议8次、性能化消防3次、抗震审查6次、地铁保护审查4次），数量还在不断增加之中。

所以，对专业技术的“深度+广度”的把控，成为平安大厦项目管理的核心内容。而这个项目参与方众多、信息交互频繁、多个国际化设计顾问团队的不完全同步、多地点办公，加上工程进度紧、现场提前开工等因素。作为主设计单位，CCDI与业主建立起“业主直接管理+建筑师牵头协调”的两级纵向管理层次，专业设计方分别与主设计方签订合同以保证整体进度的协调，并采用针对该项目单独定制的标准工作文件模板及技术措施，强调技术协调与图纸细化同步。从深化设计开始，CCDI团队除了技术复核及确认，还必须考虑如何满足构件加工、制作、安装与现场之间的衔接。

此外，在这个过程中如何做好预控预判、保障上下游环节的交互条件、避免建造过程中的返工以及运营脱节问题，也是设计管理的职业素质体现。时至今日，在跨越国界的努力下，总算为业主、为这座城市递交了一份较为令人满意的答卷。