Ni Hao
Good Morning, Ladies and Gentlemen

I would like to thank McGraw Hill and China International Contractors Association for organizing this summit. I am honored to be addressing you this morning.

Like everything else about China over the past 25 years, the story of the construction industry is astonishing. In contemplating its future, one cannot help but draw the conclusion that it will be even more astonishing. It is useful to view this in its historical context and to recall that by Q2 of the 15th Century, China was the most developed country in the world and an established international trading nation 70 years before Columbus landed on Hispaniola. By the 1425 or so:

- The population of Beijing was more than 1 million people; 50 times that of London and 1500 times the geographical area
- The magnificent Forbidden City had been built by a workforce of more than 1 million
- The Great Wall had been repaired and extended to 6400km in length
- The Grand Canal had been constructed, linking Beijing in the north with Hangzhou the coast in the south. At 1800km, it remains to this day the longest man-made waterway in the world (Longer than Panama, Suez, St. Lawrence Seaway)

And then China abruptly sealed its borders and turned its back on the world for 450 years. Since 1949, China has developed on a strategically-planned basis. Since market-oriented economic reforms commenced in the 1970s, development has once again gained pace and scale.
When asked to give this address, I reviewed the work carried out by my firm in China over the past 25 years, which is a small sample, but tells a story about where design and construction in China is going.

In the 1980s, we designed hotels. Since then, over 60 have been built, initially to provide for foreign investors and traders. Also, infrastructure projects, including I think the first ever BOT projects--power stations and toll highways in Guandong Province.

***

Clockwise from top left:

1. Hilton Hotel, Shanghai
2. Jiu Zhou Holiday Inn, Dalian
3. Shajiao B Power Station, Guangdong
4. Furama Hotel, Dalian
5. Nantong Hotel, Jiangsu
6. EIE Golf & Country Club, Shenzhen
7. Shenzhen Guangzhou Motorway
8. Mandarin Hotel, Shanghai
9. Sun Oil Plant, Shekou
In the 1990s we designed industrial infrastructure and major urban masterplans.

***

Clockwise from top left:
1. Shajiao C Power Station, Guangdong
2. Baoding Brewery
3. Shunde Development Master Plan
4. Shanghai Stadium
5. E & E Electronics Factory, Guangzhou
6. Beijing Metro Depot Development
7. Tianhe Guangzhou Master Plan
8. ‘G’ Club, Shanghai
9. Shantou Power Station
In the late 1990s we designed office buildings and industrial facilities.

***

Clockwise from top left:
1. Furama Hotel Phase 2, Dalian
2. IBM Facility, Shenzhen
3. Everbright City, Shanghai
4. Citic Square, Shanghai
5. Lippo Center, Shanghai
6. General Motors, Shanghai
7. Tianhe Plaza, Guangzhou
8. Aquatic Center, Shenzhen
9. East Jin Jiang Hotel, Shanghai
In the early 2000s we designed international standard office buildings and high-quality public infrastructure.

***

Clockwise from top left:
1. Chongqing Jiangbei International Airport
2. Fortune Plaza 1, Beijing
3. Commercial Bank, Xiamen
4. Shangri-La Hotel, Pudong Shanghai
5. Fortune Plaza Phase 2, Beijing
6. Shenzhen Citizens Center
7. Bank of China HQ, Beijing
8. Prosper Center, Beijing
9. Jing An North Lot, Shanghai
Currently we are designing more sophisticated infrastructure including Dongzimen Public Transport Interchange, and buildings including China World Trade with SOM, which at 330m will be the tallest in Beijing; and Guangzhou Tower, which at 600m will be the tallest building in the world.

***

Clockwise from top left:

1. Beijing Dongzimen Public Transport Interchange
2. Green Plaza, Beijing
3. K Wah International Center, Shanghai
4. Chao Yang Garden, Beijing
5. New World Plaza, Shanghai
6. Guangzhou TV Tower
7. NAGA Development, Dongzhimenne Street, Beijing
8. Beijing Book Building
9. China World Trade Center, Beijing
…and world-class public facilities, bridges, other transportation infrastructure and other tall and modern buildings.

***

Clockwise from top left:

1. Olympic Aquatic Center, Tianjin
2. Guangzhou West Tower
3. Sutong Bridge South Viaduct, Nantong City, Jiangsu
In all, we have undertaken the design of more than 300 projects in these cities in the past 25 years, which of course is only a tiny fraction of a construction industry where:

- Construction employment has grown from 6.5 million workers in 1980 to 30 million last year
- Gross output has grown from 30 billion Rmb in 1980 to 3 trillion Rmb last year
- There are nearly 1 million engineers and architectural designers
- Last year, close to 3 billion square feet of floor area was under construction . . . and nearly have that put in place.
If it is not already apparent, Beijing will emerge on the world stage in 2008 as a first-rank global city. We are very proud to be working on several breakthrough projects here in Beijing that when completed in time for the 2008 Olympic Games, will be the envy of any capital city anywhere in the world.

***

BEIJING CHINA CENTRAL TV NEW HEADQUARTERS (CCTV HQ)

The total development is 5 813 000ft² (540 000m²) consisting of two main buildings: the CCTV building and the Television Cultural Centre (TVCC).

The new centre combines administration with news, broadcasting, studios and program production - the entire TV process - in a sequence of interconnected activities. This first building is not a traditional tower, but a continuous loop of horizontal and vertical sections that establish an urban site rather than point to the sky. The irregular grid on the building’s facades is an expression of the forces traveling throughout its structure.

It would be a significant structural challenge anywhere in the world, but is especially so as in a highly seismic zone. The second building, the TVCC, includes a hotel, a visitor’s centre, a large public theatre, and exhibition spaces.
The China Central TV headquarters and TV Cultural Center with architect OMA will be an absolutely stunning building. At 230m tall and more than half million square meters, it is a totally new kind of tall building in all respects and pushes engineering technology to its limits.
The new Terminal 3 at Beijing Capital International Airport that we have designed with NACO, Foster and Beijing Institute of Architecture. Design will bring the capacity of the airport to 66 MAP, about the same as Heathrow and 50% more than JFK.

***

Beijing International Airport, Terminal 3

The building structure has been designed on a simple standard module to optimize repetitive construction, minimize on-site learning and to create opportunities for prefabrication and preassembly. The terminal has been designed with few changes of level, short walking distances and quick transfer times. 

Design Consortium: NFA joint venture team comprising NACO, Foster & Partners, Arup and Beijing Institute of Architectural Design
It will provide state of the art facilities, including APM and BHS. Were it not split in two by the taxiway it would have the largest floor area of any building anywhere in the world, a distinction the U.S. Pentagon currently holds. Just as remarkable is that Beijing Urban Construction Group, Beijing Construction Engineering Group, and China State Construction Engineering Company are constructing this project in 42 months with a workforce of 40,000 people on site. We currently have another terminal under construction at JFK, about one tenth of the size and to be constructed in about the same time!

***

Beijing International Airport, Terminal 3
National Swimming Center—or water cube—being built for the 2008 Games. It is the largest Olympic swimming center ever built.

***

NATIONAL SWIMMING CENTRE, BEIJING, CHINA

17,000-seat swimming centre, with a total floor space of over 70,000m2.

The structure of the Water Cube is based on the most effective sub-division of three-dimensional space - the fundamental arrangement of organic cells and the natural formation of soap bubbles. It will be clad in ETFE foil cushions which have excellent insulation properties and will create a greenhouse effect.

A structure based on this unique geometry is highly repetitive & buildable while appearing very organic & random. Also the ductile space frame that is generated from this geometry is ideally suited to the seismic conditions found in Beijing. The building is sustainable & energy efficient. 90% of the solar energy falling on it, is trapped within the structural zone & will be used to heat the pools & interior.

We based the structural design on Weaire and Phelan’s (Professors of Physics at Trinity College) proposed solution to the problem of “What shape would soap bubbles in a continuous array of soap bubbles be?” This problem was both initially posed and tentatively answered by Lord Kelvin at the end of the 18th century but it was 100 years before the Trinity Professors proposed a better one.
• Enclosed within bubble walls modeled on the structure of soap bubbles
• Analyzed, designed, documented and fabricated using state of the art software
• Translucent ETFE pillows weigh 1% of equivalent glass structure
• Sustainable design features include using sun to heat the building and water; uses 30% less energy than conventional; daylighting (50% saved), energy recovery Systems, lightweight structure = less material, especially in a seismic zone

***

NATIONAL SWIMMING CENTRE, BEIJING, CHINA

We developed an analytical program that would automatically model the entire structure in 25 minutes rather than months if modeled manually, analyzing 22,000 members and 12,000 nodes under 190 load conditions. The end result is a highly refined and robust structure like no other.

Twenty percent of the solar energy trapped within the building will heat the pools and the interior area - the equivalent of covering the roof with photovoltaic cells. Covered in 100,000m2 ETFE bubble cladding, this tough recyclable material turns the building into an insulated greenhouse.

With rainfall such a precious commodity in Beijing, water in the centre will be recycled. Even rainwater falling on the giant roof will be collected, stored and re-used.
Last, but not least, one of our major Beijing projects, the Olympic Stadium, with a stunning design in collaboration with Herzog & DeMeuron and China Architecture and Research Group.

***

BEIJIN NATIONAL STADIUM

On completion it will have a capacity of 100 000.

Inspired by randomness in nature, and patterns found in Chinese style ‘crazed’ pottery typically found in Beijing markets, there are, in fact, several layers of patterns that the eye does not pick up on the stadium’s apparently random structure.

The geometry of the bowl was defined using a powerful computer software program. The software is parametric which means many layouts can be generated by altering some of the rules.

It is clad with a series of ETFE panels on the upper surface, with an acoustic membrane on the lower surface. This layer reflects and absorbs sound to maintain the atmosphere in the stadium.
• Geometry defined, using powerful computer software
• Will seat 100,000 people and will host the opening and closing ceremonies of the Olympic Games
• Will be both the most functional and most visually stunning of any Olympic Stadium to date

***

BEIJING OLYMPIC STADIUM, BEIJING, CHINA
But that is not the end of the story. Those of you who were here for the Green Buildings discussion yesterday will have heard from my colleague, Shanfeng Dong, about Dongtan Eco City on Chongming Island, where we are working with Shanghai Industrial Investment Corp. to create the world’s first sustainable city. The aim is to create a development with low energy consumption which is as close to carbon-neutral as possible.

***

Dongtan Ecocity

In August 2005, Arup was contracted to design and masterplan the world’s first sustainable city, Dongtan in Shanghai, China. Our contract is with Shanghai Industrial Investment Corporation (SIIC). In November 2005, we signed a contract to work with SIIC on two further eco-cities.

Dongtan will be a city of three villages. Phase one should be completed by 2010, in time for the World Expo in Shanghai, and will accommodate a population of 50,000, rising to a projected 500,000 by 2040. Dongtan will incorporate many traditional Chinese design features and will feel like a ‘Chinese’ city.

**Sustainability:** Dongtan will be self-supporting, generating all its energy needs, including transport, from renewables and will have zero emissions from the tailpipes of vehicles. Farmland around the city will grow food for the city and there will be nutrient and soil conditioning recycling between city waste and the surrounding land.

**Energy:** The city region will supply the bulk of its energy from wind turbines, bio-fuels and recycling organic material.

**Recycling:** Most of the city's waste will be recycled and organic waste will be composted or used as bio-mass for energy production. There will be no landfill of waste and human sewage will be processed for irrigation and composting.

**Buildings:** Where possible, labor and materials will be sourced locally to reduce transport and embodied energy costs associated with construction. A combination of traditional and innovative building technologies will reduce energy requirements associated with heating and cooling of buildings by up to 70%. Green roofs on buildings improves insulation, water filtration and potential storage for irrigation or waste disposal.

**Transport:** Dongtan will be a city linked by a combination of cycle-paths, pedestrian routes and varied modes of public transport, including buses and water-taxi's. Canals, lakes and marinas will permeate the city, providing a variety of recreation and transport opportunities. Public transport will use innovative technologies, which may include solar powered water taxi's or hydrogen fuel-cell buses.
Here we are in the presence of President Hu and Prime Minister Tony Blair, signing an agreement to undertake this project. The project covers an area almost the size of Manhattan, and the first phase is to be completed for the 2010 World Expo in Shanghai. Its importance is more than just this one project in the growing realization that we must find new ways of development in order to deal with the limitations we are facing on resources and the impact of the prevailing mode of development on our climate, and the economic and social consequences of those things.

***

Dongtan Eco-city

Main Photo Caption: Clockwise from top left, Chinese president Hu Jintao, UK Prime Minister Tony Blair, Deputy Prime Minister John Prescott, Arup Chairman Terry Hill, Peter Head of Arup, and SIIC Executive Director Mr. Ma Chengliang attend the agreement signing for the Dongtan Eco-City in November 2005.
China's 11th Five-Year Plan calls for both continued growth and a more sustainable mode of development. On the basis that the goals of the previous plans have been met, we should be optimistic that this too can be achieved.

China then, having undergone extremely rapid development over the past 25 years, has re-emerged as a major global player in what we hope will become a truly global market and construction industry.

And China is poised to show the way towards more sustainable forms of development that will be critical to all our futures and that of our children.

Thank you.
Xie Xie

***

End of Presentation