CCTV Headquarters, Beijing

A Structural Design Overview

Topics

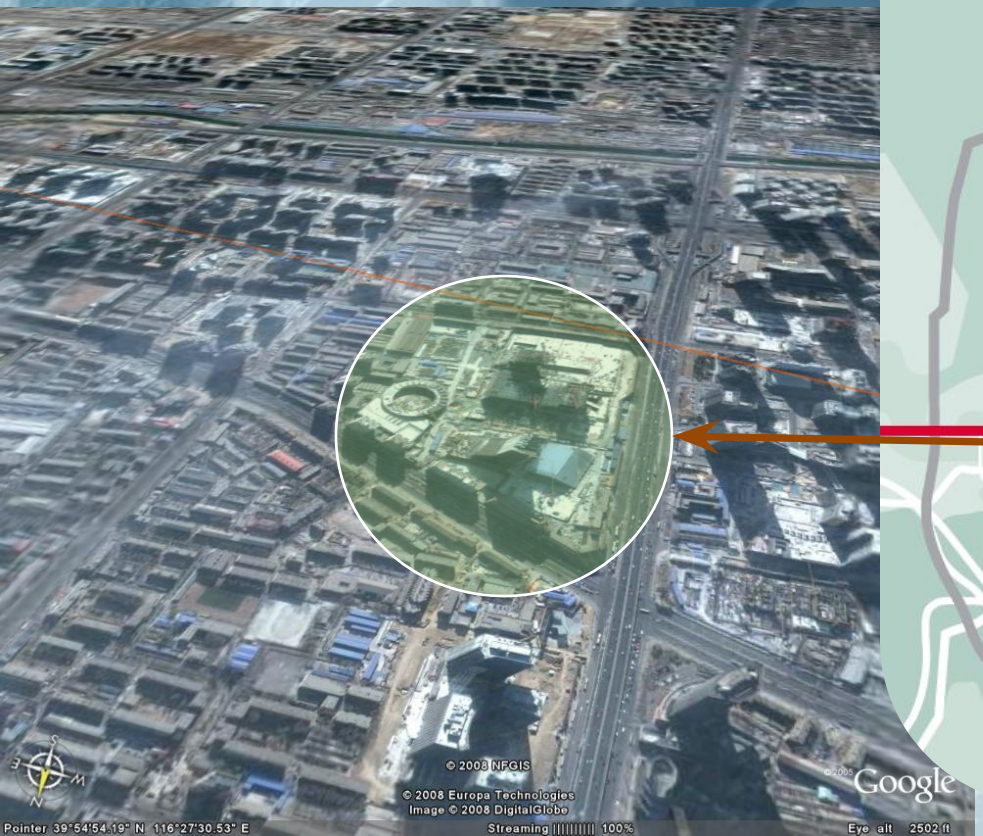
- General Project Details
- Architecture
- Construction Challenges
- Diagrid Framing System
- Miscellaneous Topics
- The Other Buildings
- Conclusion

General Project Details

General Project Details

Location

- In Beijing's CBD (Third Ring Road)
- East of Forbidden City



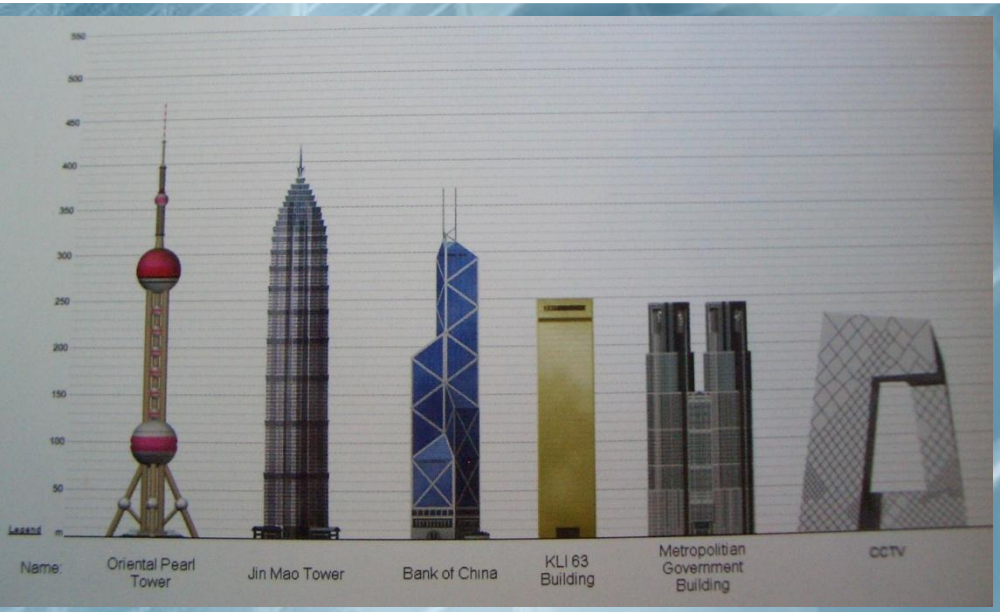
General Project Details

Admin – Site – History

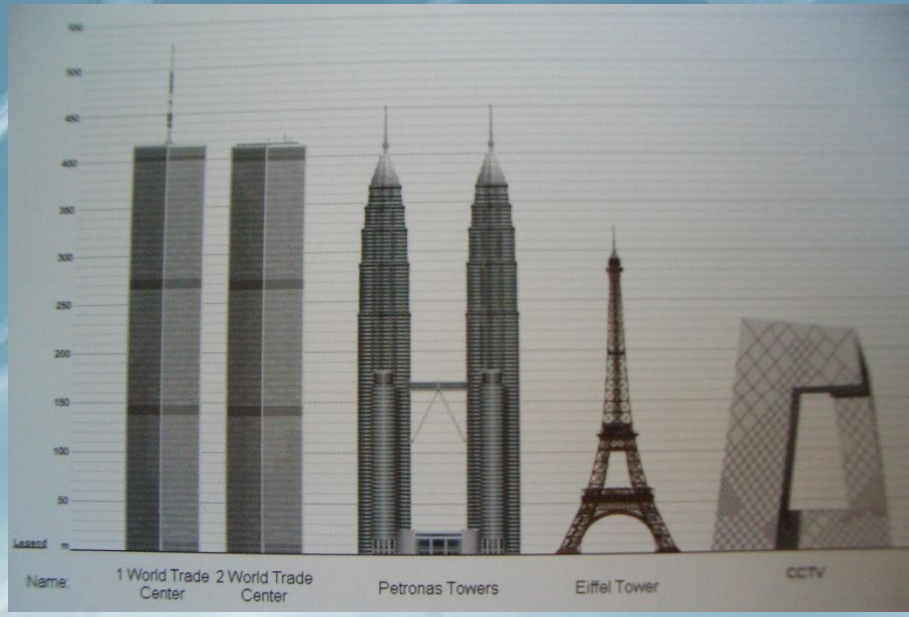
- Architects: Office for Metropolitan Architecture (OMA)
- 10-hectare site
- Two L-Shaped Towers, tallest tower is 230m high
- Total Estimated Construction Cost: €600million
- Will employ 10,000 people

General Project Details

Admin – Site – History (cont.)



Comparing Building Heights in Asia

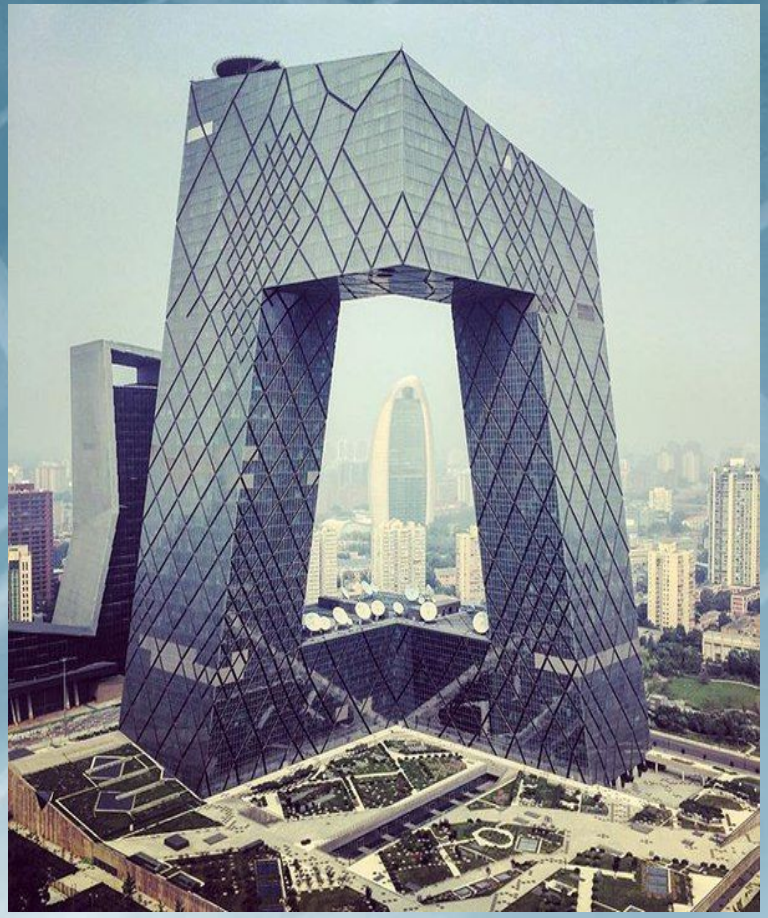


Comparing Building Heights in the World

General Project Details

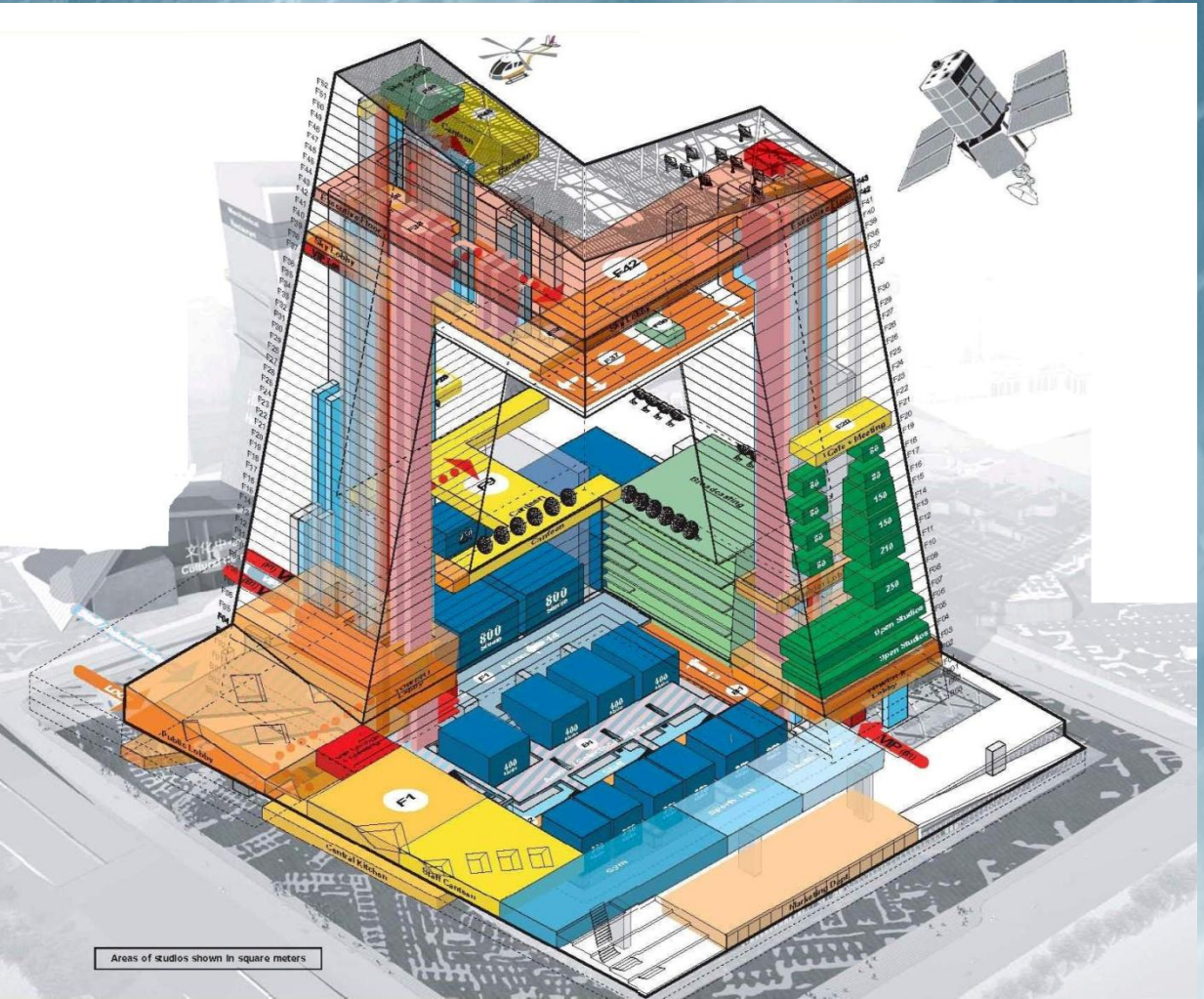
Admin – Site – History (cont.)

- History
  - December 2002 - OMA wins design
  - March 2003 – Project Start (after review)
  - September 2004 – Groundbreaking
  - Mid 2007 – Overhang Construction Underway
  - Early 2008 – Finalizing Construction

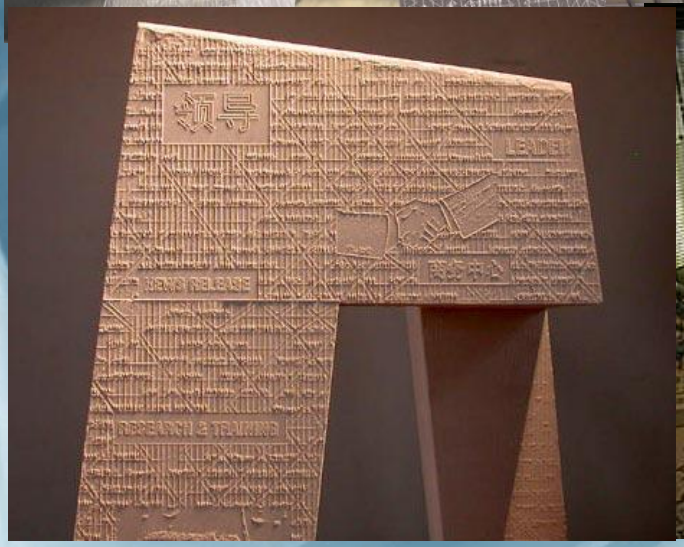


General Project Details

Space Usage (cont.)



Yellow = Canteens
Dark Blue = Studios
Green = Open Studios
Orange = Lobbies (Tower & Sky)
Pale Green = Broadcasting
Light Blue = Sports & Recreation
Red = VIP Areas

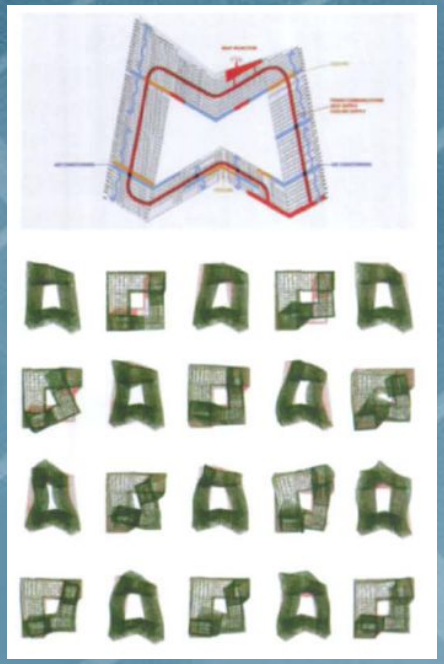


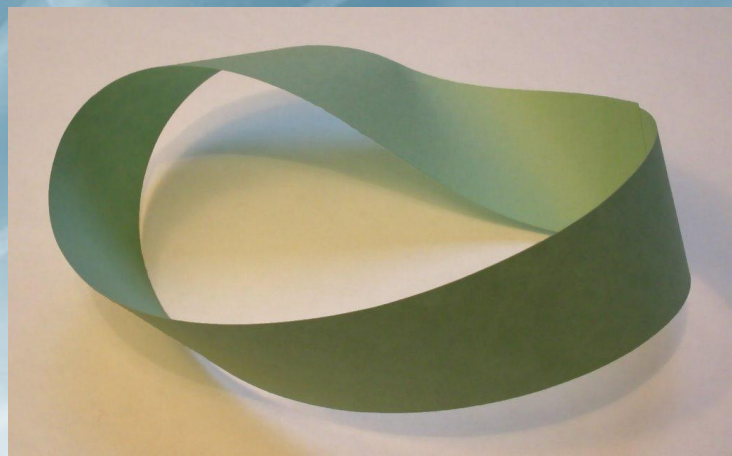
Architecture

Architecture

The Basic Geometry

- Mobius Strip (continuous loop)
- Cantilever Overhang
- Diagonal Structural Grid System
- L-Shaped



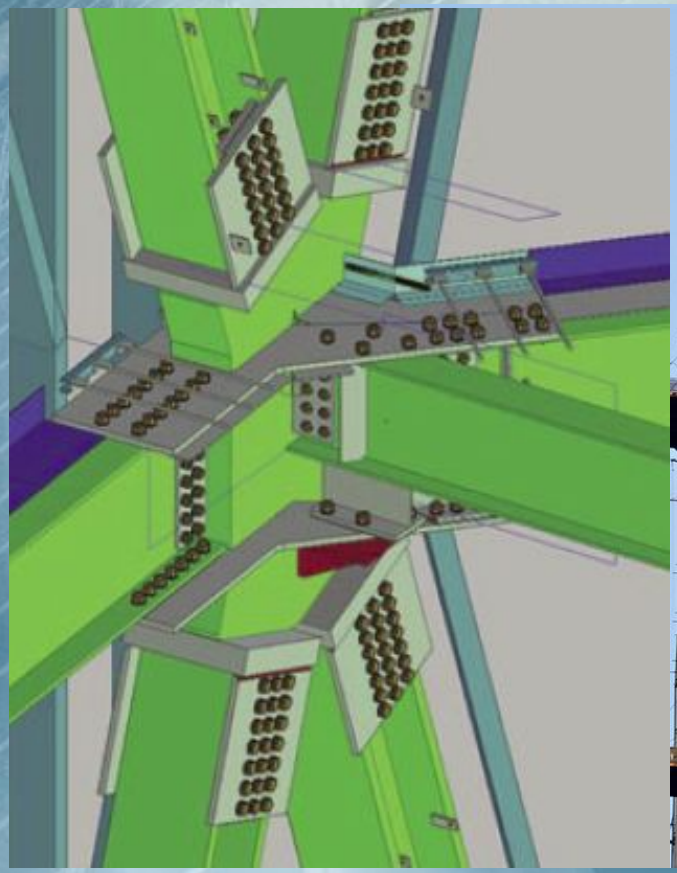


Construction Challenges

Construction Challenges

What kinds of Challenges will this Project face?

- Needs to accommodate 10,000 people, heavy equipment ☐ High service loads
- Beijing is an Earthquake Prone Area (need seismic stability)
- Every building encounters vertical and lateral loads
- Temperature changes, material deformation
- Subsoil Conditions:
  - Pore Water present in great amounts
  - High Settlement Risk



Diagrid Framing System

Diagrid Framing System

What is it?

- Short for *Diagonal Grid System*
- Triangulated structure with diagonal support beams
- Similar to a typical moment frame
- Triangles connected at *Nodes* and *Rings* intersect the nodes
- Combines the benefits of a hollow tube with a truss


Swiss Re, London

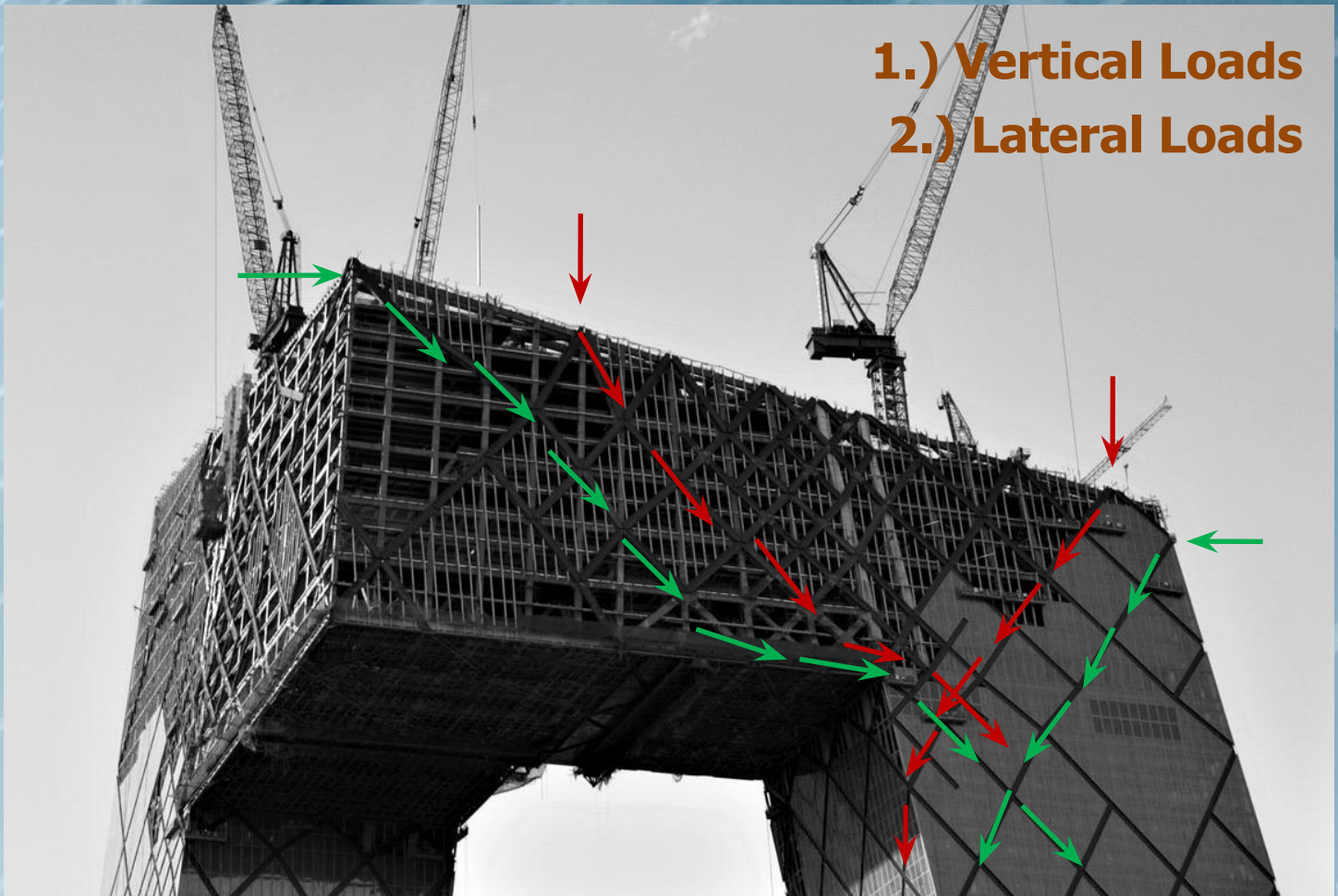
Diagrid Framing System

What is it? (cont.)

- Can be constructed of either:
  - Steel (most common)
  - Timber
  - Reinforced Concrete
- Steel is typical because of high tensile and compressive strengths
- Essentially marrying columns, diagonals and bracings into one system
- Not a new technology, used in early aviation and small-scale structures

Diagrid Framing System

Load Transfer

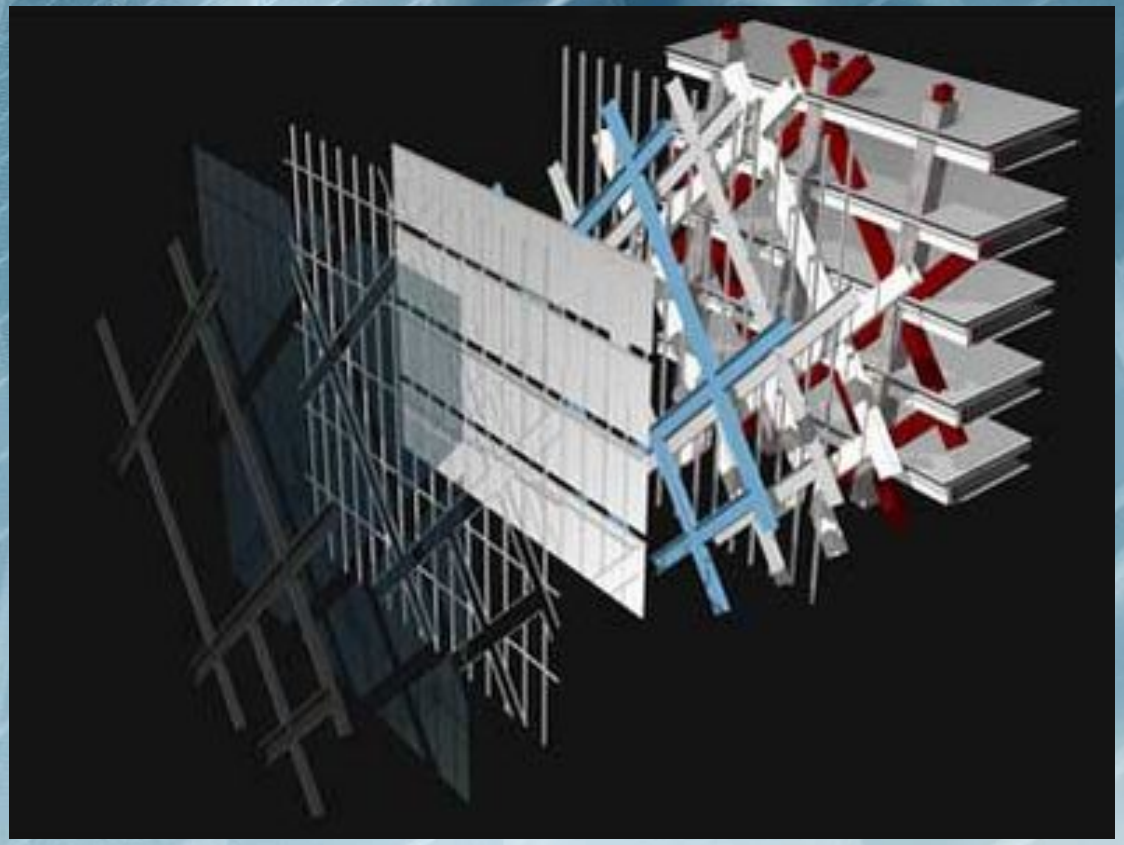


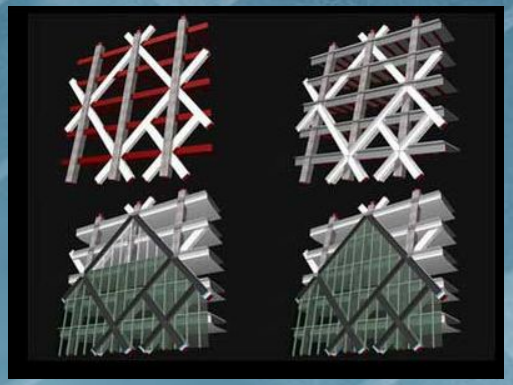
Diagrid Framing System

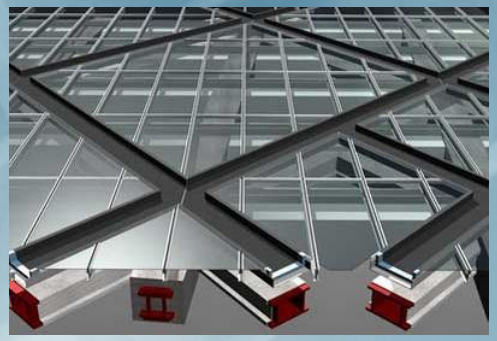
Advantages of this System

Diagrid Framing System

Disadvantages of this System



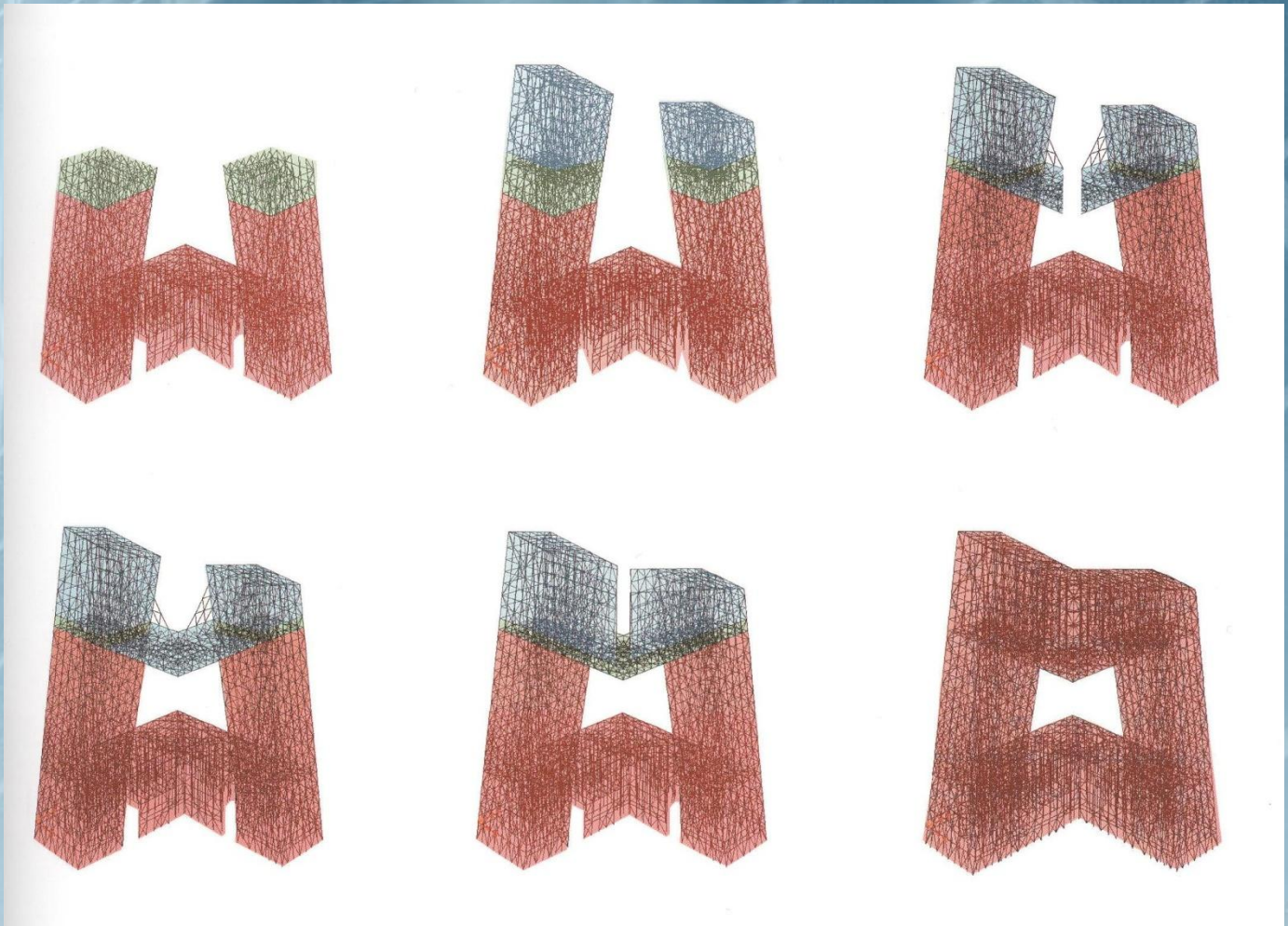




Miscellaneous Topics

Miscellaneous Topics

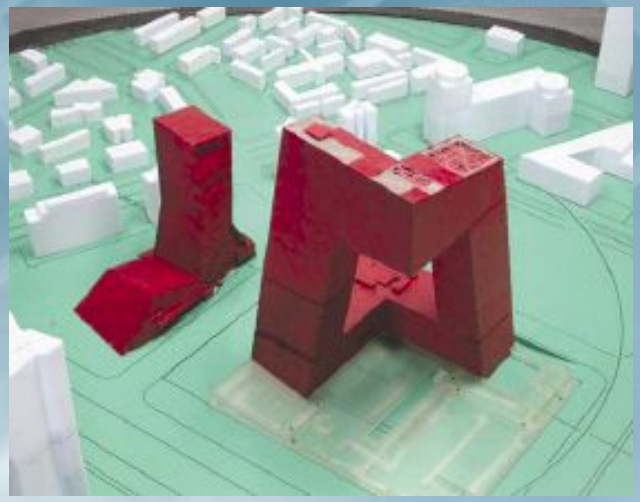
Construction Procedure



Miscellaneous Topics

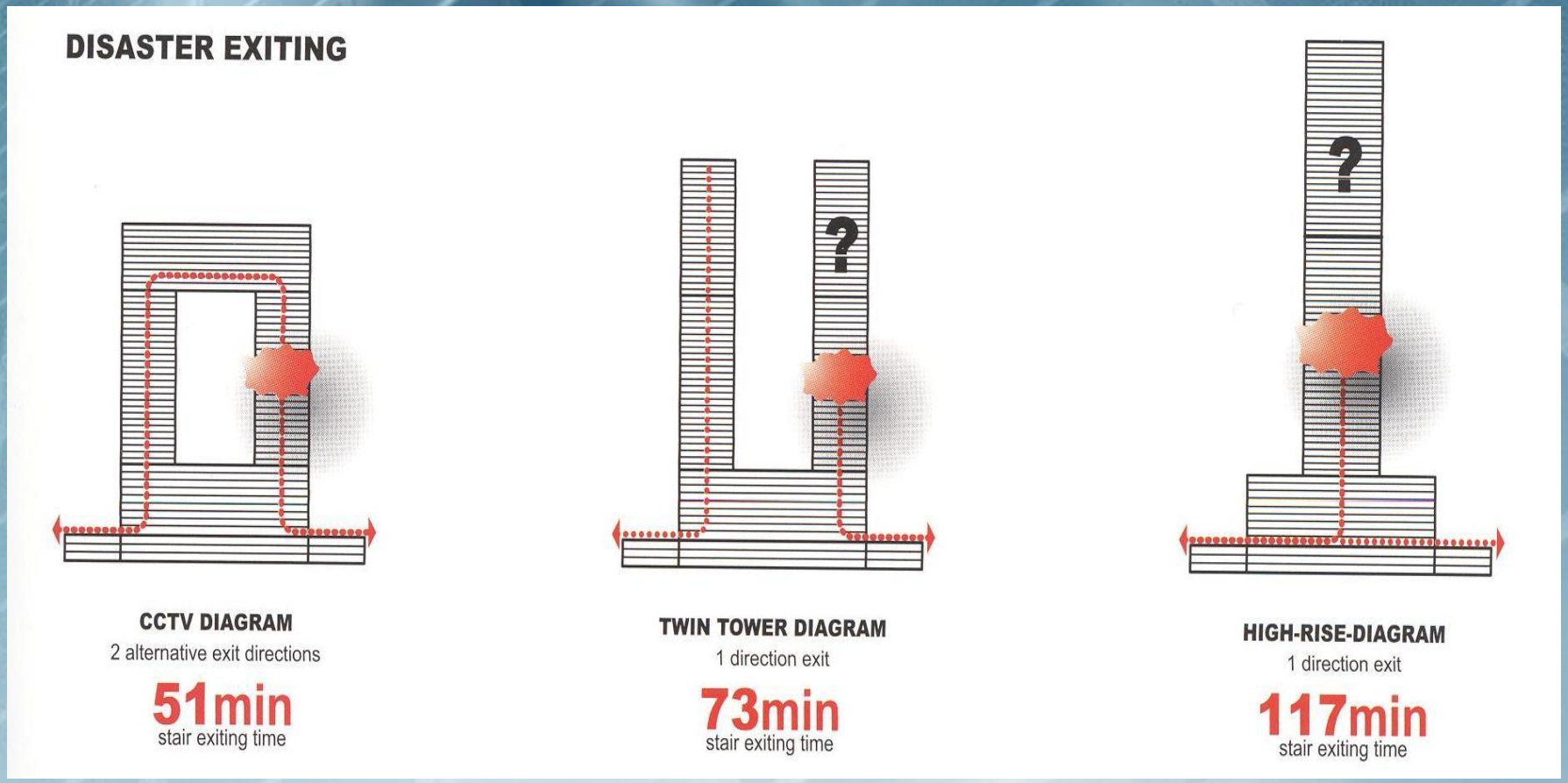
Dealing with Wind

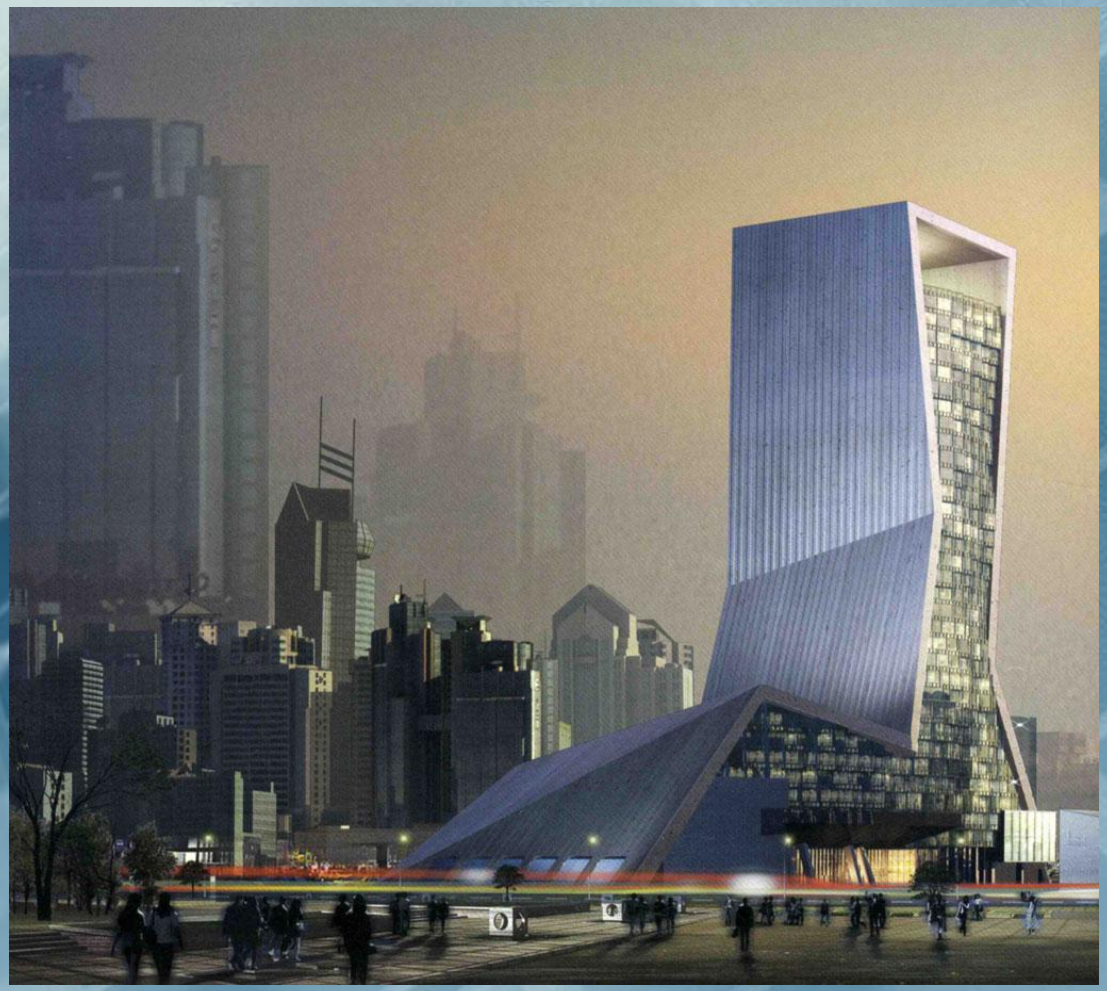
- Wind Tunnel Experiments had to be carried out to assess the severity of Wind Loads
- Building strength against a 100-year Wind was assessed
- Method: Dynamic Analysis using High-Frequency Pressure Integration Method
- 285 Pressure Taps installed on 1:500 Scale Model
- North and West Winds Critical
- Southwest Wind worst for Vertical Loads



Miscellaneous Topics

Emergency Scenarios

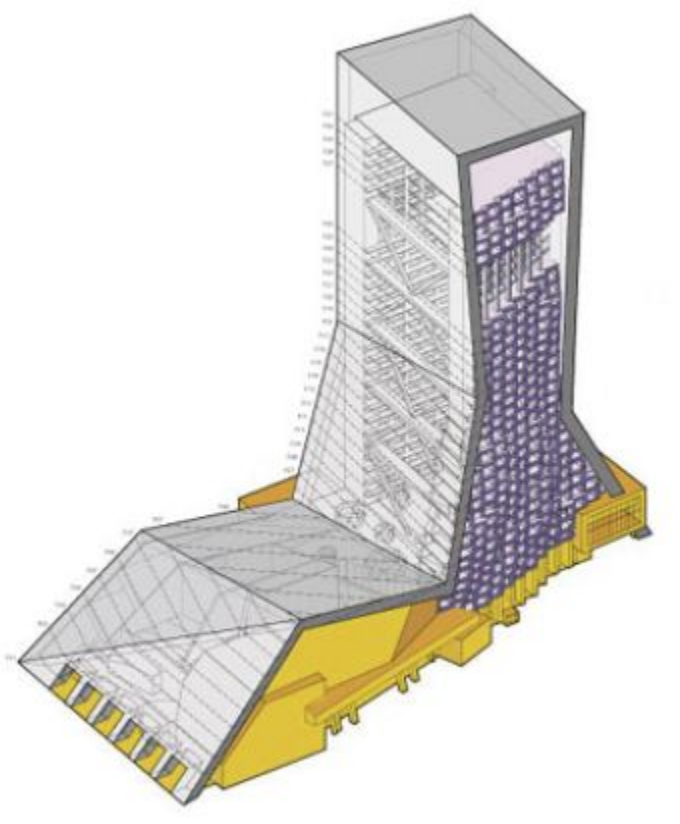


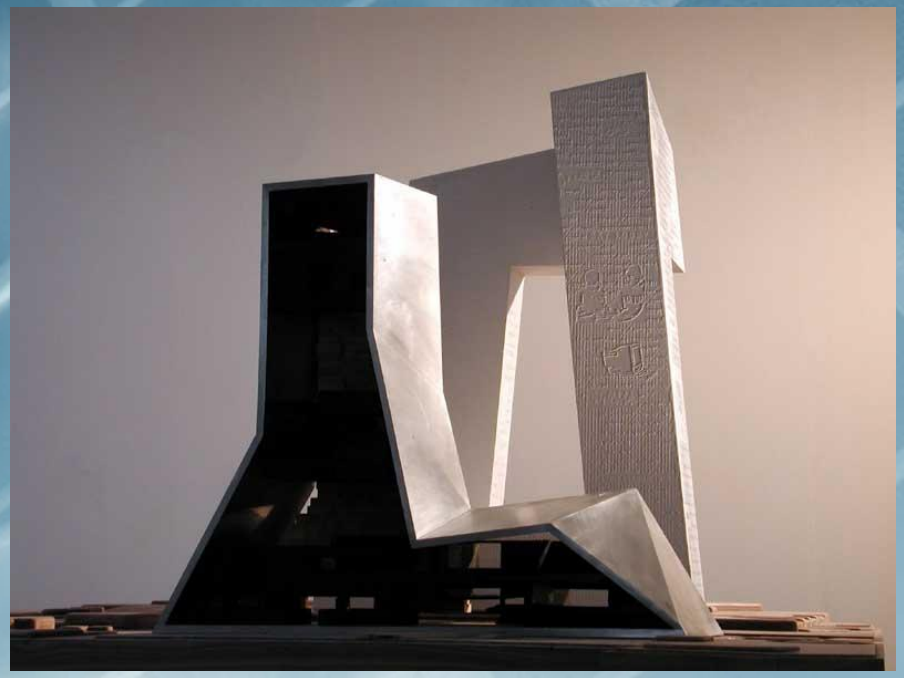


The Other Buildings

The Other Buildings

The CCTV Building





The Other Buildings

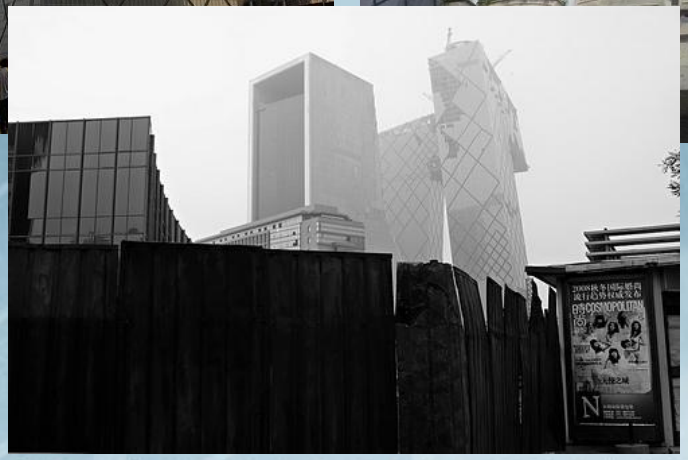
Service Building & Media Park

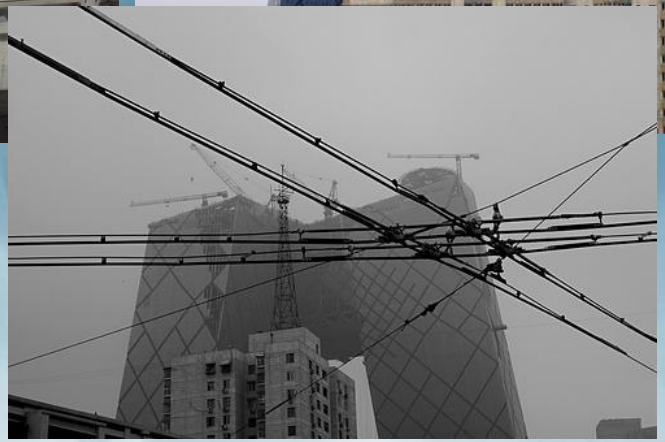
- **Service Building:** Energy Center, Guards Dormitories, Major Broadcasting Vehicle Garages, Fire Control Center

- **Media Park:** Social Gathering place, filming options

Construction Progress

Latest Pictures of the Building





Dated June 2008

Conclusion