

CTBUH "In Detail" Series  
CTBUH "深入解读"系列

# Ping An Finance Center: In Detail

## 平安国际金融中心: 深入解读

Editors (编者): Antony Wood, Wai Ming Tsang (曾伟明) & Daniel Safarik





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封面: 平安金融中心, 中国深圳 © 平安

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## Introduction

### 概述

# Ping An Finance Center 平安国际金融中心

Shenzhen, China 中国深圳

Shenzhen, a coastal city near Hong Kong, has expanded in population from 300,000 to 10 million in the 35 years since it was declared a Special Economic Zone by the government in 1979. It is mainland China's 10th most-populous city, and has received more than \$30 billion in foreign investment, making it one of the fastest-growing cities in the world.

The Ping An Group of financial services companies has also undergone rapid growth in recent years. It now has more than 200,000 staff, and office space is very much in demand. In an effort to consolidate functions in a single headquarters building, Ping An began construction of the Shenzhen Ping An Financial Center (PAFC) in 2009, which is targeted for completion in 2016.

Located at the center of Shenzhen, PAFC is a "transit-integrated tall building" that will occupy a major node in the increasingly connected mega-city of Hong Kong / Shenzhen / Guangzhou: home to 120 million people and one-third of China's trade value. By 2017, Hong Kong and Shenzhen will be only 15 minutes from each other by train, and in Shenzhen, PAFC is strategically located at the terminus of the under-construction XRL line to Hong Kong, as well as Shenzhen Metro lines 1 and 3.

PAFC will be 660 meters tall, comprising 460,665 square meters of floor area across 115 levels, with a daytime population of 17,000. And yet, despite its size, it will also have significant sustainability credentials. With an extremely dense program and well-chosen materials and mechanical engineering strategies, PAFC is predicted to sustain an 18.25 percent energy savings beyond ASHRAE standards, and a 46 percent annual savings in energy costs over a conventionally constructed commercial office building of the same scale.

As a design, PAFC is meant to symbolize its owner's image and title – "Ping An" is the combination of the Chinese characters for "peaceful" and "safety" – while evoking the entrepreneurial spirit of Shenzhen. The design also epitomizes efficiency. Its stretched, needle-like shape is streamlined and notched with continuously tapering corners, for both aerodynamic performance and visual effect, as well as returning the maximum possible number of square, functional floor plates on a compact site. Overall, PAFC achieves a 32% reduction in overturning moment and 35% reduction in wind load compared to China code, due to the shape of the tower.

深圳——一座毗邻香港的海滨城市，自1979年被政府设立为经济特区以来人口已从三十五年前的三十万增加到了上千万。作为大陆人口数量第十大城市，深圳已收获超过三百亿的海外投资，是全球发展最快的城市之一。

中国平安保险(集团)近年来也发展迅速。现在平安集团已有超过二十万员工，因此亟需办公空间。为了将主要功能集中到一座总部大楼中，平安集团于2009年开始建设深圳平安金融中心(PAFC)，并预计于2016年竣工。

地处深圳的核心地带，平安金融中心是一座“枢纽型高层建筑”，位于正逐渐连接起来的新特大城市群(香港/深圳/广州)的重要节点，这个特大城市群坐拥了一亿两千万人口，并占据中国三分之一的贸易值。到2017年，火车来往香港和深圳之间将只需十五分钟，而深圳平安金融中心就战略性地坐落于正在建设中的广深港高铁终点站上方，同时也是深圳地铁1号和3号线的枢纽站。

平安金融中心高660米、115层，建筑面积

Right: The Ping An Finance Center under construction mid-2014. (Source: Ping An)

右图：正在施工中的平安金融中心，于2014年夏(来源：平安)



# Designing China's Tallest: DNA of the Ping An Finance Center

## 设计中国最高之巅: 平安金融中心的DNA

David Malott, Kohn Pedersen Fox Associates

The Ping An Finance Center is the next generation of the prototypical Asian skyscraper: megatall, hyper-dense, and highly connected. Encoded in the design of PAFC are the evolutionary building blocks of a modern megatall building. Ping An Insurance Company of China envisioned a tower which could represent stability, befitting the company's image and title (Ping An is the combination of the Chinese characters for "peaceful" and "safety"), while evoking the entrepreneurial spirit of Shenzhen. Also, the tower was to be intelligently designed to the highest international specifications: efficient, elegant, yet evocative. PAFC will symbolize a city which has witnessed unprecedented urban growth – from 300,000 people to approximately 10 million – in the 35 years since becoming China's first Special Economic Zone. This chapter outlines key architectural concepts centered on the Ping An Finance Center, relative to larger issues concerning supertall building design and the formation of tall building clusters, as a means to achieve sustainable vertical urbanism.

平安金融中心是新一代的亚洲摩天大楼的典型代表: 超高层, 高密度, 以及高度的通达性。平安金融中心的设计体现了现代超高层建筑体块的演变。本演讲将围绕平安金融中心讨论其主要的建筑构思, 以及有关超高层建筑设计 and 高层建筑集群形成的问题, 实现可持续的垂直城市化发展。平安金融中心是新一代的亚洲摩天大楼的典型代表: 超高层, 高密度, 以及高度的通达性。平安金融中心的设计体现了现代超高层建筑体块的演变。本演讲将围绕平安金融中心讨论其主要的建筑构思, 以及有关超高层建筑设计 and 高层建筑集群形成的问题, 实现可持续的垂直城市化发展。

### Introduction

In line with Ping An's commitment to quality, safety, and sustainability, the project team made a strategic decision to begin with a proven prototype for a megatall tower, and pull it to an unprecedented height. The design was less about a radical alteration of the tall building, but one of continuous refinement. The techniques in up-scaling were nonetheless challenging, and led to key innovations in the building's form, structure, and other systems.

A key challenge was addressing the tower's high population density. PAFC has a floor area to site area ratio exceeding 20, with nearly 350,000 square meters contained within the tower footprint alone. Compounding the issue is that the PAFC tower is almost exclusively an office tower, with a high design occupancy requirement, averaging 11 square meters per person (see Figure 2.1a).

To put this in perspective, PAFC's entire office population of 15,500 workers is stacked on a 72-meter by 72-meter footprint constrained by the tower's irregular piano-shape site. At this density, our entire global workforce, estimated at 3 billion workers, could be housed in a land area less than 1,000 square kilometers. *That is two planets full of workers, fitting within the borders of Shenzhen* (see Figure 2.1b).

### Which Leads to the First Question: Why Build Such a Tower Here?

PAFC is what can be described as a Transit Integrated Tall Building. It speaks to the promise of the tall building as a sustainable paradigm, in which individual buildings form part of a larger ecosystem of dense vertical centers linked by horizontal networks of public transportation.

Increasing density in city centers is more effective in preserving land resources and reducing energy usage than the alternative of urban sprawl. The relationship between density, land use, and energy use is well documented. Amongst high-income societies, the dense city-state of Hong Kong ranks as the most energy-efficient in annual energy use per capita. The average Hong Kong resident uses less than a third as much energy as the average American, while enjoying the same purchasing power (World Bank 2012, IMF 2013). And, while Hong Kong is associated with images of tall buildings, less than 25% of its land area is urban or built-up;

### 前言

根据平安做出的质量、安全和可持续发展的承诺, 项目组制定了一个战略决策, 从经过验证的超高层塔楼原型开始逐渐将它拉高到前所未有的高度。这一设计不是高层建筑的彻底改变, 而是不断的完善。随着建筑尺度的扩大, 其中使用的技术毋庸置疑具有挑战性, 并且能引起建筑形态、结构和其他系统的关键创新。

一个关键挑战是要解决塔楼中的高人口密度。平安金融中心楼层面积与基地面积比超过20, 仅塔楼投影面积上就有近35万平方米建筑面积。使问题更复杂的是, 平安金融中心几乎完全是办公楼, 具有极高的人口入驻要求, 平均每人占有11平方米 (见图2.1a)。

从另一个角度看, 平安金融中心内将有15500名办公楼员工叠加在一个72x72米范围的平面上, 同时还受塔楼基地不规则钢琴形状的限制。按照这个密度, 我们全球预计三十亿的员工可以安置在一个面积不到1000平方千米的平面上。也就是说两倍于地球上现有工作人员的人数可安置在深圳市辖区内 (见图2.1b)。

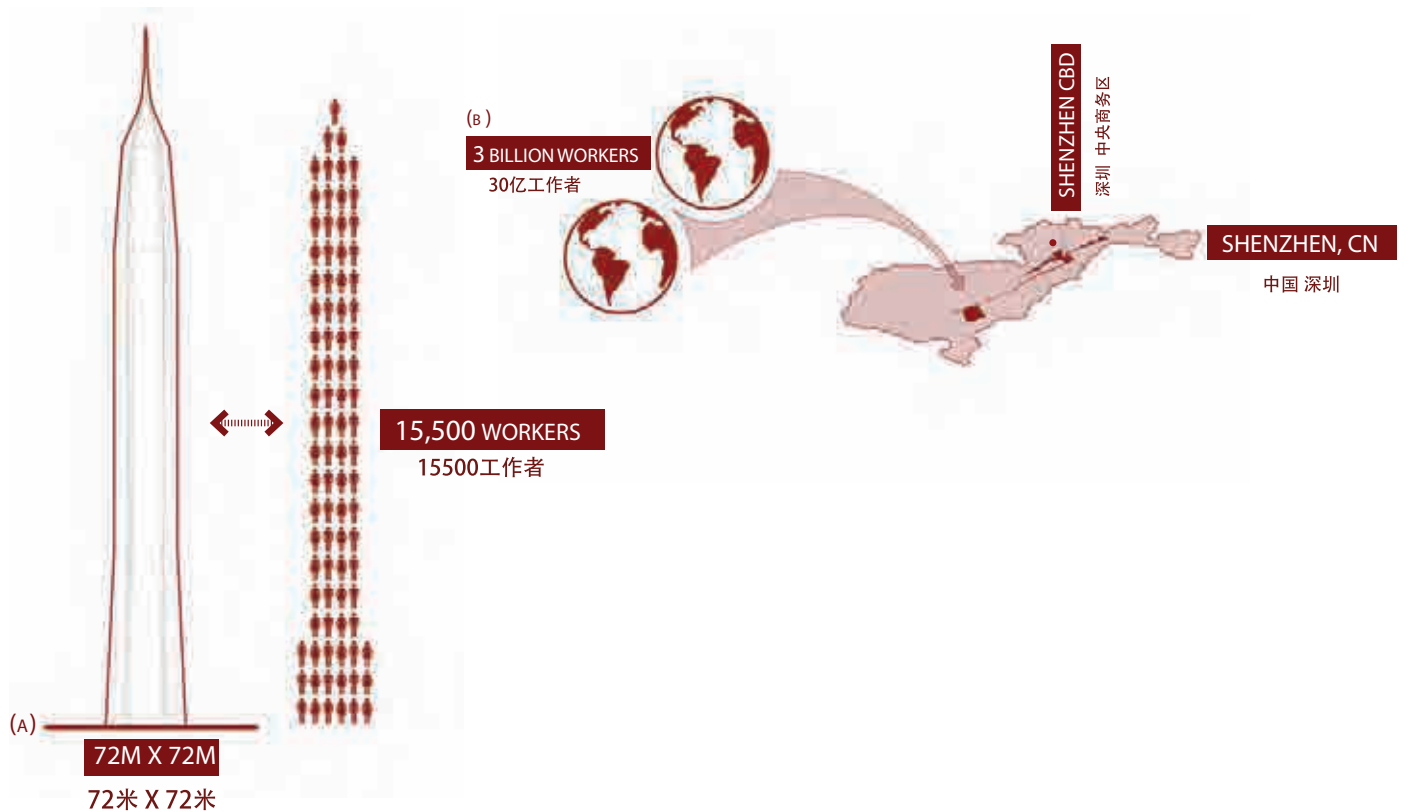


Figure 2.1. (a) PAFC offers 11 square meters per person for 15,500 workers, (b) at this density twice the current global workforce could fit within the borders of Shenzhen. (Source: KPF)  
 图 2.1a 作为一座绝无仅有的办公建筑，平安金融中心为 15,500 工人提供 11 平方米的空间。  
 图 2.1b 两倍于地球上现有工作人员的人数可安置在深圳市辖区内。(来源: KPF 建筑事务所)

nearly half of the remaining land area is reserved as park and nature preserve (Hong Kong Planning Department, 2008).

Hong Kong was home to the densest habitation in human history, the Kowloon Walled City (KWC), an ungoverned settlement of 30,000 residents packed into 4 square meters per person. Known in Cantonese as the “chaotic city of darkness,” the Kowloon Walled City has enjoyed nostalgia as of late. As an urban model, it is fascinating: an agglomeration of individual buildings into one giant entity with skybridges, roof gardens, interwoven mechanical systems, and public space infill. Essentially, and with a touch of irony, it is a precedent for the buildings and cities we are trying to design today.

Now, imagine taking an interconnected building entity such as KWC, and gradually stretching it apart. As the distance between buildings grows, so must the connective tissue holding the entity together. For the connection to remain effective, it must become faster. Hold time constant, but increase our speed, and our perception of space is contracted (see Figure 2.2).

### 那么就引出了第一个问题: 为什么要在此建造这样一个塔楼?

平安金融中心可以被描述为一个“在高层建筑内的交通中转站”。它证实了高层建筑作为可持续发展典范的承诺，其中单个建筑是更大的高密度垂直生态系统的一部分，由公共交通组成的横向网络相连。

城市中心密度增加比城市扩张更能有效地保护土地资源及减少能源消耗。密度、土地利用和能源使用之间的关系是有据可查的。在高收入的社会中，高密度城市香港是年人均能源使用效率最高的城市。虽然香港居民平均使用的能源不到美国人的三分之一，但他们却拥有相同的购买力(世界银行2012年，国际货币基金组织2013年)。而且香港到处高楼林立，其城市土地使用面积不到25%，近一半的剩余土地被保留为公园和自然保护区(香港规划署，2008年)。

香港九龙寨城曾经是人类历史上居住最密集的地方。30,000居民不受约束地挤在人均4平方米的地方。在广东话中称为“黑暗混乱之城”，当时的状况近来对九龙寨城来说就只是可追忆之往事了。作为城市的模型，现在它令人着迷: 单个楼宇由天桥、屋顶花园、交织机电系统以及公共空间连接，集聚成一个巨大的实体。从本质上讲，并带有一丝讽刺意味的是，它是一个我们今天正在努力设计的建筑和城市的先例。

现在，想象一个相互联系的建筑实体，如九龙寨城，并逐步将它延伸拆开。随着楼间距的增加，其间的连接组织也需要扩张。为了保持原有连接的有效性，它必须变得更加迅速。维持时间不变，但速度增加，由此我们对空间的感受也得到了压缩(见图2.2)。

传统的城市关系网建立于空间接近性之上: 可步行、视线以及各类有形的联系。纽约的帝国大厦以及克莱斯勒大厦，就是这样的例子，它们距离彼此仅有15分钟的步行距离。曼哈顿的市中心和市区商业中心之间的距离同样也只有15分钟，虽然它们离得更远些。科技—如纽约地铁和轨道系统—使城市得以覆盖更远的距离。如今城市仍然被视作一个物理上连续的实体。

在不久的将来，就像从纽约市中心坐15分钟的地铁到达市区商业中心一样，你位于香港的同事也可以离开他位于ICC的办公室，通过位于山川和森林之下的隧道，穿越深圳中心的中国大陆边境，直达平安金融中心的基地。

到2017年，你和你的同事就可以乘坐连接珠三角三大城市的XRL地下高速铁路线。这就

The Shenzhen Ping An Finance Center (PAFC) is a transit-integrated, 660-meter-tall building that will occupy a major node in the increasingly connected megacity of Hong Kong/Shenzhen/Guangzhou: home to 120 million people and one-third of China's trade value. PAFC's design symbolizes its owner's image and title – "Ping An" is the combination of the Chinese characters for "peaceful" and "safety," while evoking the entrepreneurial spirit of Shenzhen. Its stretched, needle-like shape is streamlined and notched with continuously tapering corners, for aerodynamic performance, visual effect, and space efficiency.

The CTBUH "In Detail" series provides an in-depth, full-color exploration of some of the most important tall buildings in the world, drawing from the multi-disciplinary expertise of the practitioners directly involved in bringing these buildings to life.

平安金融中心高660米，是一座“枢纽型高层建筑”，位于正逐渐连接起来的新特大城市群（香港/深圳/广州）的重要节点，这个特大城市群坐拥了一亿两千万人口，并占据中国三分之一的贸易值。平安金融中心的设计意图在于象征业主公司的名称和形象——“平安”（汉字中“平”和“安”的组合），同时展现深圳的企业文化。它的针状外形向上延展，四角被削切成流线型，满足空气动力学、视觉效果以及空间利用率的需要。

CTBUH“深入解读”系列是以全彩页的出版形式对全球一些最重要的高层建筑进行深入剖析。其中，直接参与项目的不同领域的专家会参与此系列出版物的撰文与编辑，力求将项目全方位的信息生动呈现给读者。

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