



PLAZA 66
SHANGHAI, CHINA

General Information

- Official Name** Plaza 66
- Location** Shanghai, CHINA
- Use** Office, retail
- Structural height / Number of stories** 288m / 66 stories
- Ranking condition in terms of structural height** 52nd
- Status completed** (1994-August 2011)
- Design Architect** Kohn Pedersen Fox Associates PC
- Associate Architect** Frank OY Feng Architects & Associates, Ltd
- Structural engineer** Thornton Tomasetti Engineers
- Structural system** Outriggered Frame System
- Contractor** Shanghai Construction Group
- Client** Hang Lung Development Company, Ltd

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General Information

Puxi borough which is cultural, economic, and entertainment center
Nan Jing Road is major shopping and entertainment road
Major pedestrian thoroughfare



Architectural Information

Over the last fifteen years architects from all over the world have made their way to Shanghai to design buildings. Reforms to the Communist Party in the 1990s turned the city into a flashy, fun, and futuristic place with nightclubs, luxury hotels, and multitudes of high-rises.



Architecture in Shanghai

Many of the most famous people in the field including

- Sir Norman Foster
- Michael Graves and

Firms like

- Skidmore Owens & Merrill
- KPF

have implemented their designs in the city.

Architectural Information



Modern Style in Architecture

This style was introduced around 1900 and describes buildings for which the common theme is the simplification of forms. To accomplish this, the architect uses very few ornamental designs.

The Modern architecture style came about as a response to the availability of new construction materials such as steel, glass, and iron and as a rebellion against the more flashy styles like Victorian and Edwardian Art Nouveau.

Plaza 66 definitely fits this description. Its large tower has been called "a dull glass stump" by the English news source The Guardian Unlimited.

Architectural Information



Form Follows Function

Purpose of the complex is to hold offices, a parking garage, and retail stores

Modern architecture's large geometric volumes create a lot of rentable space

Architectural Information



Obstacle

Balance the relationship between the 66 story tower and the famous pedestrian mall

Five story podium which effectively matches the scale of the historical streetscape
Creates a unified composition



Architectural Information



Intentionally asymmetric podium and rooftop features enliven broad building faces of Plaza 66.

The side elevation of Shanghai's Plaza 66 shows how mall atria, outrigger levels and the rooftop lantern are expressed.



Architectural Information

Must relate the large tower itself to the feeling that the street instills. This was accomplished through the use of almost-primary volumes, a lozenge, almond, cone, and an arc. The result is an architectural energy that reflects the vibrant pedestrian mall.

Architectural Information



Lantern

The buildings have an upward spiral to them like a vortex

The spiral is topped by the massive lantern that is constructed of billowing screens that glow at night

The lantern can be seen from far away and symbolizes the commercial presence of the client

Architectural Information

51-Storey Office Tower
81,400 sq. m

Elevator System
24 elevators
(One elevator provided for 200-225 occupants)



66-Storey Office Tower
78,200 sq. m
2nd tallest building in Shanghai
Tallest Concrete Building

5-Storey Retail Podium
51,700 sq. m
Tenants include Hermes, Louis Vuitton, Chanel, Dior, Celine, and Cartier

3-Levels of Underground Parking
9,000 cars
1,500 bicycles

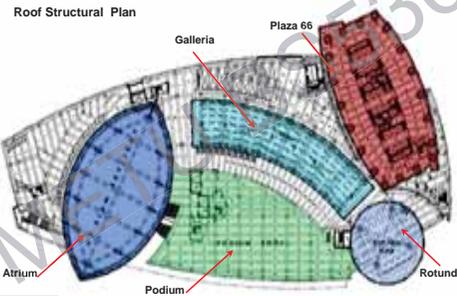
Three Building Complex

Architectural Information

The retail podium includes:



Architectural Information

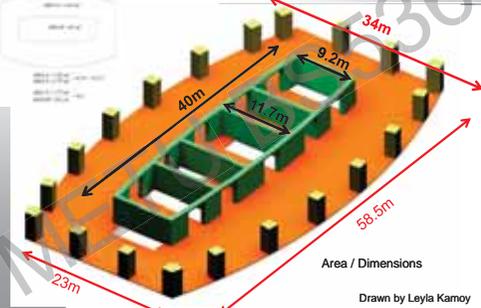


Architectural Information

A large retail mall is housed within the podium to the left of the tower in this plan. The mall includes crescent-and-lens shaped atrium spaces.



Architectural Information



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Outrigger Frame System

Floors

54-56
39-41
24-26

Structural Information

Two-storey perforated concrete outrigger connect the concrete core to the exterior columns at three levels



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Structural Information

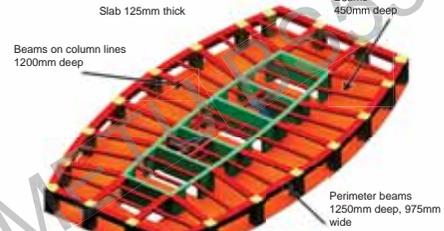
All-Concrete Structure
Tallest concrete building in China
Concrete strengths (locally available)
50MPa cube strength
Steel reinforcing (locally available)
Fy= 335MPa
Allowable drift of the building due to wind loads (local building codes)
Height/650 (0.43 m)
Designed for Typhoon Scale winds
3-5 Typhoons/yr

Structural system

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Structural Information

Typical Floor column, beam, slab

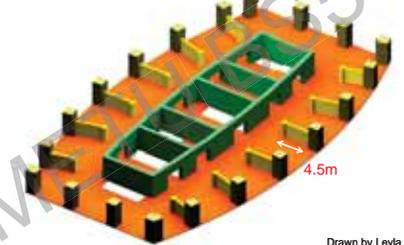


Drawn by Leyla Kamoy

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Structural Information

6 paired sets of outriggers extend from the long faces of the core, enabling all longitudinal perimeter columns to efficiently contribute to the lateral load resisting system.



Drawn by Leyla Kamoy

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Structural Information

The perimeter frame meets the requirements of a special seismic moment frame.

Typical concrete floor beam: beam-and-slab framing occurs on all floors.

Concrete shear wall of outrigger

Concrete core wall

Generous openings in outrigger walls accommodate mechanical equipment

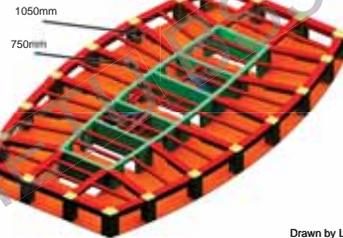
Perimeter column engaged by outrigger.

Drawn by Leyla Kamoy

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Structural Information

Floor under the Outrigger Level column, beam, slab



Drawn by Leyla Kamoy

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Structural Information

Outrigger Level 1 column, beam, slab

Each outrigger wall has four large openings, two on each floor



Drawn by Leyla Kamoy

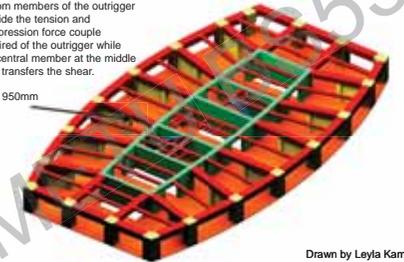
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Outrigger Level 2 column, beam, slab

In this arrangement, the top and bottom members of the outrigger provide the tension and compression force couple required of the outrigger while the central member at the middle floor transfers the shear.

950mm



Drawn by Leyla Kamoy

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Structural Information

Sand and clay filled piece of land

- Settlement
 - Initial predictions over 1m
 - Final prediction of 0.28m
 - Concrete piles
 - 0.8 m in diameter, average 9m corresponding to the different loads under tower and podium areas.
 - 80m maximum
 - Different Settlement Rates
 - Left an un-poured zone (1 year/40%)



Foundation

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Structural Information

- Resistance of the overturning moments caused by the slenderness of the structure
 - Cellular or "honeycomb" structure for stiffness with minimal weight
 - Wall along the site boundary
- High water table;
 - Bentonite slurry-wall method (basement only)
 - four planes of internal concrete cross bracing for support
 - completed from top down
 - explosives used to free bracing struts
- Bamboo scaffolding and formwork used for the remainder of the building

Construction Process

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Structural Information

- Plaza 66 is topped with
 - a dramatic visor cantilevering (12 m) , and
 - a 10-story glass lantern (36.5m) that also houses mechanical equipment and a three-story club room.



Lantern



The presence of lantern steel framing can be detected through translucent glass that surrounds it, both inside and out.

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Structural Information



For construction convenience, steel framing supports the visor and lantern. Two planes of beams and columns are trussed together as horizontal rings and vertical frames, stabilized by shallow diagonal braces.

Used Some Structural Steel In the lantern crown on top of building

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