THE HONG KONG INSTITUTE OF SURVEYORS

PROCEEDINGS

HKIS Annual Conference 2008

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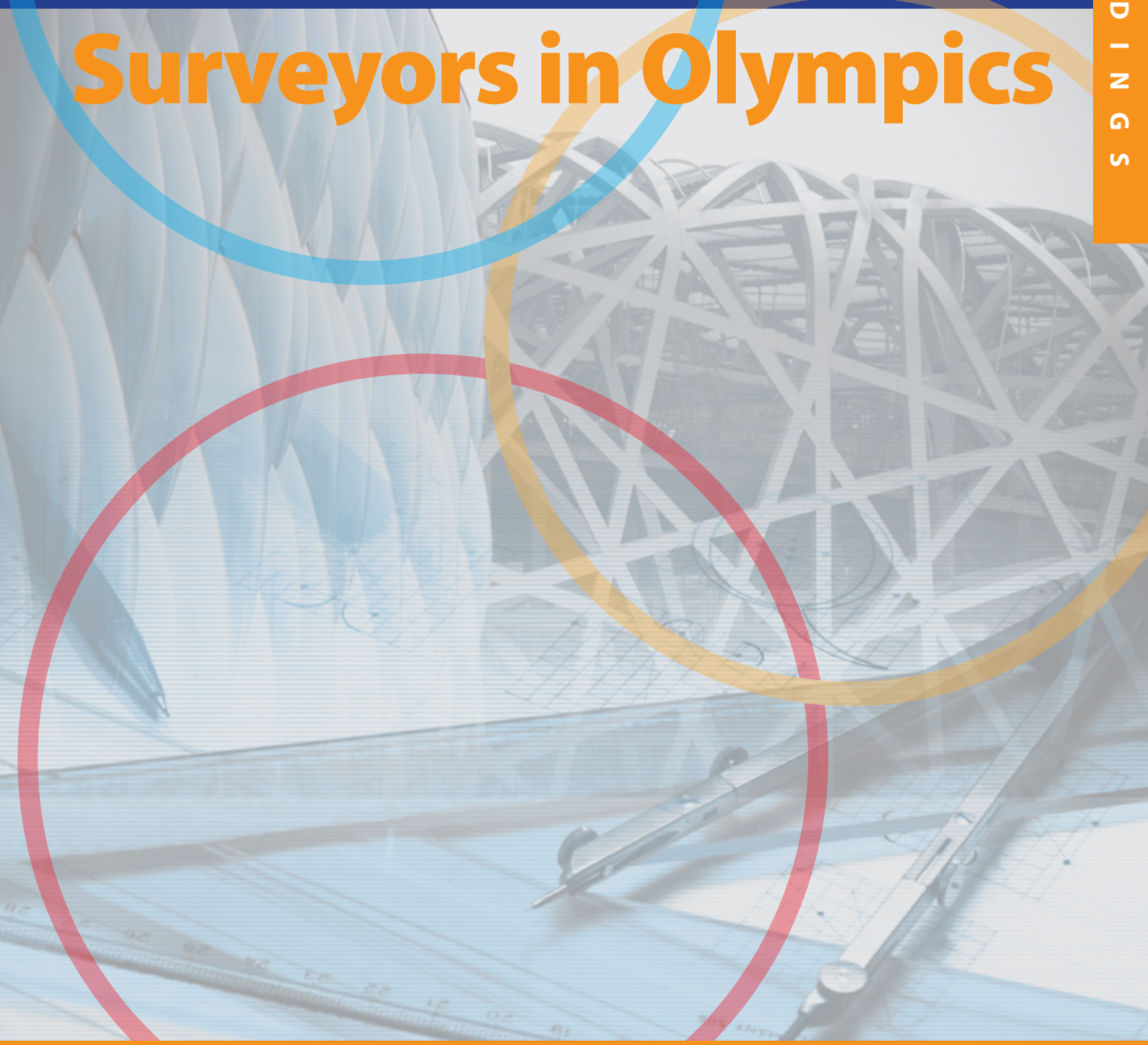
Surveyors in Olympics



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Message from the Guest of Honour

Looking forward to the opening of the Beijing 2008 Olympic Games, people in Hong Kong and around the world are all sharing the joy and excitement of this global event. At this historic moment, it is timely for the Hong Kong Institute of Surveyors (HKIS) to choose "Surveyors in Olympics" as the theme of its Annual Conference this year.

I am delighted and proud to learn that Hong Kong surveyors have seized this invaluable opportunity to contribute their expertise to the first-ever Olympic event to be held in China. Our surveyors have taken part in the planning and construction of the National Stadium, Water Cube, new China Central Television Building, Capital Terminal Airport Terminal 3, etc. Not only being world-class and monumental developments, these constructions also reflect Hong Kong professionals' success in meeting all the challenges arising from the difference in local practices and laws as well as their excellent partnership with Mainland practitioners.

I am confident that the "Surveyors in Olympics" Conference will provide an excellent and cross-disciplinary platform for surveying and construction related professionals to share their experience, knowledge and visions about Olympic developments. I am sure Hong Kong surveyors will continuously rise to the challenge and grasp opportunities from enhanced cross-boundary professional collaboration.

On this special occasion, I have pleasure to wish the HKIS Annual Conference 2008 every success.

Mrs. Carrie LAM, JP
Secretary for Development, HKSARG

It is my great pleasure to welcome you all to the Hong Kong Institute of Surveyors Annual Conference 2008. We are especially delighted to have Mrs. Carrie Lam, Secretary for Development of the HKSAR Government, to give us an opening keynote speech to this meaningful annual event.

The 2008 Olympic Games will be the first Games to be held in PRC, and it will also be the first time for Hong Kong to co-host this major sports event in the world. Surveyors and other real estate professionals in Hong Kong have opportunities to participate directly in the preparation of the event, such as by providing professional expertise in relation to project management, construction, building design, cost control, etc.. We also have indirect input on aspects including town planning and real estate market and land advisories. The Games therefore brings new challenges and valuable opportunities to our industry.

The HKIS Annual Conference 2008 will provide a platform for better sharing of experience and latest advancement in our industry. Local and overseas speakers will be invited to share their experiences and views on their involvements in Olympics which range from quantity and land surveying, risk and opportunity management, engineering to impacts on the real estate market. I am confident you will find the Conference interesting and informative.

I would like to express my gratitude to our honourable guests and speakers for their contributions to the conference, and thanks to all our members and participants for their support of the Hong Kong Institute of Surveyors.

I wish the Beijing 2008 Olympic Games a great success.

Mr. YU Kam-hung
President
The Hong Kong Institute of Surveyors

Time	Topics	Speakers
0815 – 0855	Registration	
0900 – 0910	Welcome Speech	Mr. YU Kam Hung *President,* *The Hong Kong Institute of Surveyors*
0910 – 0925	Opening Keynote Speech	Mrs. Carrie LAM, JP *Secretary for Development,* *HKSARG*
0930 – 0955	Beijing Real Estate Market - Pre and Post the Olympic Games	Mr. GAO Shibin *Managing Director, Head of China,* *Standard Chartered - Istithmar Real Estate Advisory Services (Hong Kong) Limited*
0955 – 1020	Engineering of Beijing Olympics – From Airport to Venues and Broadcasting	Mr. Ronald LI *Senior Engineer,* *Ove Arup & Partners Hong Kong Limited*
1020 – 1035	Q & A	
1035 – 1110	Coffee Break	
1110 – 1135	Effective Risk and Opportunity Management using a Multimedia Approach	Prof. Martin LOOSEMORE *Professor of Construction Management and Associate Dean, University of New South Wales, Sydney, Australia*
1135 – 1200	Cost Management in iconic buildings: the new China Central Television (CCTV) Building	Mr. Kenneth POON *Managing Director,* *Davis Langdon & Seah Hong Kong Limited*
1200 – 1225	Cost Management in Sydney Olympic projects	Mr. Niall Mc SWEENEY *Group Director,* *Page Kirkland Group*
1225 – 1245	Q & A	
1245 – 1435	Lunch	
1435 – 1500	Surveying Technologies and Applications in the Construction of the National Stadium (Bird's Nest)	Prof. WANG Yan Min *Professor, Department of Surveying and Mapping Engineering, Beijing University of Civil Engineering & Architecture, PRC*
1500 – 1525	Quantity Surveying Experience in Beijing 2008 Olympics and Mainland Projects	Mr. Stephen LAI *Managing Director,* *Rider Levett Bucknall*
1525 – 1600	Coffee Break	
1600 – 1625	Cost Management on Fast Track Olympic Project - Can it be done	Mr. Escode YUEN *Managing Director,* *KPK Quantity Surveyors (HK) Ltd.* Mr. Edward TANG *Director,* *KPK Quantity Surveyors (HK) Ltd.*
1625 – 1650	Q & A	
1650 – 1655	Closing Remarks	
1700	End of Conference	

Biography

Mr. Gao Shibin is the Managing Director, Head of China for Standard Chartered-Istithmar Real Estate Fund Management Limited. Before joining the fund management firm in June 2008, Shibin was a National Director of Jones Lang LaSalle, in charge of its North China investment advisory services. His expertise covers asset management, investment sale/disposal, feasibility study/financial analysis, real estate development and financing.

Shibin has more than 10 years professional experience in UK, Hong Kong, Canada and China. He joined Jones Lang LaSalle Beijing in 2003, and completed several high profile deals in the market. For example, the first Beijing CBD commercial site disposal with public tender in 2004, and the first Beijing income-generating commercial property sale between two institutional investors (Goldman Sachs and GIC) in 2005.

In 2007, Shibin led the Jones Lang LaSalle investment team in closing two major transactions, one is an office sale in Beijing, the other is a development partnership in the city of Qingdao, where US Carlyle Group set up a JV with a local developer. In 2008, Shibin orchestrated the successful sale of Motorola Tower, a Grade A office building along Chang'An Avenue in Beijing.

Shibin is a Member of Royal Institution of Chartered Surveyors. He earned his BSc in Civil Engineering and MSc in Building Economics from Tsinghua University, and PhD in Property Development and Financing, from University of Manchester, UK.

Beijing Real Estate Market - Pre and Post the Olympic Games

Mr. GAO Shibin
Managing Director, Head of China
Standard Chartered-Istithmar Real Estate Advisory Services (Hong Kong) Limited

Beijing's hosting of the Olympic Games has had and will have significant impacts on its real estate market. These impacts can be direct, such as growth in tourism and Olympics related-business demand for hotel, retail facilities and office buildings, but should be largely indirect and experienced over a longer timeframe: improvements to the city infrastructure and heightened awareness of environmental and sustainable development issues.

- Beijing has undergone a dramatic transformation in the past 6 years building up to the Olympic Games including changes in the city's real estate market
- Fundamental factors have been driving Beijing's continued development, and the Olympic Games is serving to substantially accelerate this process
- Olympic Games will create a legacy for Beijing, which will be profound as the city has invested in creating a cleaner, more pleasant place to live and do business
- The key demand forces underpinning real estate growth in Beijing will be bolstered by the positive legacy of the Olympic Games, driving an optimistic outlook across all sectors

Transformation of the Beijing Real Estate Market

The transformation of Beijing's built environment is not only being pushed by government initiatives, but also by private investment. Many of the new projects are recognized by the government as key pieces of their effort to make Beijing a more impressive and modern city. As such, their completion ahead of the Olympic Games has been guided by the government's approval of investment and construction plans. The result is that in 2007 and 2008, Beijing's real estate market is undergoing an expansion of unprecedented proportions. Focusing on high–end development, in these two years, the office, retail, and residential markets are expanding by 52%, 89% and 58%, respectively. This growth is coming of a relatively small base, especially in the top standard office and retail markets. Several overriding themes have emerged:

Higher Quality - Prior to 2007, Beijing suffered from a shortage of international quality office and retail space. Occupancy levels in the city's first class buildings, such as China World Trade Centre, had not dipped below 90% for years, and large space occupiers were forced to adjust their Beijing expansion plans due to this lack of suitable space. The same is true for retail as international brands were eager to expand into new areas of Beijing, but they could not locate suitable space outside of Beijing's few, established shopping centers. In 2007 and 2008, new options and new opportunities are available for these occupiers as 10 new Grade A office buildings are completed and 11 new, wholly owned international standard shopping centers enter the market. Tenants in need of expansion space now have several high-quality options to choose from, and international retailers are actively expanding, with some brands, such as Zara, expanding into multiple new locations in less than one year's time.

Strong Demand - In response to the influx of new supply that entered the Beijing retail and office markets in 2007, it was anticipated that vacancy rates in these sectors would rise, and rents would consequently drop. Vacancy rates did rise slightly, but there was no impact on the average rental levels. In fact, in the office market, average rental rose by 16% y-o-y. Increased quality, as discussed above, is one reason, and another important reason is extremely strong, pent-up demand. The experience of Seasons Place in western Beijing's Finance Street exemplifies this phenomenon. The shopping center, despite being located in a new area for luxury retailing, opened 100% pre-leased with commitments from some of Asia's most selective retailers, including Lane Crawford from Hong Kong.

Real Estate Legacy-Both Temporary and Permanent

The direct impact that the Olympic Games has on the Beijing real estate market will be both limited and temporary. Many of the direct effects of the ongoing supply boom are projected to be felt most strongly in the months following the event, with slight downward pressure on overall average rent for both the office and retail markets. Post–Olympic Games demand will, however, continue to be strong, especially in the office market, as tenants take advantage of lower rents resulting from the completion of new supply to negotiate more competitive deals. In the retail market, demand from retailers is also expected to maintain its momentum, following a period of stabilization in

2008. After the Olympic Games it is projected that retailers' key focus will shift from expansion to raising their performance in existing outlets and obtaining a better grasp of their evolving consumer base. Retailers will, however, continue to seek to establish a strong, diverse presence in the city, driving especially strong demand for quality venues in less saturated areas and stand out projects in established retail zones. The less tangible aspects of the Olympic Games, such as greater international ties, increased transparency, higher emphasis on low-polluting industries, and the creation of new commercial areas will have a permanent, positive impact on the development of Beijing's real estate industry. The city's economy will likely maintain growth on the back of these benefits, and companies and retailers are projected to continue their expansion. The years 2009 and 2010 will be important with regards to absorbing 2007 and 2008's residual new supply, but in general, the outlook for the Beijing real estate market after the Olympic Games is for greater stability and a continued, high level of development activity.

The Olympic Games will have different implications for each real estate sector of Beijing:

Office -

Pre-Olympics Build Up

The Beijing office market is undergoing a major transformation in the roughly 20-month build up to the Olympic Games. Approximately 2.8 million sqm of new grade A and grade B space is entering the market, and overall, new buildings are of a much higher quality than what previously existed in Beijing. Demand for new space has exceeded expectations with record levels of absorption in 2007. This strong demand, combined with the increasing quality of new developments, served to push rental growth in 2007 as the market average increased 16 % y-o-y as of end-2007. The most significant impact that the Olympic Games had on these shifting market dynamics has resulted from the building moratorium anticipated for July, and August, and September 2008. In response, many developers scheduled developments to have completion before July, creating an inordinate amount of new supply in 2007 and 2008.

Post-Olympics Legacy

The overall market vacancy is forecasted to rise to 19.5% by end-2008, meaning that 2009 will likely commence with higher amounts of unoccupied space and slightly lower rents. However, less new supply is expected for 2010 and 2011, indicating that the market will have several years to absorb the space left from the current supply boom, and one should anticipate that vacancy levels in the overall market will return to a more typical level of 13%-15%. The lasting legacy of the ongoing supply boom will be an overall upgrade in the sophistication of the Beijing office market. Older, grade B buildings will be especially impacted by this transformation, and they will potentially have to either reduce rents or undergo refurbishment to ensure their competitiveness.

Retail –

Pre-Olympics Build Up

Prior to 2007, international retail brands were eager to establish a strong presence in Beijing, but they were constricted by a lack of suitable venues. In 2007, four new international quality shopping centres were completed, and in 2008, an additional eleven high-end projects are anticipated. Pre-leasing is extremely strong across the market as retailers move to establish a broad, geographically diverse presence across Beijing. The Olympic Games and the expectation that more than 500,000 international visitors will descend on the city, along with untold numbers of new, domestic customers, has accelerated this expansion. New retailing areas are emerging with unproven consumer demand, but retailers continue to be highly interested as demographic growth is both dynamic and widespread across Beijing's large urban area. New high-end shopping venues in Finance Street and the Qianmen area exemplify the increase of quality retail space in less traditional locations.

Post-Olympics Legacy

Many investors and developers look at the current market and see challenging conditions: massive new supply, tense competition for the most desirable tenants, increasing vacancy levels across the market and anticipated downward pressure on rentals. It is critical, however, that one evaluates each project on an individual basis. In such a competitive market, some projects will inevitably struggle, but those projects that are well-differentiated and positioned will continue

Beijing Real Estate Market - Pre and Post the Olympic Games

to enjoy strong pre-leasing and higher footfalls. In the strategic planning process, it is especially important that developers base their strategic decisions on demographic and consumption conditions in their specific area of Beijing's diverse market. Some developers boldly aim for luxury positioning, only to find that there are no luxury shoppers in the vicinity of their project, and that they are not effectively differentiated from more established venues. Looking at the big picture, the outlook is optimistic. By 2020, it is roughly projected that Beijing's population will exceed 20 million, and that average per capita disposable income will increase roughly five times to over RMB 100,000 per annum.

Residential –

Pre-Olympics Build Up

Growth in the scale of Beijing's luxury residential market has been rapid and sustained. Sales price growth during this expansion has been steady and more consistent than one sees in more volatile markets such as Guangzhou and Shenzhen. In 2007, 3,370 new units entered the market, and 10,361 more units are anticipated for completion in 2008. New projects are of an increasingly high quality and sales prices are reaching new heights. This transformation was driven by pre-sales in projects such as Kingland and Park Hyatt residences. Both projects were asking upwards of RMB 45,000 per sqm, which drove Beijing homebuyers and investors to adjust how they view the price ceiling in the high-end market. Luxury projects continue to be focused primarily in eastern Beijing, especially the CBD, Sanlitun area, and Chaoyang Park area. We are, however, starting to see increasing quality and sales prices in southern and western Beijing as well.

Post-Olympics legacy

The influx of a projected 10,361 new units in 2008, combined with dropping transaction volumes thus far in 2008, suggest that we will see price stabilization by 2008. Buyers are becoming increasingly sophisticated and cautious when they seek investment opportunities in the residential market. This is a healthy change in the market as during the boom years of 2005 - 2007, buyers, confident in the potential for capital appreciation, were much less thorough in how they evaluated properties. As buyers become more selective, developer reputation, location, construction quality, and supporting facilities will all become increasingly important criteria. Looking at those projects that are currently enjoying strong pre-sales in Beijing, it is clear that there is still demand at the top end of the market, but it is focused on projects that stand out— whether it be through architectural design, exceptional location, or sustainable construction.

(Acknowledgement: This abstract is based on Jones Lang LaSalle's white paper "Accelerating Towards a New Beijing", 2008)

Biography

Mr. Ronald Li has over 20 years of experience in both building and civil projects. On building side, he has obtained MIStructE status over 15 years and he was involved in buildings from low to high-rise such as office, hotel, exhibition hall, commercial and residential towers with different varieties of building materials such as reinforced and prestressed concrete, structural steel, timber and masonry.

On civil side, he was involved in large scale projects including railway stations, depots and viaducts, highway bridges, footbridges, transport interchange and drainage and utility diversions.

After obtaining his Master Degree in Structural Steel Design from Imperial College, Mr. Li received one year of training in Arup's London head office before returning to Arup Hong Kong. He was the Project Engineer for the KCRC New Headquarters Building and associated railway works at Fo Tan and Nina Tower at Tsuen Wan, a major commercial development that dominate the skyline building in Hong Kong and Project Coordinator for the Ground Transportation Centre and Approach Roads at the Chek Lap Kok Airport. For the Nina Tower project, he was heavily involved in scheming of different options of both structural form and material of this 320m tall building. In the recent years, he was involved in supervision of large scale civil structure projects such as Tin Shui Wai Station of KCR West Rail and Deep Bay Link (Northern Section) of the new HKSAR/China vehicular border crossing. He has extensive experience in both design and construction of large scale projects and is particularly conversant in structural steelwork. Mr Li was also the representative of RSE and AP for different projects and T5 supervisory personnel for the KCRC West Rail Project.

Currently Mr Li is the Design Liaison Engineer for the China Central Television (CCTV) New Headquarters project in Beijing who is resident on site coordinating the design and construction of this iconic building in the world.

Qualifications

- Bachelor of Science (Civil Engineering) Queen Mary College, U of London (1986)
- Master of Science (Civil Engineering) Imperial College, University of London (1987)
- Diploma of Imperial College (Structural Steel Design), University of London (1987)
- Member, Institution of Structural Engineers (1992)
- Chartered Engineer, Engineering Council, UK (1992)
- Member, Hong Kong Institution of Engineers (Structural Division) (1997)
- Registered Professional Engineer (Structural), Hong Kong Institution of Engineers (1998)
- Member, Institution of Civil Engineers (2002)
- Class 1 Registered Structural Engineer, PRC (2008)

Engineering of Beijing Olympics -
From Airport to Venues and Broadcasting

Mr. Ronald LI
Senior Engineer
Ove Arup & Partners Hong Kong Limited

Beijing Capital International Airport Terminal 3

Gateway to the Games

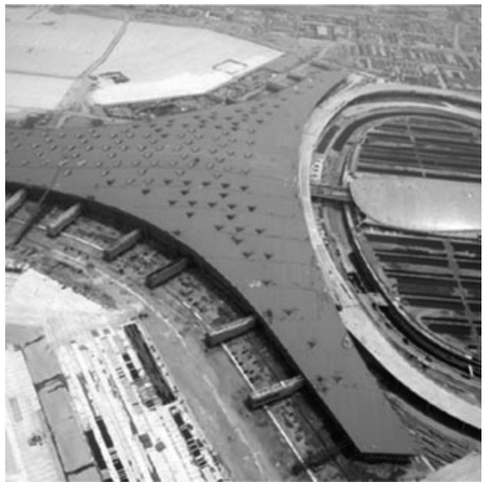
Visitors flying to the 2008 Olympic Games will arrive at what will be the world's most advanced airport. Beijing Airport's Terminal 3 will set global standards for positive passenger experience, operational efficiency and sustainability, providing a modern gateway to China and a new design icon for the city of Beijing.

The expansion of Beijing's airport, currently the busiest in China, is being driven by the country's economic growth following entry to the World Trade Organisation, in addition to the dramatic increase in passenger numbers generated by the 2008 Beijing Olympic Games. The addition of Terminal 3 and a third runway will increase the airport's capacity from 35 million to 90 million passengers per year by 2012.

The striking terminal building has been designed to be as welcoming as possible with few changes of level, short distances between areas and quick transfer times. The lighting scheme means that passengers will be bathed in shades of red and gold as they move through the lofty building.

Terminal 3 will be one of the world's most sustainable airport terminal buildings. Its soaring, aerodynamic roof incorporates south-east orientated skylights to make the most of natural heat and available light. Solar panels will be a heat source and dual-water systems will preserve water. The carbon footprint of the building has been reduced by minimising energy consumption with integrated environmental control systems, incorporating shading into the design to reduce the need for cooling, and combining natural daylight with intelligent use of artificial lighting.

The modular structural form at Terminal 3 in Beijing has enabled a very fast construction programme. It has taken just over four years from the start of the design work to opening in early 2008.



Client
Beijing Capital International Airport

Arup Scope of Work
Structural, mechanical, electrical and public health engineering, building physics, IT/comms, airport systems, fire engineering, vertical transportation, façade, acoustics, day-lighting studies.

Gross Floor Area
930,000m^2 (excluding basement)

Current Capacity of Airport
35 million passengers per year

Capacity of Airport by 2012
90 million passengers per year

Design Consortium
NFA joint-venture team comprising:
NACO, Foster and Partners, Arup

Local Design Institute
Beijing Institute of Architectural Design

Planned Start Operations
January 2008

National Stadium (Bird's Nest)

The Centrepiece of Beijing Olympics

The National Stadium will host the opening and closing ceremonies of the 29th Olympiad, as well as athletic track and field events. On completion it will have a capacity of 91,000 seats, including 11,000 temporary seats for the duration of the Games.

The Stadium is located in the Olympic Green, the focal point for the Beijing Games. The building's vast scale and dramatic form will create a new icon for China and the City of Beijing. The circular form of the Stadium represents Heaven, while the adjacent square form of the National Aquatics Centre, also design-engineered by Arup, is a reflection of the Chinese symbol for Earth.

Although the structural form of the Stadium is popularly described as a 'bird's nest', the pattern was initially inspired by Chinese style 'crazed' pottery, typically found in Beijing markets, and the randomness of the natural world. Although seemingly arbitrary, the pattern abides by complex rules from which Arup was able to define the geometry. Without this, the Stadium would be impossible to build.

To reduce costs, the outside of the Stadium needed to have minimum surface area while also being able to contain the entire structure; therefore, Arup designed the seating bowl first and then the outside façade to wrap around it. The bowl is designed to optimise spectator sight lines and minimise distance between seats and the field where action takes place.

The Stadium is located in one of the world's most seismic zones and therefore needs to withstand major earthquakes. Arup used advanced computer analysis to test the structure under earthquake of different intensity and direction.

The National Stadium is designed in such a way that the spectator will be left wondering which aspects of the structure are functional and which have been included for appearance alone. The Stadium combines a sense of chaos with one of order.

Client
National Stadium Co Ltd

Arup Scope of Work
Full multidisciplinary service including sports architecture, structural, mechanical, electrical and public health engineering, acoustics, fire strategy, sports lighting and wind engineering

Seating Capacity
91,000 including 11,000 temporary seats for the Games

Gross Floor Area
254,600m^2

Height
Maximum 69.2m (266.4ft) above pitch level

Design Consortium
Arup, Herzog & De Meuron Architekten
AG, China Architecture Design & Research Group

Completion Date
Early 2008

Engineering of Beijing Olympics -
From Airport to Venues and Broadcasting

National Aquatics Centre (Water Cube)

Sustainable Blue Bubbles

The National Aquatics Centre, also known as the 'Water Cube', will be one of the most dramatic and exciting sporting venues for the Beijing Olympic Games in 2008. Enclosed within the blue bubble walls are five swimming pools, including a wave machine and rides and a restaurant, along with seating and facilities for 17,000 spectators.

The Water Cube is located in the Olympic Green, the focal point for the Beijing Games. The design was voted as the clear winner by the people of China in a competition for their favourite design. The square shape of the Water Cube is a reflection of the Chinese symbol for Earth, while the adjacent circular form of the National Stadium, also design-engineered by Arup, represents Heaven.

The form of the Aquatics Centre was inspired by the natural formation of soap bubbles. Arup's engineers realised that a structure based on this unique geometry would be highly repetitive and buildable while appearing organic and random. The result is a very simple regular building form, with very complex geometry in the façade which is used for beautiful effect.

The highly sustainable structure is clad with translucent ETFE (ethyl tetra fluoro ethylene), a tough, recyclable material that weighs just one percent of an equivalent sized glass panel. The bubble cladding of the Aquatics Centre lets in more light than glass and thoroughly cleans itself with every rain shower. It is also a better insulator than glass, and is much more resistant to the weathering effects of sunlight.

Although it appears fragile, the skin and structural form is very robust and is ideally suited to the seismic conditions found in Beijing. In fact, it is so strong that Arup's computer models show that the structure can be placed on its end and still maintain its shape.

The Water Cube is specifically designed to act as a greenhouse. This allows high levels of natural daylight into the building and, as swimming pools require a lot of heating, harnesses the power of the sun to passively heat the building and pool water. Arup has estimated that this sustainable concept has the potential to reduce the energy consumption of the leisure pool hall by 30 per cent, equivalent to covering the entire roof in photovoltaic panels.

Client
Beijing State-Owned Assets
Management Co

Arup Scope of Work
Full multidisciplinary service including structural, mechanical and electrical, building physics and fire engineering

Size
177 x 177 x 31m
The wall cavity is 3.6m deep and the cavity forming the roof is 7.2m deep

Gross Floor Area
70,000m^2

Seating
17,000 seats

Project Manager
Three Gorges Corporation

Consortium Leader
China State Construction Engineering
Corporation (CSCEC)

Architect
PTW Architects & China State
Construction International
Shenzhen Design Consulting Co
(CSCEC+DESIGN)

China Central Television Headquarters

A Skyscraper with a Difference

China Central Television's (CCTV) new headquarters building is a 234m tall building whose shape has been described as a 'three-dimensional cranked loop'. The building is formed by two leaning towers, which are bent 90° at the top and bottom to meet forming a continuous tube. The tower will be the focal point of Beijing's new Central Business District.

The highly unusual shape of the tower redefines the physical form of the skyscraper and posed some significant structural challenges during design, not least the need for the structure to withstand a high level of seismic activity.

The building's primary support is achieved through its skin of leaning columns, horizontal beams and triangulated bracings that form a network of diagonal grids (diagrids) surrounding the extremely strong braced tube structure. This diagrid support is visible in the building's façade, where the pattern reflects the distribution of gravitational forces throughout the building structure; the smaller the diagonal pattern, the stronger the load. The braced tube structure also gives the building the required robustness to withstand the likely seismic activity in the area and therefore provide an extra level of safety.

The biggest challenge for the Arup engineers was the unique structural form of the CCTV building. Before the towers are linked towards the end of the construction phase, they will be prone to movement due to the extremes of hot and cold weather in Beijing, so construction issues were a key part of the design process. It was of paramount importance that the design should take into consideration the way the building would behave in its partially-constructed form.

The completed building will combine administration functions with news, broadcasting, studios and programme production. It will enable the staterun television broadcaster to reach a new level of global broadcasting, expanding from its current operation of running 13 channels to over 200 upon completion.

Engineering of Beijing Olympics -
From Airport to Venues and Broadcasting

Client
China Central Television

Arup Scope of Work
Structural, mechanical, electrical and public health engineering, geotechnical, security and fire engineering

Gross Floor Area
540,000m^2

Height
The leaning twin towers are 234m and 194m tall respectively

Main Contractor
China State Construction Engineering Corporation

Architect
Ole Scheeren & Rem Koolhass,
OMA Stedebouw BV

Local Design Institute
East China Architecture and Design Institute (ECADI)

Target Completion Date
2008

Biography

Mr. Martin Loosemore is Professor of Construction Management and Associate Dean at the University of New South Wales, Sydney, Australia. He is a Fellow of the Royal Institution of Chartered Surveyors and a Fellow of the Chartered Institute of Building and is a visiting Professor at University of Loughborough in the UK and The University of Hawaii in the US.

In 2002, Martin was a consultant to the Australian Royal Commission into the Building Industry, advising on international workplace reform and productivity and was called to provide evidence to the Federal Senate inquiry into the Building and Construction Industry Bill. Martin has worked with a wide range of major private and public sector organisations and NGOs in Australia, Asia and The Middle East to develop and implement new Risk and Opportunity Management systems. Recently worked with the Beijing Olympic Organizing Committee (BOCOG) and the Ministry of Science and Technology in China to develop a risk and opportunity management system for the 2008 Beijing Olympic games facilities. He has published over 150 articles and four international books in risk management, crisis management, facilities management, occupational health and safety and human resource management.

In 2002 he was awarded the UK Literati Club Highest Commendation Award for a paper entitled "Customer focussed benchmarking in facilities management". In 2000 he was awarded the American Society of Civil Engineers' Engineering Management – Outstanding Journal Paper Award for peer-reviewed paper entitled "The psychology of accident prevention in the construction industry". In May 2004, he was winner of Literati award for excellence for an article entitled "Flexible problem solving in construction projects on the national museum of Australia project", published in the International Journal of Team Performance Management. In March 2006, he was awarded an International Innovation Award by the UK's Chartered Institute of Building for his work in developing and implementing an innovative risk and opportunity management system for Multiplex Facilities Management. In March 2008, he received first prize in the International Construction Project Management Association Award for the risk management system he developed for the 2008 Beijing Olympics construction program. This unique approach is documented in the recent book: Risk Management in Projects by Loosemore, M., Raftery, J. , Reilly, C., and Higgon, D., Taylor and Francis (2005), London.

Effective Risk and Opportunity Management using a Multimedia Approach

Prof. Martin LOOSEMORE
Professor of Construction Management and Associate Dean
University of New South Wales, Sydney, Australia

Introduction

The construction industry has an unenviable reputation for managing risk. Although we rarely hear of the many projects that exceed time, cost and quality expectations, the industry's reputation has been tarnished by adverse media coverage of project disasters and numerous government enquiries into poor industrial relations, unreliable performance, a lack of transparency, environmental degradation, poor safety and working conditions, low rates of pay, illegal activity, corruption and insensitivity to the needs of the community and minority groups such as migrants and women. Recently, concerns about climate change and infrastructure security have exacerbated public perceptions of risk associated with the industry. In this increasingly emotional and politicised environment, effective risk management has become a basic necessity for every profession in the construction industry, as has the ability to communicate effectively with external stakeholders about risk. Effectively communicating with the public is difficult enough but the challenge of communicating the risks associated with a multimillion pound construction and engineering project are immense.

This paper presents a new approach to risk and opportunity management called ROMS which was the basis of the risk management system used to deliver the 2008 Beijing Olympic Games facilities. ROMS combines award winning multimedia technology with current knowledge and best practice in risk management and organisational learning. A number of leading companies in other high risk industries have been experimenting with multimedia technology and are finding significant improvements in risk management practices and culture. Multimedia technology is highly cost effective and improves learning by up to 91%, making cutting-edge risk management accessible to managers and operatives at all organisational levels. It can also overcome many of the common problems of risk management which one finds in the construction industry. Before discussing the advantages of a multimedia approach it is worthwhile summarising what these common problems are.

Common problems of risk management in the construction industry

Evidence indicates that the majority of firms in the construction industry have inadequate risk management systems, do not understand their capacity or appetite for risk and regularly take on projects which fall outside these boundaries. There are many reasons for this. For example, too many companies see risk management as a compliance issue, adopting minimum standards suggested by BS 6079: 3: 2000, AS/NZS 4360: 2004 or COSO 2004 etc. rather than developing approaches which reflect best practice and their own business culture. Most approaches to risk management are therefore not driven or inspired by the profit and value enhancing opportunities which risk management can offer (the upside of risk) but by the fear of the ever greater penalties for doing something wrong (the downside of risk). It is not surprising that few projects exceed expectations for clients and for the companies involved.

Another problem is that many companies aggressively pursue profit without fully understanding their capacity or appetite for risk, a problem exacerbated by incentive structures which compensate on revenue earned without balancing the risks involved. Poor governance is also a problem in many companies with inappropriately structured boards which do not have the capacity to develop effective risk management policies, practices and cultures. And still, despite the rhetoric, too many clients inappropriately transfer risk, impose counter-productive time and cost constraints and emphasise price rather than value in tender selection criteria. In an attempt to cope with this risk-transfer culture, many companies rely on insurance and back-to-back contracts as a substitute for good risk management. Risk is too often transferred down the procurement chain until it reaches the point of least resistance, creating a dangerous illusion of control which can lead to disputes, delays, cost escalations and rework. It also leads to a selfish and uncooperative industry culture lacking the collective responsibility that is required for effective risk management in the industry's unwieldy and fragmented supply chains. Thus decisions made in one project stage too often create risks in subsequent project stages, by which time, risks have grown in proportions and opportunities to exceed expectations have been lost. The industry also has a narrow view of its stakeholder base and is generally insensitive to their needs. This results in a poor public image, irrational public perceptions of development risk, activism and opposition and inadequate information on which to make decisions.

While some companies may have some understanding of risks on individual projects, risks and opportunities are best understood collectively as part of a risk portfolio. Yet few companies understand risk correlations between different projects and business units meaning that many organisations have insufficient understanding of their total risk exposure and are vulnerable to crisis contagion spreading through their business. This is partly related to the fact that many organisations also manage risks in departmental, regional or functional silos which encourage independent evaluation of risks and fail to consider potential synergies which can be realised when risks are managed collectively. So while most managers practice risk management on a day-to-day basis, it is often practiced in an unsystematic and inconsistent manner. This means that standards vary considerably within companies and along supply chains and that many risks go unmonitored and unmanaged. Too few organisations recognise and promote the importance of risk management internally and throughout their supply chains. So it is often seen as a low management priority and an additional burden which has to be carried out to satisfy the mechanical requirements of system documentation. This problem is reinforced by the tendency of many companies to overcentralise risk management around a senior risk manager, preventing collective responsibility for risk management and slowing down responses to problems and opportunities.

There is also a tendency to focus too heavily on early commercial risks at the expense of operational risks which arise later in a project. It is too often forgotten that it is the operational phase where money is often made or lost and where one major crisis can wipe out margins. Ultimately, it is the effective management of operational risks that gives commercial managers the confidence to make up-front strategic decisions. This problem is related to the false perception that if one is not using numbers then one cannot be doing risk management. Strictly, quantitative analysis should only be used for major risks which has been first filtered by qualitative analysis, which can be sensibly measured, when there is reliable data available and when managers can understand outputs. More often than not, these conditions are not present resulting in overly complex risk models which make no sense. And related to these problems is the tendency of many companies to invest in software which isolate people from the risk management process, overemphasise the risk analysis process and generate predetermined solutions to standardised lists of risks.

Experienced risk managers know that people are the most prolific and important source of risk information and the most powerful weapon for managing it. The best risk management systems involve people intimately in the process and illuminate the talents, creativity and experience of employees.

The power of multimedia in managing risks

The potential benefits of addressing the above problems are enormous. One major problem avoided can repay investments many times over. A multimedia approach to risk management can offer a solution by better engaging people in the risk management process. Research indicates that people retain and understand up to 91% more when using multimedia compared to computer and paper-based management systems (http://www.webusability.com/article_multimedia_and_learning_11_2001.htm). Not only is multimedia engaging but it is highly cost effective, stimulating, interesting, enlivening and fun. Images, words and text enliven the process and complex jargon can be minimised, making it easy to understand, even for non English speaking background users. Multimedia switches peoples' minds on rather than off and can help people communicate more effectively about risk, assisting firms to change their business culture. Every educator knows that every adult learner wants to be fascinated and entertained and if we can bring a sense of wander and creativity to the way people learn, we can reach out to peoples' innate desire to learn and be more effective at managing our risks and opportunities. This is the power of multimedia. A multimedia interface is also easy to use and interactive, enhancing the learning process, enabling managers to develop their skills and maturity over time by providing cutting-edge and well researched advice in response to specific questions during different stages of the risk management process. In this way, multimedia can support a training and induction system as well as a methodology for managing risks and opportunities. Finally, multimedia is also highly flexible and can be used for any situation, no matter how complex or simple and in any business environment. It can also be adapted to any user, no matter how novice or experienced and it does this by enabling the system to determine an appropriate level of complexity depending upon answers to a range of simple questions about the complexity and magnitude of the risks faced, the amount of data available, the user's experience, the time available etc. Having automatically recommended a suitable level of analysis, a multimedia system can then interactively guide users through a step-by-step process using a range of appropriate qualitative and/or quantitative methods. By automating the risk management process in this way, multimedia allows managers to focus on thinking rather than the mechanics of the risk management process.

The world's first multimedia risk management system (ROMS) has been developed in Australia (www.risk-opportunity.com). The multimedia delivery is important as a big differentiator from other risk software. The power of the multimedia approach from a learning and culture change perspective should not be under estimated. Effective risk management is more about engaging people than anything else and this is the power of multimedia and the ROMS approach. There are two parts to the ROMS system: educational and operational.

Educational - The educational component is important in training and helping people learn about risk management and ROMS and changing risk management culture – it uses voice delivery, moving graphics, text, pictures and is interactive so that people can get further information and guidance and examples of risk management policies, management responsibility structures, job descriptions for risk management, stakeholder consultations strategies etc. The multimedia format makes it easier and more interesting and is aimed at managers at all levels of risk management expertise. The multimedia format is also suited to non English speaking background people which have been identified as a source of greater risk in many research projects in the industry.

Operational – The operational component is the "system" which takes people step-by-step through a risk management methodology which is based on international standards and benchmarked against best practice in other industries such as defence, nuclear etc. The operational part of the system is highly interactive in that users get guided through step-by-step process and can do so at their own pace and interact with the system to ask questions and get guidance at any time.

The ROMS has been used successfully by a wide range of organizations in the public and private sectors and in many different contexts. For example, it was used recently with a Public Health Department in Australia to develop a strategy to adapt all its hospitals to cope with the health impacts of climate change. It is now being used by all Australian and New Zealand government Health departments to produce an Australian and New Zealand national climate change adaptation strategy. It has also been used for identifying appropriate contingencies on major PPP tenders, for resolving IR and safety problems, for resolving security threats etc.

What is different about ROMS compared to other risk management/analysis systems?

1. The cutting-edge multimedia approach is a very powerful tool to change company risk management cultures (research indicates learning is up to 91% more effective than with traditional mediums such as paper).
2. It is very easy to use and therefore WILL be used and won't "sit on the shelf"
3. It is flexible in that it can be adapted to different complexity projects and people's abilities from very advanced and complex to very simple.
4. The educational component and flexible capability to different user needs allows an organization to grow its risk management maturity over time.
5. It provides a 3-dimensional view of risk (imminence, controllability and risk level) whereas other systems provide a one-dimensional view (risk level).
6. It provides a powerful mechanism to negotiate optimum risk distributions on projects because it is to so transparent.
7. It provides a simple and rigorous mechanism to enable companies to filter out the majority of risks which can be managed by simple qualitative methods.
8. When complex quantitative analysis is appropriate and justified, it is sold in partnership with @RISK - the most widely used and respected simulation software.

The Beijing Games system

The Beijing Organising Committee of the Olympic Games (BOCOG) is responsible for the procurement and delivery of the 2008 Beijing Olympic Games Facilities on time, on budget and with minimal environmental and human impact. Due to the Athens experience, the increasing risks associated with delivering Olympic Games facilities on time and the inflexible deadlines associated with the Olympics construction program, 2008 was the first time that the International Olympic Committee (IOC) required an organizing committee to report on risk management procedures and practices. At the same time, BOCOG were well aware of the large reputational, security, technical, political and project management risks associated with the Olympics procurement process. The required IOC reporting structure is highlighted below.

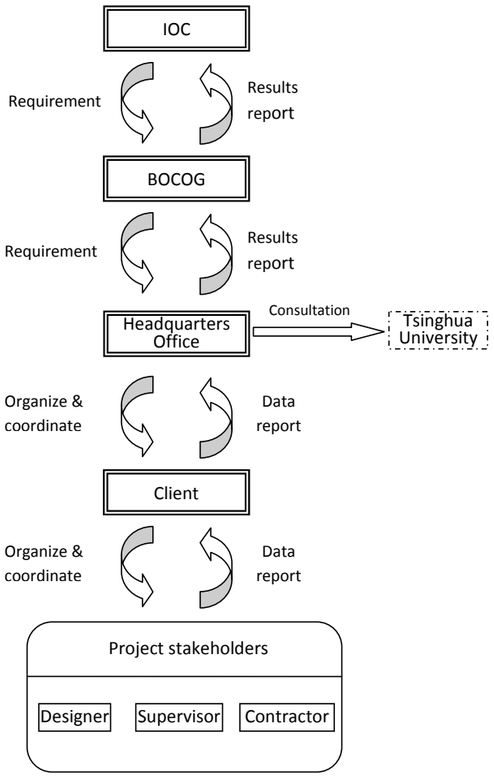
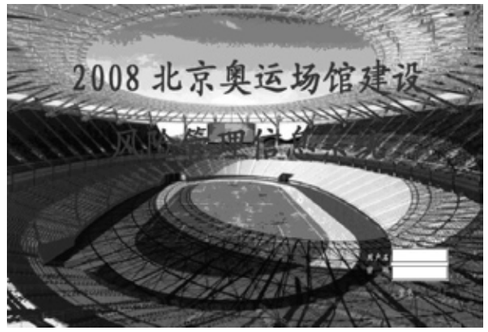


Figure 1 IOC reporting structure

To help manage these risks and reporting responsibilities, a risk management system was developed for BOCOG by a team at Tsinghua University in partnership with UNSW. This was based on the principles used to develop a risk and opportunity management system called ROMS described above.

While the creation of the new system was a major undertaking, changing peoples' behaviour was far more challenging, particularly given the immaturity of risk management within China in 2003. Thus the challenge was to establish the new system as an integral part of BOGOC's business culture so that it automatically determined the way that people operated, acted and behaved on a day-to-day basis.

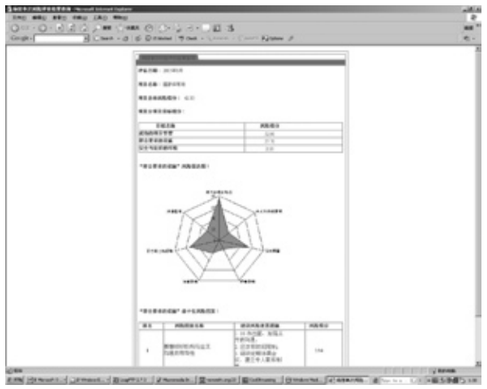
Senior management commitment was vital to the success of the system and there was also extensive consultation with other stakeholders at all stages of development. This was achieved through a series of workshops with construction project management, planning and design experts drawn from throughout China. The interesting difference with the BOCOG process was that the workshops were used to identify the main risks and opportunities associated with the Olympic projects, to assess and rank them and to develop pre-conceived control strategies to deal with them. Culturally, this reflected the Chinese respect for authority and was in contrast to the type of approach one would use in Australia. The BOCOG workshops were run using the Delphi brainstorming technique and the result was a weighted analytical hierarchy map of the main objectives and risks associated with the procurement program. The objective of BOCOG was to develop a common web-based system which would draw on a common data-base of risks and solutions which could be used by project managers involved in each project as illustrated below.



2008 BOCOG venue construction risk management system

Sample page of risk analysis and ranking for National Stadium (Bird Nest) at different time

The RMS Login page



Sample page on presentation of risk analysis results

Status of risk analysis and risk levels/rankings for different venues' construction at different time

There were a number of unique features in this project, in both, theoretical and practical terms.

1. It widened the scope of risk management to project groups, rather than individual projects allowing BOCOG to manage risks across its entire project portfolio.
2. A new risk breakdown structure was used to identify possible risks at different project stages and to develop appropriate control strategies in each case.
3. The development of the risk management system was built around the unique characteristics of the Olympic venues and the auditing needs of BOCOG and IOC.
4. The result was a practical and easy to use system with user-friendly graphical interfaces.
5. It also included a warning system to allow the managers to take proactive responses to major risks.
6. With further adaptation, it could provide a basis to manage risks on other large-scale construction projects.

Conclusion

To conclude, it is worth reflecting on the lessons learnt in developing systems like this for a range of companies including BOCOG. In some ways, these lessons represent the risks of risk management, which themselves need to be managed. For example, we have found that people tend to focus on potential problems rather than opportunities. Although people are not use to formally thinking about risks, they are even less used to thinking about potential opportunities to do their job better than expected. To control this problem, a performance evaluation system needs to be installed which rewards opportunities taken as well as risks avoided. Another potential risk is that some people in their enthusiasm to embrace a new system throw themselves into the process and neglect to follow the systematic steps involved. Close monitoring of the implementation and simple training helps to avoid this problem. A quarterly audit system also needs to be developed to ensure that staff know exactly what is expected of them and how their performance is assessed.

Another potential risk revolves around time management. People tend to use risk management systems sporadically, fitting it around other duties, whenever they can find some spare time. In order to cope with day-to-day time pressures, some people try to delegate the process to a subordinate who did not have the skills, information and training to undertake an effective risk management process. Close monitoring, training and regular auditing by a dedicated risk manager helps to avoid this problem, encouraging people to manage their risk management time effectively. In using a new risk management system the learning curve for many staff is steep. While younger staff are often relatively more informed about the theory of risk management than more mature staff, their lack of work experience often ensures that they find the process more difficult. To address this potential problem, staff should be discouraged from working in isolation and encouraged to work in multidisciplinary groups with a spread of experiences.

Finally, an effective risk management system requires people to think proactively and in the long-term, whereas client drivers are more often than not, short term and reactive. Understandably, people who have existed in this reactive environment for a long time, find it challenging to think proactively about risks and opportunities. To manage this risk, training and close monitoring is important and senior managers and customers need to be educated about their role in the process and the importance of being proactive in their risk management activities. Common barriers to being proactive include: Fear of change; Fear of responsibility; Fear of exposure; Fear of learning; Time constraints. These need to be overcome by using positive rather than negative reinforcement and building risk management responsibilities into job descriptions. But arguably, the biggest lesson is the central importance of training. For this reason, a training strategy must be developed to support the implementation of any system and it is better if it is not a formal classroom-based program but a practical, problem-based, self-directed, on-the-job learning program, supported by a peer-based mentoring and coaching system and flexible delivery using web based learning. It is often useful if the process commences with a volunteer being trained from each contract to act as a risk management champion who can then mentor and coach to other contract project managers/supervisors who collectively administered the system on each contract. The volunteers can liaise with trainers to design and organize training suited to the needs and pressures of site-based staff and after the training is completed, they can play a mentor role by providing moral support and leadership while the coaching role involved practical advice and support in using the ROMS.

For more information about this article and multimedia approaches to risk management, contact Steve Clarke (Managing Director of Cell-Media – steveclarke@cell-media.com or Professor Martin Loosemore at m.loosemore@unsw.edu.au). See also Loosemore, M, Raftery J, Reilly, C and Higgon D (2005) Risk Management in Projects, Second Edition, E and F N Spon, London.

Biography

Mr. Kenneth Poon is the Managing Director of Davis Langdon & Seah Hong Kong and China Ltd. He heads the Cost Estimation and Analysis Unit in Hong Kong and has been personally involved in the cost planning of many large scale projects both in Hong Kong and China. He started working on projects in China since 1984 – providing quantity surveying services, a capitalist market conceived profession, for projects in a communist society. Some of his projects include the China World Trade Centre (Beijing), the CITIC Plaza (Guangzhou), the Bank of China (Beijing), the Central China Television Building (Beijing) and the Beijing Capital Airport Terminal 3. His involvement has taken him through the changes of the China construction industry from the early days of the open Door Policy to today's powerhouse economy.

Cost Management in iconic buildings : the new China Central Television (CCTV) Building

Mr. Kenneth POON
Managing Director
Davis Langdon & Seah Hong Kong Limited

Great projects do more than just fulfill its functions. They fire the imagination and carry symbolizing powers that can transform the landscape of a city itself. Buildings like the Sagrada Familia (Barcelona) and the Sydney Opera House (Sydney) etc. marked their influence and have become inseparable icons of the cities themselves. China, and more recently the oil rich countries in the Middle East, eager to establish their new position on the global scene, has shown an insatiable appetite for such projects. The numerous special projects built in Beijing for the 2008 Olympics have made Beijing a "showcase of world class architectural designs".

It is unknown whether the Sagrada Famila by Gaudi had any budget or not when it started work in 1883. Even if it had, it would have long been exceeded as works on the huge building is still not finished as of to date. The Sydney Opera House also exceeded its initial budget by more than 10 times and was 10 years late in completion. The cost of iconic buildings has always been extremely difficult to manage as in addition to being buildings, they are also perceived as pieces of artwork and one does not question cost when pursuing artistic excellence! Today, most iconic buildings operate also on commercial grounds and therefore management of its cost and program would be unavoidable. However, when implementing control, it should be done with care and skill so as not to stifle the designer's innovation and ruin the original intention of building a grand and outstanding landmark building.

The Project

The CCTV building is a skyscraper by all definitions but it impresses not by its height. Rising to 234m above ground, the China Central Television Building (CCTV) exerts its dominance by its unique form. Designed by world renowned architect Rem Koolhaas of OMA, the building redefines circulation within composite developments. The building encompasses an astonishing total construction floor area of 470,000m^2 in one inseparable mass, housing 30 performance studios that can accommodate nearly 10,000 visitors at any one time, casting studios, broadcasting facilities plus administration and marketing offices for the whole corporation. The space is packed elegantly into two leaning towers rising from a base podium and linked at the top by an L shaped horizontal building. The design gives the form of an infinity loop which greatly enhances circulation efficiency between the various functional parts within the towers and the podium base.

The unique form of the building poses daunting challenges to both the structural and building services design team. A vertical internal core inside a slanting external core forms the structure for the two vertical towers. The linking horizontal tower at the top is constructed as a bridge that first projects out, turns and then spans across the landscaped podium deck 150m below. To service the equivalent of floor spaces of three towers by two cores only, the cores are packed with 27 single deck lifts and 6 double deck lifts. Electricity, air-conditioning and other services are provided from a separate Central Main Plant with boosters strategically placed throughout the building. The slanting external facades pose new technical and maintenance problems which calls for special innovative designs and treatments.

The CCTV is accompanied by its "sister" building, the Television Convention Centre (TVCC). The TVCC is mainly composed of a 241 room 6-star hotel and a multi-purpose auditorium. The design of the TVCC is by itself as striking as the CCTV with its zinc clad façade and 80m high internal atrium. It complements the CCTV's strong regular form by its irregular flowing lines wrapping over both the hotel and the auditorium in one continuous sheet of zinc cladding. The auditorium is designed for performances, conferences and press releases. It has a seating capacity of 1,925 seats and is equipped with state of the art facilities to match its multi-purpose function.

Little Facts		
	CCTV	TVCC
Construction Floor Area	470,000m^2	100,000m^2
Building Height	234m	159m
No. of Storeys	52	30
Total tonnage of steel	190,000t	37,000t
Total area of curtain wall	100,000m^2	42,000m^2
No. of lifts	76	18
No. of guestrooms		241

Control from Day 1

Under the PRC Tendering Law, all design appointments of major public buildings have to undergo an appropriate tender. This requirement is normally fulfilled by means of a design competition for the project. Design competitions are usually arranged by tendering agents and assessed by a panel of assessors comprising mainly of architects or engineers. Budgets are set and the submitting firms would need to confirm that their design meets the stipulated construction budget. Cost checks are rarely carried out. Due to the scale and specialty of the CCTV project, the Client realized the forthcoming difficulties in the future cost control. They therefore decided to employ a quantity surveying firm to give early advice on costing matters. We were initially appointed to participate in the architectural design competition stage to carry out checks on the reported floor areas and construction cost in the submissions by the design firms that entered the final round.

The design was eventually won by OMA under a full vote by all the assessors. The Client was initially skeptical on whether to proceed with the construction or not of this unconventional design which would obviously cost more than the others but eventually decided to continue and add another landmark to Beijing's cityscape.

Dynamic Cost Management

The selection of OMA's design represented a major challenge for us. The design was the most unconventional of all 6 schemes that made it to the final round. During our preliminary assessment of the scheme, we already realized that the slanting shape of the towers imposed problems not only on the structure, but also on many other elements including the external façade, vertical transport system and internal layout. When informed of the decision, we immediately revisited the preliminary estimate and started to recalculate the construction budget, taking into account the additional explanation of the scheme made by the Architect in his presentations. The new figures were reported immediately to ensure a practical and appropriate budget which was vital to the smooth implementation of the project.

The design of iconic buildings is never completed on Day 1. The design progresses and changes according to the impacts visualized by the Architect as the building take shape. A lot of new and specially made materials are normally adopted. Master grade architects are adamant of their designs and it would be hard to change their minds once they have decided. In order to keep the anticipated cost in check, we adopted a dynamic cost management approach whereas we strived to keep our cost estimation one step ahead of the design throughout the design development stage. Costs were reported for reference before or at the same time as the design presentations were made to the Client. To do so, a resident team of surveyors led by a senior associate was dispatched to the project office right from day 1 to attend all design meetings and workshops, including those held at OMA's office in Rotterdam. Working with the Client's project team, all new and special materials proposed were studied in detail and localized as far as possible to reduce the cost. On site mock-ups were erected to check the effect of the local alternatives which were jointly decided upon by the Architect and the Client.

The arrangement ensured both the Client and the Architect were aware of the cost before they committed on any of the proposed designs. It prompted them to consider alternatives whenever the cost of any particular element exceeded the initial budget allowance. The cost control tools actually did not differ much from that for common building projects but it was applied one step faster than normal: costs were anticipated based on ideas rather than reported after they were designed. One point to note is this dynamic approach is much more costly than the traditional approach!

Cost Management in iconic buildings : the new China Central Television (CCTV) Building

Biography

Industry Experience

Mr. Niall Mc SWEENEY brings over 20 years' of construction industry experience to the Page Kirkland Group.

Having worked in Europe and Australia, he has attained wide experience in all aspects of quantity surveying and construction - from feasibility analysis and budget estimation to cost planning, contract documentation and contract administration.

Examples of Niall's previous/current projects include:

- Residential - Bullecourt, Balmain Shores, City Quarter, Discovery Point, Freshwater Place
- Commercial - Binary Centre, ASX Centre Sydney, Woolworths Corporate Campus, Four Seasons Hotel, State Street Centre, AMP/GIO Intergration
- Public Buildings - NSW Police HQ, Wollahara Council office, Olympic Sydney Superdome, Gosford Graham Park Stadium, Oasis Arena Liverpool, Homebush P1 Multi-Story Carpark
- Education - SHORE School, St Lukes School, UNSW, Brigideen Convent
- Heritage – Tempe House and Chapel, The Mint Building, MCA , Argyle Stores, Rose Bay Police Station.

His expertise has also been utilised in several commercial negotiations on dispute resolution, where he has gained a reputation as a key team member who will always try to achieve the clients goals to the full, while maintaining a balanced view.

Qualifications

BSc, Dip Con Econ, MCIOB

Previous Experience

Niall's career commenced in Ireland from a trade background and led to a contract administration role with Contractors and Quantity Surveyors. He joined Page Kirkland Partnership in 1995 and his current duties as a Group Director include day to day management of all aspects of the cost management process for both private and public sector projects.

Mr. Niall Mc SWEENEY
Group Director
Page Kirkland Group

1.0 Introduction – Background

Sydney played host in September and October 2000 to the 27th Olympic and Paralympic Games, which were the largest at that time with 10,651 athletes competing in 300 events.

Despite their size, they were well organised, renewing faith in the Olympic movement.

The Games primarily took place at Homebush, an Inner West suburb of Sydney, in the state of New South Wales. Homebush is located 15 kilometres west of the Sydney central business district, in the local government area of the Municipality of Strathfield.

Other venues in Sydney and even in other cities were used. Please refer to the venues listed below.

To give you an idea of the overall size of the event consider the level of participation required:

- 199 nations
- 4 individual athletes
- 10,651 athletes (4,069 women, 6,582 men)
- 300 events
- 46,967 volunteers
- 16,033 media

All along with a total of 6.7 million spectator visits.

Sydney 2000 set a new Olympic record for ticket sales, with more than 87% of available tickets sold across Sydney and interstate venues (football). Sydney venues sold more than 91% of available tickets. The IOC has confirmed this broke the previous record for ticket sales of more than 82% set in Atlanta.

The main features of Sydney's bid as outlined in the Candidature File, a formal response by the bidding city to a series of questions put by the International Olympic Committee (IOC) were:

- the concentration of Olympic venues in one central location at Sydney Olympic Park at Homebush Bay. Fourteen sports were to be undertaken at Sydney Olympic Park, which also provided the location of the Main Press Centre and the Olympic Village. Sydney Olympic Park was to have the largest concentration of venues in Olympic history
- many other sports played in the Sydney Harbour Zone, with yachting on the Harbour itself and six sports in the Darling Harbour area, the fifth largest Olympic precinct in history
- all athletes located in the one Olympic Village adjacent to Sydney Olympic Park for the first time in Olympic history
- most venues within 30 minutes of Sydney Olympic Park
- a focus on the needs of the athletes in every aspect of planning
- a four-year arts festival program with a particular focus on Australia's indigenous and multicultural heritage
- the sheer physical beauty, the warmth of its people and the temperate climate of Sydney were also highlighted as providing a perfect location for the Olympic Games

In addition, Sydney's bid committee broke new ground in promising the most 'environmentally friendly' Olympic Games up to this time. The Sydney Bid Team developed environmental guidelines which were later adopted by the IOC as the standard for environmental policies for the Summer Olympic Games.

1.1 Why Did Sydney Want The Olympics?

- Perceived impact

1.2 The Venues

Sydney Olympic Park hosted the following:

- Stadium Australia: Opening and Closing Ceremonies (Athletics, Football Final)
- Sydney International Aquatic Centre (Diving, Swimming, Synchronised Swimming, Water Polo)
- State Sports Centre (Table Tennis, Taekwondo)
- NSW Tennis Centre (Tennis)
- State Hockey Centre (Field Hockey)
- The Dome and Exhibition Complex (Badminton, Basketball, Rhythmic Gymnastics, Handball, Modern Pentathlon, Volleyball)
- Sydney SuperDome (Artistic Gymnastics, Trampoline, Basketball)
- Sydney Baseball Stadium (Baseball, Modern Pentathlon)
- Sydney International Archery Park (Archery)

Other Sydney Olympic Park venues used for the Games included:

- Sydney Showground
- Olympic Park Station and Rail Link
- Olympic Village (including Olympic Boulevard – Homebush Bay's main street linking the major venues and transport facilities)
- Homebush Bay Wharf
- Novotel and Ibis Hotel

Sydney hosted the following:

- Sydney Convention and Exhibition Centre (Wrestling, Boxing, Judo, Fencing)
- Sydney Entertainment Centre (Volleyball)
- Dunc Gray Velodrome (Track Cycling)
- Sydney International Shooting Centre (Shooting)
- Sydney International Equestrian Centre (Equestrian)
- Sydney International Regatta Centre (Rowing, Sprint Canoeing)
- Blacktown Olympic Centre (Baseball, Softball)
- Mountain Bike Course, Fairfield City Farm (Mountain Biking)
- Ryde Aquatic Leisure Centre (Water Polo)
- Penrith Whitewater Stadium (Slalom Canoeing)
- Bondi Beach (Beach Volleyball)
- Sydney Football Stadium (Football Preliminaries)
- Sydney Harbour (Olympic Sailing Shore Base)

The following venues outside of Sydney were also used:

- Bruce Stadium, Canberra (Football Preliminaries)
- Hindmarsh Stadium, Adelaide (Football Preliminaries)
- Melbourne Cricket Ground (Football Preliminaries)
- Brisbane Cricket Ground (Football Preliminaries)

Case Studies of projects PKG was directly involved in will be discussed later.

1.3 History Of Olympic Park Site

- Why understand all the background?
- Understanding the requirements
- Risks associated with its location

2.0 Cost Management Process At Bid Stage

- Understanding the task at hand, knowing the end product
- Filling in the gaps during design
- Cost Planning :
  - Feasibility Estimates
  - Cost to the State
  - Government/OCA/Socog
  - Proponent

2.1 Bid Process By Different Parties

- By the Government and its budgets by the proposals
- By consortia for BOOT schemes
- By consultants and contractors for services/ projects

2.2 Delivery Methods

- Design and Construct
- Build Only (Traditional)
- BOOT (Build Own Operate Transfer – like PPP)

3.0 Interested Parties

- Mainly in two sectors

3.1 Government/OCA

- Ensuring Value/Budget
- Maintaining Design Intent (D+C/Build only)
- Identifying Risk
- Comprehensive Documentation
- Co-ordination of Design
- Tender
- Construct
- Commission

3.2 BOOT Proponents (Consortium)

- Like Main Stadium/Superdome/Olympic Village
- Bid Process
- Business Plan
- Feasibility Estimate to Bid
- Refinement of Business Plan
- Design Development
- Procurement of Works Packages
- Construction
- Commission
- Life Cycle Costing
- Post Olympic Results

Cost Management in Sydney Olympic projects

3.3 Other Areas of Involvement By Quantity Surveyors

- Consultants
- Subcontractors
- Facility Managers
- Legal Cases/Challenges

3.4 Related Activities And Projects At This Time

- Commercial Development
- Hotels/Accommodation
- City Scape
- Public Transport

4.0 Specific Roles Performed By Quantity Surveyors At The Olympics

- Initial Budgets
- Review of Design Guideline
- Feasibility Studies
- Life Cycle Costings
- Design Development Input
- Drafting Specification
- Review of Documentation/Co-ordination
- Preparation of Works Packages/Bids
- Input in Selection of Delivery Method

4.1 Developer

- Tender Assessment
- Reports/Selection of Contractors
- Risk Assessment (Internal + External)
- Management of Construction
- Assessment of Claims
- Controlling Variations
- Completion of Build
- Tax Depreciation
- Life Cycle Costing

4.2 State/OCA

- Tender Assessment
- Reports/Selection of Contractors
- Risk Assessment (Internal + External)
- Management of Construction
- Progress Payments
- Same as result of business decision
- Final Accounts
- Tax Depreciation
- Asset Management

5.0 Post Olympic Activities

- Development:
  - Residential
  - Commercial
  - Industrial
  - Retail
- Civic:
  - Park
  - Foreshore Upgrade
  - Transport
  - Public/Historical
  - Future Events/RWC/Commonwealth Games

6.0 Learning From The Process

- Future Olympic works
- Other venues/stadia
- What worked/what did not

7.0 Case Studies/PKG Involvement

簡歷

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國家體育場(鳥巢)施工測量技術研究與實踐

1. 概述：鳥巢的特點，鳥巢施工的特點，鳥巢施工測量的特點，鳥巢施工測量的要求
2. 精密施工控制網：控制測量方案設計，精密導線測量，精密高程控制測量，GPS控制測量
3. 鋼構件拼裝測量：拼裝測量坐標系的轉換，胎架形式及建立，胎架和拼裝測量
4. 購構件吊裝測量：定位測量基本要求和方法，柱腳定位測量，桁架柱定位測量，屋面主桁架梁定位測量
5. 鋼結構支撐卸載變形監測：卸載概況，鋼結構卸載變形測量
6. 地面激光雷達技術鋼結構安裝測量：鋼構件安裝及構件焊接質量檢測，卸載前後鋼結構整體變形監測
7. 結束語：取得的經驗，存在的問題

Surveying Technologies and Applications in the Construction of the National Stadium (Bird's Nest)

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測量技術在國家體育場施工中的應用

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摘要

介紹了國家體育場施工測量技術與方法：特大型複雜精密施工控制測量技術，為施工測量提供可靠的總體控制框架；特大型鋼結構元件的精密拼裝測量技術，保證國家體育場鋼結構元件按設計尺寸拼裝焊接；特大型鋼結構元件吊裝精密定位測量技術，保證鋼結構的正確安裝；利用激光雷達測量技術檢測鋼結構拼裝品質和吊裝品質，監測鋼結構卸載整體變形規律；數位重建鋼結構整體模型。

1 引言

國家體育場俗稱“鳥巢”，是2008年奧運會主體育場，位於北京奧林匹克公園中心區南部，是奧林匹克公園內的標誌性建築，也是北京最大的、具有國際先進水準的多功能體育場。國家體育場平面呈橢圓形，立體為馬鞍形，三層碗狀看臺，外側鋼結構由24榀主桁架承重，網格狀構架，組成體育場整體的“鳥巢”造型。佔地面積20.4公頃，總建築面積25.8萬平米。“鳥巢”作為一項奧運體育工程，舉世矚目，有其獨特的設計和施工特點，她的設計特點反映了當今世界體育工程的發展趨勢。

“鳥巢”建成後，不僅成為奧林匹克公園內的標誌性建築，而且成為整個北京、乃至中國和全世界的標誌性建築。國家體育場，在奧運會期間可容納觀眾91,000人，在會後平時可容納觀眾80,000人，外側鋼結構總重量達42,000噸。調整設計後預計總投資34億元人民幣。國家體育場工程的筋混凝土結構、鋼結構和膜結構，以及給排水、照明、通訊、安全等專業，都應用了當今世界最前沿的技術和最優質的材料。三層看臺坡度的設計，充分考慮了觀眾視點的集中和視線的通暢；為要員設置專用通道、電動扶梯和避難所，充分考慮了國家、國際要人的生命安全。

由於國家體育場結構在空間變化的不規則性、多樣性、複雜性以及超大規模，增加了施工測量難度和困難，超出傳統工程測量範疇，而且又無工程先例，更無工程經驗。不論是地面拼裝還是安裝定位，測量工作都十分煩瑣和困難，這些對工程測量的實施都提出了挑戰。同時，由於施工場地狹小，場地中的大型施工設備、運輸車輛和重型起重機械的頻繁運行。加之作業公司多，配合、協調、工作交圈不容易。施工測量管理和協調難度大都給測量工作帶來了很多意想不到的困難。必須要建立高效率的測量質量管制體系和質量檢驗體系，配備高素質的測量人員和先進的測量儀器，才能保證在工序銜接緊湊，測量作業時間短的情況下，滿足施工要求，避免因測量工作的延誤或失誤造成窩工、返工現象。

2 精密施工控制測量

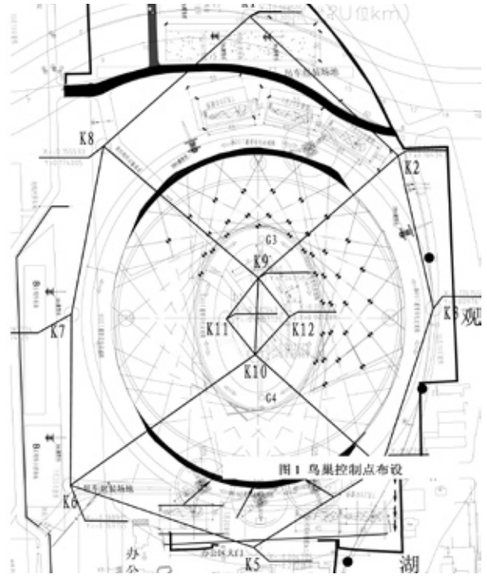

圖1 鳥巢控制點佈設

國家體育場建設分為混凝土結構和鋼結構施工，二者對施工測量控制網的精度要求不一樣，由於施工週期長，為了保證不同施工期間對測量控制網的需要，施工測量控制網按精度要求最高的鋼結構要求進行設計和佈設。控制網的點位誤差按照小於等於3mm來設計。

將控制點埋設在鋼結構周圍和場地中央，精密控制網由12個點組成。最初的設計採用精密導線測量的方法進行平面控制測量，用精密水準測量方法進行高程控制測量。在進行鋼結構施工時，由於鋼結構拼裝有大量的鋼材料堆積，無法保證導線點之間的通視，在對控制網進行複測時採用雙頻GPS靜態測量方法進行平面控制測量。

導線網由兩個互相連接的環形組成，內環位於場地中央，外環位於鋼結構週邊，內環和外環通過體育場出入口互相連接，其佈設形式見圖1。導線網最短邊長40m，最長邊長205m，按四等光電測距導線技術要求施測，角度和邊長用徠卡TCA2003全站儀進行觀測。控制點最大點位誤差為±2.2mm，最大點間誤差±1.5mm。

高程控制網按二等水準測量精度要求進行觀測，外業採用徠卡NA2自動安平精密水準儀。最大高程中誤差1.1mm。

GPS控制網共有16個控制點，使用3台Leica雙頻GPS測量型接收機，GPS網採用邊連接方式的靜態同步觀測。內外單獨測時，每個點50分鐘，裡外相聯時要90分鐘。最後成果的精度為最大平面點位中誤差為2.7mm。與精密導線網的結果比較，平面位置最大差值為4mm。

3 鋼構件拼裝測量

由於國家體育場的鋼結構較為複雜，每個安裝單元體積龐大、組成杆件眾多，且受運輸條件和加工廠房條件的限制，鋼結構施工採用在工廠加工成較小的鋼構件，到施工現場拼裝安裝單元構件，然後再進行吊裝。因此，現場拼裝的構件多，工作量非常大，主要可分為桁架柱拼裝測量、桁架梁拼裝測量、次結構拼裝測量、樓梯拼裝測量等。

圖2 鋼構件拼裝測量

由於每一個安裝構件不僅形狀奇特，各個構件的大小、形狀、結構各不相同，需要在不同的胎架上進行拼裝，拼裝測量的第一步就是根據不同構件的大小、形狀和結構做胎架測量並建立起不同形狀的胎架，然後才能在胎架上用高空定位測量的方法進行拼裝。

拼裝前先要依據所拼裝的安裝構件的設計座標建立拼裝控制網。選擇所拼裝構件邊沿上3～4個相距較遠且分佈均勻的埠角點，按他們的平面設計座標精確地設置在地面上，以此為依據建立胎架和拼裝測量控制網。

因為構件的形狀非常複雜和奇特，其所有的表面都是一個個扭曲面，無法將其軸線投影或佈設到構件的某一個表面上，也就無法根據軸線來進行對接拼裝，只能根據圖紙上給出的構件埠四個角點的座標來進行拼裝。拼裝時依據埠或牛腿的角點座標在胎架上進行三維定位，並反復調整，直到所有埠角點實測三維座標符合規範和設計要求。

每一個安裝構件都要和它周邊的幾個構件進行對接，如果一個安裝構件上有一個埠或牛腿的拼裝精度低，都會直接影響到它和周邊構件的對接，也會使後續安裝的構件不能順利對接，給整個工程的鋼結構施工帶來不利影響。因此在拼裝時都是多次反復進行調整，直到符合設計和規範要求。

4 鋼構件安裝定位測量

與胎架拼裝測量同一道理，除桁架柱柱腳外，安裝定位測量也不能利用構件的軸線來進行定位，而只能依據安裝構件上埠或牛腿角點的座標，用三維座標定位的方法來安裝定位。

整個鋼結構工程是由柱腳、桁架柱、次結構柱、桁架梁通過牛腿和腹杆等相互連接成一個整體，一個構件安裝的定位是否精確，是否符合規範和設計要求，直接影響周邊構件的安裝，也會間接影響到其他部位構件的安裝，可謂牽一髮而動全身。因此一個新的構件安裝定位前要對前期安裝的構件進行檢查測量，對變形較大要進行調整。

安裝構件的安裝定位測量主要有柱腳（包括桁架柱柱腳和次結構柱柱腳）安裝定位測量、桁架柱安裝定位測量、次結構柱（包括排水柱、樓梯柱）安裝定位測量、桁架梁安裝定位測量。各類構件的大小、形狀和定位條件都不一樣，雖然都用三維座標定位，在具體的操作方法上還是不完全一樣的。

安裝構件的安裝定位基本步驟分為初步定位和精確定位，初步定位採用龍門吊或起重機進行吊裝，在測量人員的指揮下，利用安裝在構件上的纜繩和倒鏈使安裝構件與支撐柱相應定位標誌吻合，達到初步就位，然後利用千斤頂、鋼楔等工具進行精確定位。

5 鋼結構安裝激光雷達測量

激光雷達測量技術具有速度快、精度高、無需接觸目標、同時對目標進行三維掃描等特點。在鳥巢鋼結構安裝中採用激光雷達技術進行了3項工作：檢測鋼結構拼裝質量和吊裝質量；監測鋼結構卸載整體變形；鋼結構整體模型數位重建。

圖3 鋼構件安裝測量

5.1 檢測鋼結構拼裝和吊裝質量

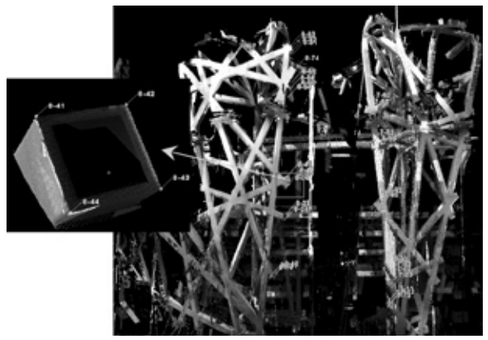

圖4 激光雷達鋼構件安裝品質檢測

當局部鋼結構焊接完畢後，必須保證結構的主要介面點是否與設計的鋼結構吻合在一定誤差範圍內，才能在高空吊裝時和已安裝好的鋼構件埠精確對接。另一方面，已安裝好的鋼構件埠也必須與設計位置向符合，否則，在吊裝時也不能精確對接。由於吊裝好的鋼構件上不宜設置反射棱鏡，用全站儀難以檢測吊裝質量。經過實驗研究，採用地面激光雷達技術可快速準確地檢測鋼構件拼裝質量和吊裝質量，保證鋼結構安裝過程中的精確對接。圖4是利用激光雷達掃描所得的吊裝後預留埠的擬合位置示意圖。

5.2 卸載前後鋼結構整體變形監測

圖5 內環桁架梁與支撐塔架

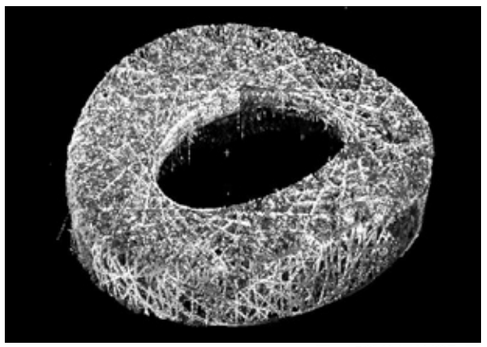

圖6 卸載後鋼結構點雲

鳥巢主體鋼結構採用78個臨時支撐點（塔架）分段（共分成182段）高空散裝焊接而成。在主體鋼結構合攏後，需對臨時支撐塔架進行分階段整體卸載，使鳥巢鋼結構屋面由臨時塔架的支撐逐步轉換為自身承重狀態，見圖5。為了監測卸載前後的鋼結構整體變形情況，採用激光雷達在卸載前後分別對鋼結構進行整體掃描，在掃描點雲上擬合出關鍵部位的空間位置，通過關鍵部位的卸載前後位置差來分析鋼結構的整體變形情況。圖6是卸載後的掃描整體點雲。

5.3 鋼結構整體模型數位重建

國家體育場的三維模型能夠直觀的反應出體育場宏偉的真實外觀。同時，由於三激光掃描精確的優點，又能夠準確細緻地表現鋼結構牛腿部分鋼架的扭曲程度，並且可以在模型上進行直接量測，簡單精確測出鋼結構上的每一點的三維空間座標。通過掃描點雲，構建了鳥巢鋼結構的整體模型，如圖7所示。

圖7 鳥巢鋼結構線框模型

6 結束語

國家體育場施工測量工作從2003年開始到現在已經4年多了，在項目組全體工作人員的共同努力下，克服了重重困難，圓滿地完成了全部研究工作，為國家體育場的成功建設做出了應有的貢獻。取得了一些創新性的成果：

1）利用智能化全站儀、精密水準儀和雙頻GPS測量系統在施工環境條件十分複雜的情況下建立了平面由於3mm，高程由於1mm的特大型精密施工控制網；

2）針對鋼結構地面拼裝的特點，研究和實施了鋼構件地面拼裝測量方法：先建立胎架控制網，將鋼構件的設計座標轉換到胎架坐標系中，按照鋼構件的胎架座標進行拼裝定位測量；

3）所有鋼構件的安裝定位測量都採取先粗略定位，再精確調整的原則進行測量，不同性質的鋼構件採用不同的安裝定位測量方法。

4）首次將地面激光雷達技術應用到了特大型鋼結構安裝測量中。對主結構安裝質量進行檢測，同時對象對應的次結構拼裝質量進行檢測，發現問題及時補救，提高了安裝效率和質量。對卸載前後的鋼結構分別進行掃描測量，分析鋼結構卸載整體變形情況。還建立了鋼結構的整體三維模型。

Biography

Mr. Stephen Lai is the Managing Director of Rider Levett Bucknall Limited.

Rider Levett Bucknall, formerly known as Levett and Bailey in Hong Kong, is one of the largest global professional practice with 2,500 staff operating from more than 70 offices serving countries across Americas, Asia, Oceania, Europe and Middle East.

Mr. Lai was responsible to set up the first few offices in China.

Mr. Lai possesses over 24 years of professional experience in the construction industry. He is experienced in all aspects of quantity surveying from the preliminary estimating stage up to the settlement of final accounts for a wide variety of projects including hotel, residential & commercial complex, offices, theme parks, market, playground and cargo terminal.

He is currently the Chairman of the Quantity Surveying Division of the Hong Kong Institute of Surveyors (HKIS). He is currently the Chairman of the CEPA Committee of the HKIS. He is actively involved in the mutual recognition of qualification of Surveyors.

He is also a part-time Assistant Professor of the University of Hong Kong lecturing in Professional Practice in the Architectural Department.

He was the President of the Rotary Club of City Northwest Hong Kong in the year 2007-2008.

Quantity Surveying Experience in Beijing 2008 Olympics and Mainland Projects

Mr. Stephen LAI
Managing Director
Rider Levett Bucknall

SHOOTING RANGE

Rider Levett Bucknall was engaged by the management office of Olympic venue and training facilities for national team of the State General Administration of Sport (The Management Office of the Olympic Range and National Team Training Facilities Construction of the State Sport General Administration of China Shooting Project Group) for the pre-contract quantity surveying services (Main Contract) in the Beijing Shooting Range.

Construction of the Beijing Shooting Range started on 13th July 2004. The venue, with a total construction floor area of 45,645m^2, contains qualification competition halls, a final competition hall, a storehouse, a room for armed police use, M&E rooms, etc.

During the Beijing 2008 Olympic and Paralympic Games, the venue will host a total of 10 shooting events. The venue has a total seating capacity for 8,600 spectators, with 2,170 permanent seats and 6,430 temporary seats. The qualification competition halls can seat 6,100 spectators, and the final competition hall can seat 2,500 spectators.

NATIONAL INDOOR STADIUM

In March 2005, Rider Levett Bucknall was appointed by the Guoao Investment and Development Co., Ltd., an official organization for the development of 2008 Beijing Olympic venues, to prepare bills of quantities (in accordance with the GB50500 Method of Measurement) and provide post-contract quantity surveying services for the National Indoor Stadium.

The stadium consists of a main structure and a warm-up gymnasium nearby and other outdoor facilities, with an overall building area of 80,900m^2. The seating capacity of the National Indoor Stadium is 18,000. The outdoor landscaping and roadways occupy an area of 44,000m^2.

The National Indoor stadium will be the competition venue for the Olympic Artistic Gymnastics, Trampoline, and Handball competitions and the Paralympic Wheelchair Basketball.

FORBIDDEN CITY

The Garden of the Palace of Established Happiness in the northwest corner of the Forbidden City, Beijing was built by Emperor Qianlong in 1740. In 1923, when the deposed Emperor Puyi still lived in the Forbidden City, the Garden was razed to the ground by fire. All that remained were cracked stone foundations, plinths and column bases. These lay untended beneath a pile of rubble for decades of years.

China Heritage Fund is a Hong Kong based non-profit organization. The Fund's inaugural project is the reconstruction of the Garden of the Palace of Established Happiness. Rider Levett Bucknall is one of the major supporters of the Fund in this project.

With a substantial donation from the Fund, the exquisite Garden commenced to be rebuilt in 2000, using traditional tools, techniques and processes, and was completed in November 2005. The Fund provides project management on a day-to-day basis, and it considers the revival and transmission of traditional crafts, as well as the training of artisans, as part of its responsibility towards conserving China's cultural past. Rider Levett Bucknall was honorably invited to provide full quantity surveying services to charity.

This project represents a first for the Palace Museum on several fronts. It is the first reconstruction on such a large scale in the Forbidden City since the early 1900s, and the first time that a restoration has been carried out in full collaboration with an organization from within or outside China.

Unlike the other parts of Forbidden City, the Garden of the Palace of Established Happiness is not open to public. After handover to the Palace Museum, China in 2005, the Garden is reserved for state visit and special conference.

On the completion of the Garden of the Palace of Established Happiness in 2005, Rider Levett Bucknall continued to serve in the reconstruction of the Hall of Rectitude complex which was also destroyed in the same fire in 1923. Construction is underway, and is expected to finish in 2009.

Rider Levett Bucknall provided full quantity surveying services to the Fund. These include cost estimating and cost management, production of tender and contract documents, financial administration of building contracts.

Quantity Surveying in PRC

- Difference in quantity surveying system (done by different parties)
  - Cost Planning Stage
  - Tendering Stage
  - Construction Stage
  - Final Account Stage
- Pricing Basis
  - Standard & Norm/Market Rates
  - Bills of Quantities
  - Schedule of Items
- Tender Packages
  - Piling Works/ELS Works
  - Basement Works
  - Superstructure Construction
- Tender Bureau
  - Registration of tender documents/contract documents
  - Issue of Letter of Award
- Tender Assessment/Tender Award
- Site Supervision Company
- Final inspection/As-built documents

Quantity Surveying Experience in Beijing 2008 Olympics and Mainland Projects

Issues to be noted when preparing tender documents in PRC

- Scope of works such as utilities connection (water supply, drainage connection, sewage connection, power connection, tele-communication connection, gas connection, roads/run-in and out connection, site formation) (七通一平)
- Nuisance to the neighbourhood/obstruction from the neighbourhood (民擾/擾民)
- Civilized construction (文明施工)
- Quality Standard (such as Great Wall Cup長城杯)
- Payment guarantee (from the Employer)/ Performance bond (from the contractors)
- Insurance (workmen compensation)
- Contract Period
- Time for application for work commencement permit
- Scope of works of the Site Supervision Company
- Materials to be supplied by the Employer directly
- Underground obstructions/accuracy of the site investigation report
- Ceiling of the variation amounts to be absorbed by the contractors
- Winter construction (for northern cities)
- Provisional Bills of Quantities (no drawings for firm BQ and need to commence work asap)

Biography

Mr. Escode Yuen Tung Kwan, the Managing Director, is a Fellow of the Royal Institution of Chartered Surveyors, a Fellow of the Hong Kong Institute of Surveyors and a Registered Professional Surveyor (Quantity Surveyor) in Hong Kong. He qualified as a Chartered Quantity Surveyor in 1985. Apart from the many years of experience in construction cost control and contract administration in Hong Kong and China, he has also worked in Vietnam and Malaysia. Escode also specialized in Cost Management of Electrical & Mechanical Installations and Building Contracts Dispute Resolution.

Qualifications

FHKIS, FRICS, ACI Arb., RPS(QS), HON. FSZCEA, MCECA

Professional Experience :

1994 Onwards : KPK Quantity Surveyors (HK) Ltd. - Managing Director

1989 - 1993 : Davis Langdon & Seah (HK) Ltd. - Assistant Director

1986 - 1989 : The General Electric Co. of HK - Divisional Manager

1981 - 1986 : Davis Langdon & Seah - Project Surveyor

Major Project Experience include :

- Kennedy Town Redevelopment – H12, H.K.
- Proposed Comprehensive Development at Tsuen Wan Town Centre CDA – (K13), H.K.
- Manhattan Heights at 28 New Praya, Kennedy Town, H.K.
- Residential Development at Dynasty Height at Beacon Hill, Kowloon, H.K.
- Residential Development for Greensfields at S.T.T.L. 108, Shatin, N.T., H.K.
- Commercial/Residential Development at Regentville Phase 1 & 2 at Luen Wo Hui, N.T., H.K.
- Redevelopment of Hok Un Power Station – Laguna Verde, Hung Hom, H.K.
- Student Residents Hall Development at Sassoon Road - University of Hong Kong, H.K.
- Residential Development at Regent-on-the-Park, The Manhattan, H.K.
- Beijing Legend Garden Villas, Beijing (Representing First Chicago Bank)
- West Rail DD210 – Tuen Mun Section, H.K.
- East Rail Extensions – Ma On Shan Rail TDD200 & TDD300, H.K.
- Tsing Yi (MTRC) Station, Lantau Airport Railway, H.K.
- Hong Kong Electric Company, Phase III 275KV cable route Parker Switching Station, H.K.
- KCRC Lo Wu Station Extension, H.K.
- MTRC Island Line Contract 464, H.K.
- Eastern Harbour Crossing - M&E packages, H.K.
- Junk Bay Road Tunnel - M&E packages, H.K.
- Aberdeen Tunnel - M&E packages, H.K.

Cost Management on Fast Track Olympic Project - Can it be done

Biography

Mr. Edward Tang is a Director of KPK Quantity Surveyors (HK) Ltd since 1995. Edward is a Member of the Royal Institution of Chartered Surveyors, a Member of the Hong Kong Institute of Surveyors in Hong Kong, Member of Singapore Institute of Surveyors and Valuers and Honourary Member of the New Zealand Institute of Quantity Surveyors. He qualified as a Chartered Quantity Surveyor in 1985. Apart from the many years of experience in construction cost control and contract administration for projects in Hong Kong, he has also worked in Singapore and Mainland China. Edward is specialized in project and cost management of hotel development and interior fitting out projects.

Qualifications

MRICS, MHKIS, FSISV

Professional Experience :

1988 Onwards : KPK Quality Surveyors (HK) Ltd. - Director

1985 - 1988 : Mass Rapid Transit Corporation - Quantity Surveyor

Major projects handle :

- International Broadcast Centre, Main Press Centre and Sports Halls for 2008 Beijing Olympic Games, PRC
- Four Seasons Hotel
- MRTC Circle Line Stage 3
- MRTC Woodlands Line
- Temasek Polytechnic
- SGX Centre
- Kismis Gardens
- Tao Nan Primary School
- Singapore Telecommunication Disaster Recovery Complex – Phase 1
- Plaza Singapura Upgrading – Phase 1
- Carlton Hotel Upgrading
- 6 Battery Upgrading
- Bank of China, Singapore – Upgrading and Extension
- Tang Dynasty City – Theme Park
- Scotts 28
- The Bayshore
- Carlton Hotel Upgrading
- Shanghai Ocean Aquarium, Shanghai, China
- Meritus Mandarin, Shantou, China
- Residential Development in Chengdu, China

Cost Management on Fast Track Olympic Project - Can it be done

Mr. Escode YUEN
Managing Director
KPK Quantity Surveyors (HK) Ltd.

Mr. Edward TANG
Director
KPK Quantity Surveyors (HK) Ltd.

KPK Quantity Surveyors provided full Professional Quantity Surveying Services to the development of the China National Convention Centre, one of the purpose built stadium for the 2008 Beijing Olympic Games.

Conceived by UK based Architectural firm RMJM and completed in early 2008, the curvaceous Convention Centre will host the fencing competitions and the fencing and shooting components of the Modern Pentathlon. It will also be the venue for Paralympic wheelchair fencing. In addition, it will house the International Broadcasting Centre and the Main Press Centre which will be home to 16,000 press and media crew during the Games.

With a measurement of 265,000m^2 gross floor area, the Convention Centre is one of the largest Building at the Olympic Village. After the Games, the fencing competition hall will be converted into a 6,000 seats convention hall and the Building will be transformed into the National Convention Centre.

Construction began in April 2005. With a construction period of less than 3 years, it was a race against time. The procurement strategy became critical to the success of the whole construction process.

This presentation deliberates how traditional Quantity Surveying Practices were adopted on a fast track Olympic Project and the art of striking a balance between time, quality and cost.

Background of The Hong Kong Institute of Surveyors

The history of the surveying profession in Hong Kong goes back to 1843 with the arrival of the first Surveyor General from the United Kingdom. The first Government Land Auction then took place on 22 January 1844. Until the 1950s, most surveyors in Hong Kong were recruited from overseas, these surveyors being qualified chartered surveyors. Local educational institutes started diploma courses in surveying in the 1960s, and now there are three universities in Hong Kong offering degree courses in surveying.

The Hong Kong Institute of Surveyors (HKIS) has strong links with the Royal Institution of Chartered Surveyors (RICS). A Hong Kong Branch of the RICS (the Branch) has been in existence since 1929 (then known as The Surveyors Institution Hong Kong Branch). In 1978, the Branch set up a working group to examine the possibility of establishing a local institute of surveyors and the conclusion was positive. The Branch was only dissolved on 31 August 1997.

The HKIS was founded in 1984 and registered under the Societies Ordinance. It had 85 founder members, the number of members has now grown to around 4,545 as at 1 April 2008 – Members and Fellows - distinguished by the initials MHKIS and FHKIS. The HKIS is now incorporated by ordinance, with the passing of the Hong Kong Institute of Surveyors Ordinance in January 1990. In July 1991, there was also passed the Surveyors Registration Ordinance to set up a Registration Board to administer the registration of surveyors.

To qualify as a corporate member of the HKIS, surveyors must possess a recognised academic degree or similar qualification, followed by a minimum 2 years supervised professional experience within strict guidelines, followed by an Assessment of Professional Competence. HKIS members are also bound by a comprehensive Rules of Conduct.

The title of "Surveyor" embraces a number of disciplines involved with land and its development with buildings. Usually the first to be involved is the ***Land Surveyor*** who measures and sets out the site. Next follows the ***Quantity Surveyor*** who is concerned with the building contractual arrangements and cost control. The ***General Practice Surveyor*** is involved in the valuation, sale, leasing and management of the finished product. ***Planning and Development Surveyor*** advises on the possible change of zoning likely environmental impacts and make suggestion on preliminary development contents, while the ***Building Surveyor*** is involved in the construction and maintenance of the fabric of the building. The ***Property and Facility Management Surveyor*** plans, organises and manages accommodation services, supplies and other facilities relating to building occupancy.

The HKIS has reciprocal agreements with the following overseas surveying institutes:

The Royal Institution of Chartered Surveyors
The Australian Property Institute
The New Zealand Property Institute
The Singapore Institute of Surveyors and Valuers
China Institute of Real Estate Appraisers
China Engineering Cost Association
China Association of Engineering Consultants
The Australian Institute of Quantity Surveyors
New Zealand Institute of Quantity Surveyors
Building Surveyors Institute of Japan
Canadian Institute of Quantity Surveyors

For further information, please contact:

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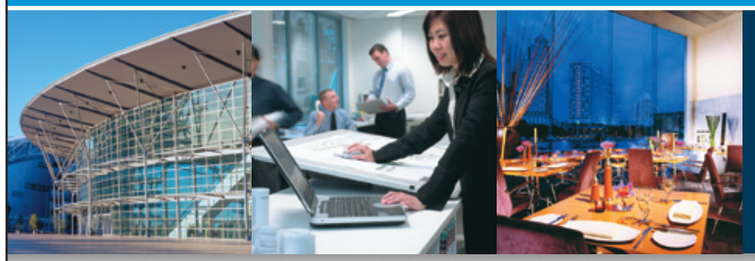

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The views expressed by speakers in the conference, written or verbal, may not represent those of the Hong Kong Institute of Surveyors.

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