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Ping An: Insurance and Tall Buildings

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Abstract

The Ping An Finance Center in Shenzhen will become one of the most significant tall buildings in China and the world when completed in 2016. As the headquarters of a major insurance company, in a prominent location subject to intensive weather conditions, the preparations to insure Ping An Finance Center were of a scale appropriate to that of the building and its stature. This paper details the determination of the risk profile and the chosen insurance policies undertaken for the project.

Keywords: Insurance; Tall Buildings

Project overview

The Ping An Group has 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.

The project is being built in the Futian District of Shenzhen, a coastal city near Hong Kong that 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.

This is a truly stunning building, equal to the superlatives that describe its home city. PAFC will be 600 meters tall, comprising 460,665 square meters of floor area across 118 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 will sustain an 18.25 percent savings beyond ASHRAE standards, and a 46 percent annual savings in energy costs over a conventionally constructed commercial office building of the same scale.

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.

While the shape of the tower is aesthetically pleasing, it is also highly practical. 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. The design of the tightly-packed core, including double-decker elevators, also contributed to its generous lease spans.

To resist typhoons and high wind speeds, while providing maximum floor space to a tight program, the engineers devised a tube-in-tube system, with five outriggers and seven belt trusses connecting the two tubes, complemented by exterior diagonals. The performance

Figure 1. Ping An Financial Center, Shenzhen, China. (Source: KPF)

of this unique structure is monitored by a 428-sensor structural health monitoring (SHM) system, which communicates vital statistics about the structure from construction through service life.

All of the effort that went into the structural engineering to achieve the great height of the tower becomes obvious when one visits the observation dome at the 585-meter level. The elegance of the "linen" pattern of stainless steel is complemented throughout the height of the tower by stone walls and a unitized glass curtain wall, which is shaded by the steel extrusions, lending a 20 percent improvement to façade performance over local code requirements.

A big point of pride for the team comes from the comprehensive systems thinking that drove every aspect of the project. For example, the electrical power system is optimized for immediate failover, yet provides extra cooling capacity for elevator machines so that, in the event of an evacuation during a power outage, the elevators would still run reliably.

The more mundane day-to-day operations of the building will, once again, hit superlative levels equal to the building's height and structural engineering achievements. PAFC is 46% more energy-efficient than a similarly sized conventional building. Many of the energy budget savings achieved are provided by active systems including free cooling, lower lighting power density design, daylight penetration, free cooling, heat recovery, demand control ventilation and thermal storage design.

All of these initiatives, while laudable on their own, could easily have caused chaos and had mutually deleterious effects without proper coordination. An extensive program of engineering and contractor management was undertaken, with BIM forming the essential "glue" between the disciplines, particularly, electrical, civil, fire protection, and HVAC engineers. Major aspects of the project were pre-visualized using BIM models, including optimizing construction elevator sizes to use ventilation shafts, synchronizing labor shifts to reduce conflicts and waste, and performing as much assembly as possible offsite via robots.

A sophisticated pacing program kept the completion of core walls approximately 20 floors ahead of the floor slabs at any given point, with

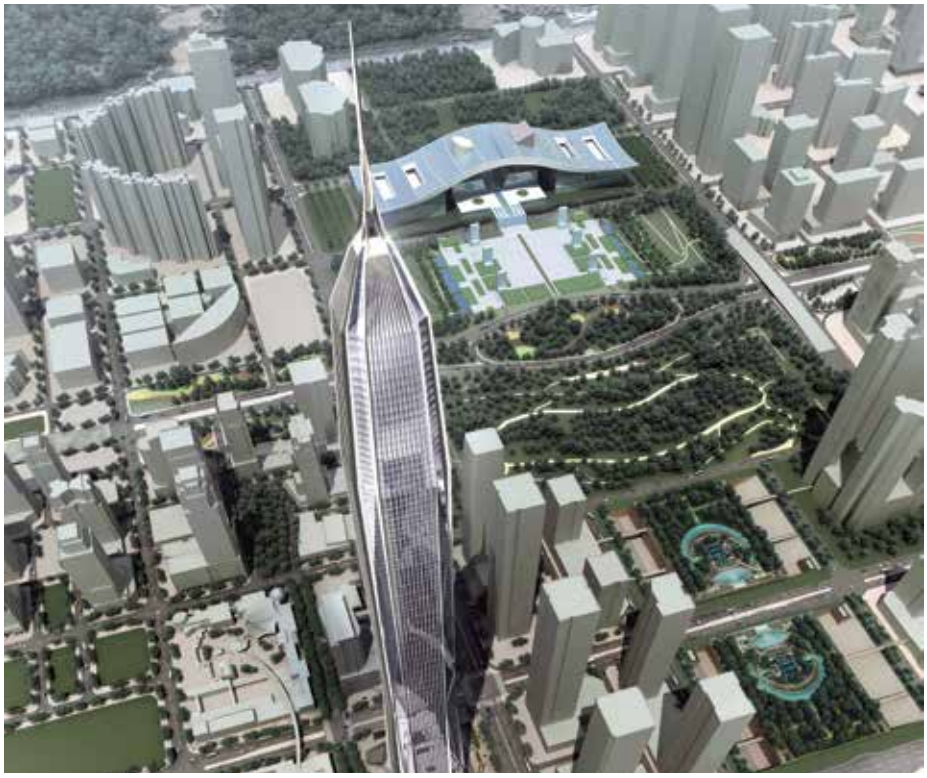

Figure 2. Ping An Financial Center, Shenzhen, China. (Source: KPF)

mid-construction changes to the tower craning program resulting in one floor being erected every four days. The construction team also adopted a vertical welding approach, which also helped collapse the time schedule.

The Ping An Finance Center is an extraordinary project, but the lessons it can teach the tall-building community are universal. From the first iterations of the design, it was clear that competing objectives would provide the guideposts of the design process, and that no space could be wasted. It was also clear that early collaboration and a strict set of hierarchies would be needed in order to deliver a functional building that also inspired those who come into contact with it.

This background is provided so as to guide an understanding of the scale of investment and forethought that has gone into the project, so that the justification of the scale of the insurance program designed to protect it is clear. The project is rendered at a gigantic construction scale, will be built over a long construction period, using complex engineering technologies, a large number of participants, and a wide range of contributing environmental influences. All of these resulted in extensive risk factors that had to be mitigated.

Project Risk Profile

The project is located in Shenzhen, a region with frequent disastrous weather events varying with the seasons. Specifically, there are severe convection events, cold waves, rains with low temperature and heavy fog during spring ; typhoons, thunderstorms and high temperatures in summer; followed by drought, typhoon and cold wave risk during fall; and lastly, drought, strong winds, cold waves, and low temperatures in winter. The risk profile of the project takes account of the likelihood of rainstorms, typhoons, strong winds and thunderstorm.

This risk profile applies to the entire lifecycle of the project, not just operations. For example, during the excavation of foundation pit, there were risks of pit damage caused by the soaking effects of rainstorms, and damage of construction equipment due to typhoons.

The project requires large engineering calculations, complex construction technologies, numerous participant organizations, and extensive cross-coordination. All of these requirements carried increased risks of all kinds of accidents in each stage of construction, including fires, explosions, high-altitude falls, hoisting accidents, collapses, overturning of equipment, electric shock, etc.

Figure 3. Ping An Financial Center, Shenzhen, China. (Source: KPF)

It is the rare construction project that takes place in a vacuum. Like many urban projects, Ping An Finance Center is surrounded by high-rise office, commercial and residential buildings, many of which are currently in use. Several busy in-service roads and the tunnel of Metro Line 1 also operate in the immediate vicinity; various municipal pipelines run underground around the project site as well. Thus, the construction process involves heavy and frequent intersection with the outside world, which may result in accidents causing third-party property loss or personal injury. For example, an abnormal subsidence happening during the excavation of foundation pit may cause wall or foundational cracking, or inclination of a third-party building.

Based on the risk features of the project, the insurance team focused on the following risks: the loss of the project itself, third-party indemnity liability, construction accidents and construction delay.

Worker accidents are included in the General Construction Contract, in which liability is held with the constructor. Thus, personnel safety is managed integrally by the constructor based on the principle of equal rights and obligations.

For construction delay risk, when it considered that the general project arrangement provided ample enough flexible reserved time, and because the risk of delay was relatively low, the team decided not to insure against construction delays.

As for the project's loss and third-party liability, the common available insurance includes construction / all risks and third-party liability insurance. Because the project is insured integrally with total cost, including all the civil construction and installation, and these two construction sections are proceeding simultaneously on staggered schedules, instead of that installation coming in sequence after civil construction has been completed and inspected, the project adopted both the construction / all risks clause and the installation / all risks clause in the insurance scheme. With these two clauses coming into force and combined together, risk to the two construction processes being connected could be seamlessly managed.

Insurance arrangements

In response to the risk characteristics mentioned above, Ping An Property Insurance established a specific working group and exclusively drafted the insurance pattern and clauses for this project. Some of the major insurance arrangements are as follows.

1. According to the risk characteristics of the construction phase, the owner issued insurance policies in different stages on the basis of the actual risk conditions, which affected pricing. The project is considered to be mainly divided into the pile foundation construction stage and the main construction stage. Thus, two insurance policies were issued—"All Risks and Third-Party Liability Insurance of Pile Foundation Construction of Ping An Finance Center" and "All Risks and Third-Party Liability Insurance of Construction & Installation of the Main Part of Ping An Finance Center"—covering the pile foundation stage and the main stage, respectively. Both policies covered the natural disaster risk, accident risk and third-party liability risk during their respective construction periods.
2. Considering that the loss amount of a single accident in this project increases with the development of construction progress, the indemnity limit of a single accident is set at the same level as the overall insured amount, in order to guarantee the holistic shift of the project's late-phase risks.
3. Concerning the high third-party liability risk in this project, the indemnity limit for third parties was increased, so that the indemnity limit per accident and in the aggregate is 1 billion RMB (US$160 million), and the indemnity limit per person, per accident is 0.6 million RMB ($96,639).
4. Due to the advanced and complex technologies involved in the design and construction of the project, the insurance policy especially extends to include:
    - Designer's Risk Clause
    - Professional Fees Clause
    - Extra Charges Extension Clause
    - Airfreight Extension Clause
    - Fire Extinguishing Expenses Clause
    - Ground Subsidence Clause
    - Facilities Clause
    - Site Visit Clause, etc,

The additional clauses were written in order to cover the extra insurable risks outside the main clauses, to the greatest extent possible.

Risk controls after underwriting insurance

Ping An Property Insurance is the insurer of all construction risks and third-party liability for the PAFC, while Ping An Property Co., Ltd. is the construction management company

These two internal companies have made full use of their advantages. In the case of Ping An Property Insurance, these advantages include abundant experience in engineering insurance and risk management data. In the case of Ping An Property Co., Ltd., the project benefits from mature management experience in investment, construction and operation of real estate. These are combined with the construction management practice of PAFC in order to develop specific risk controls during the construction period of this megatall building, from the perspectives of engineering design, construction technology, construction machinery and weather-driven disasters. These efforts helped the project team to timely detect potential risks during construction, as well as reduce accidents, in order to achieve the ultimate goal of a "win-win" situation for both the insurant and the insurer.

Specific risk service is conducted for this project. At the beginning of construction in 2012, the Risk Engineering Management Department of Ping An Property Insurance, acting as the risk service provider of the insurant, established a professional risk control team in cooperation with the Engineering Management Department of the constructor, so that risk controls could be implemented through the whole construction process. Since the project stands near the existing Ping An Property Insurance Headquarters, the team members included the core force from the head office, a particular advantage of location. The everyday process of construction was discernible to every team member, so that the risk conditions and risk control arrangement of all the construction stages could be optimally and directly controlled.

The risk control team created an analytical model of the risks of each stage of the project. The model was augmented and updated as the risk control team inspected progress during each construction stage. This was complemented by on-site communications and explanations to all the constructors about the potential risks. In addition, a formal written report was issued to provide suggestions on risk reduction. This effort functioned as a supplement to the on-site construction supervisor, so that more construction risk could be avoided. For example, as the top finished floor ascended higher, the amount of damage that could result from a high-altitude fall to vehicles and pedestrians in the vicinity increased, as did the potential severity of injury, thus resulting in higher risks. After inspection, the risk control staff developed measures for expanding the protective sheds and fences around the site, which had the effect of eliminating almost all of this type of third-party liability accident.

The risk control team of the insurer, acting as the insurance service provider, also invited experts in supertall and megatall building construction risk from international reinsurers, who conducted risk examinations and safety training for the construction managers on site. With the help of this advanced, internationally experienced team, the risk management of this project tended to be more comprehensive and robust than on a typical project in the area.

During the process, the risk control team focused its research on some important fields of risk and completed tracking and supervision of those fields of risk. These included the construction of foundation pit, the effects of the typhoon and rainy season, fire risk in winter, safety controls of workers and the third-party liability for loss. The research was fruitful to the degree that it was compiled into a technical guide, which received an Annual Excellence Award from the Shenzhen Financial Council, as well as public recognition.

As an indicator of the success of this risk management approach, as of this writing there have been no major reportable compensation events, nor any accidents causing personal injury.

The enlightenment and value of the Ping An Finance Centre's construction risks and insurance

The most significant differentiator of the project's insurance scheme was the use of different insured strategies based on the different characteristics of risk in different phases. It provides a reference for other supertall and megatall buildings; a wealth of support data is available for this cause.

Figure 4. Ping An Financial Center, Shenzhen, China. (Source: KPF)

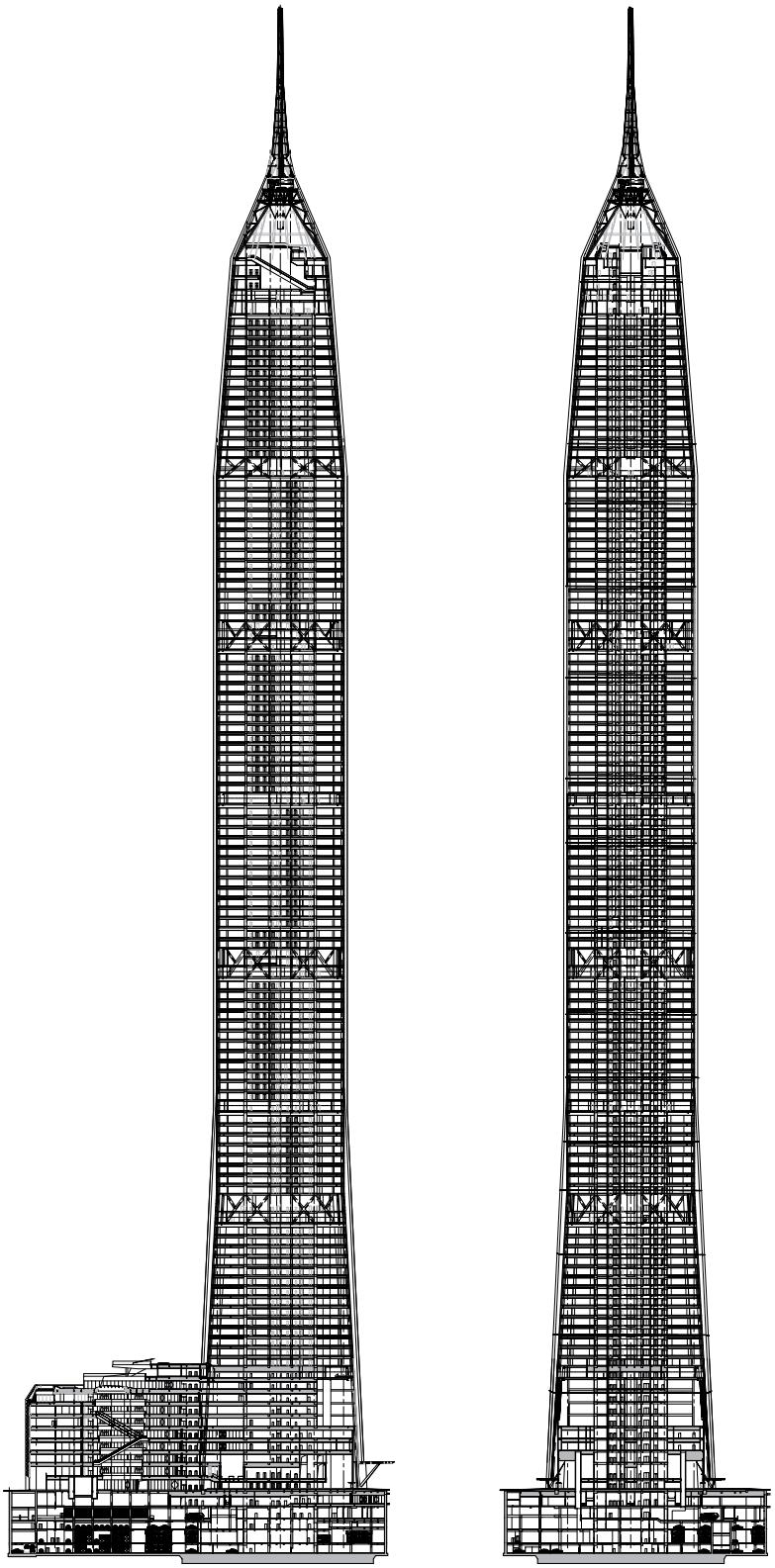

Figure 5. Ping An Financial Center, Shenzhen, China. (Source: KPF)

Meanwhile, regarding the result and effect of the risk control management, the value of risk control during the insurance period was very high, significantly reducing the potential frequency and damage degree of the accidents. This too can provide a valuable example for other large-scale construction projects.

- Insured Amount:
  - Part 1 (Material Damage)
    - Project Costs: RMB 7 billion ($1.1 billion)
    - Professional Fees: RMB 50 million ($8 million) per accident limit
    - Costs of cleaning debris: RMB 2 billion ($320 million) per accident limit
  - Part 2 (Third-Party Liability)
    - Indemnity limit per accident and aggregate amount during the insurance period: RMB 1 billion ($161 million)
    - Indemnity limit per person per accident: RMB 0.6 million ($96,639)
    - Per accident: one accident or a series of accidents caused by one event
- Insurance Period:
  - Construction Period: approximately 57 months, from 0:00, August 21st, 2011 to 24:00, May 25th, 2016
  - Guarantee Period: 12 months, from May 26th, 2016 to 24:00, May 25th, 2017
- Premium Rate: 0.293%
- Premium: RMB 20,510,000.00 ($3,281,600)
- Deductible:
  - Material Damage:
    1. Deductible per accident of earthquake or tsunami is RMB 3 million ($480,000) or 15% of the loss amount, whichever is greater.
    2. Deductible per accident of rainstorm, flood, storm wind or typhoon is RMB 1 million ($161,000) or 10% of the loss amount, whichever is greater.
    3. Deductible per accident of fire or explosion is RMB 1 million ($161,000) or 10% of the loss amount, whichever is greater.
    4. Deductible per accident of other risks is RMB 0.5 million ($80,000) or 5% of the loss amount, whichever is greater.
  - Third-Party Liability:
    1. Property Part:
       - Vibration, Removal or Weakening of Support: Deductible per accident is RMB 0.5 million ($80,000) or 10% of the loss amount, whichever is greater.
       - Others: Deductible per accident is RMB 0.2 million or 5% of the loss amount, whichever is greater.
    2. Personal Part: No deductible

Extension Clause:

Additional clauses applied to Part 1 (material damage)

1. Automatic Reinstatement of Sum Insured Clause
2. Existing Structures and/or Surrounding Property Clause (The indemnity limit per accident is RMB 50 million ($8 million), the aggregate indemnity limit is RMB 1 billion ($160 million))
3. Inland Transit Clause (the indemnity limit is RMB 50 billion ($8 billion)
4. Marine Cargo Insurance (50/50) Clause
5. Premium Adjustment Clause
6. Indemnity Basis Clause
7. Contract Work Takeover Extension Clause
8. Laying Pipelines, Ducts and Cables Clause
9. Off-site Storage Clause (indemnity limit per accident per spot : RMB 50 million ($8 million))
10. Plans and Documents Clause (indemnity limit per accident : RMB 10 million ($1.6 million))
11. Professional Fees Clause (indemnity limit per accident: RMB 50 million ($8 million))
12. Public Authorities Clause
13. Removal of Debris Clause (indemnity limit per accident: RMB 2 billion ($320 million))
14. Strike, Riots, Civil Commotion Clause
15. Extra Charges Clause (indemnity limit per time: RMB 50 million ($8 million))
16. Ground Subsidence Clause
17. Underground Cables, Pipes and other Facilities Clause (indemnity limit is RMB 20 million ($3.2 million) per accident, deductible per accident is RMB 10,000 ($1,600) or 10% of the loss amount, whichever is higher.
18. Unexploded Bombs Clause
19. Strike clause
20. Maintenance Visits Clause (12 months, the same as the policy period)
21. Time Adjustment Clause (72 hours)
22. Automatic Capital Additions Clause (10%)
23. Designer's Risk Clause (indemnity limit per accident: RMB 1 billion ($160 million))
24. Fire Extinguishing Expenses Clause A (indemnity limit per accident: 20% of the loss amount)
25. Airfreight Clause A (indemnity limit per accident: 10% of the loss amount)
26. Site Visits Clause
27. Testing of Machinery and Installations Clause B
28. Off-site Assembly Clause

Additional clauses applied to Part 2 (third-party liability)

- Cross Liability Clause
- Vibration, Removal or Weakening of Support Clause (indemnity limit is RMB 50 million ($8 million) per accident; deductible per accident is RMB 0.5 million ($80,000) or 10% of the loss amount, whichever is higher.)
- Emergency Medical Expenses Clause

Additional clauses applied to the entire insurance contract

- Waiver and Estoppel Clause
- Precautionary Measures Clause
- Errors and Omissions Clause
- Non-Survey Clause
- Co-insurer Clause
- Payment on Account Clause
- Sixty Days' Cancellation Claus
- Automatic Policy Deferred Clause
- Disputes Resolution Clause

Conclusion

As the home office of one of China's most significant financial companies, and one of the most prominent tall buildings in the country, if not the world, the risk profile of Ping An Finance Center was high indeed. In the end, the project team is satisfied that this building is well-covered by the policies developed and described in this paper, and believes that the policy not only reflects the level of investment in the building, but can serve as a guidepost for future developers and insurers of megatall buildings around the world.

Figure 6. Ping An Financial Center, Shenzhen, China. (Source: KPF)