**JIN MAO TOWER**

**Official Name:** Jin Mao building  
**Former Name:** Jin Mao Tower  
**Location:** Shanghai, China  
**Building function:** Mixed-use  
**Architectural height:** 448 feet  
**Architectural designed floor:** 50  
**Rooms above the ground:** 88  
**Structural roof:** Steel truss  
**Architect:** Bruce M. Smith from Skidmore Owings and Merrill  

**Structure:**  
1. Triangular membrane with super columns  
2. Smith outrigger trussed system  
3. Oral Biquadratic Conical outrigger system  

**Building Vertical:**  
- There are 81 elevators in Jin Mao Tower  
- Office zones are served by 36 elevators in five zones.  
- A hotel express shuttle elevator bay  
- An observation deck served by 2 grading, 8 service elevators, 3 jet elevators for the hotel  

**Structural system:**  
- The composite structural system for the Jin Mao Tower was designed to resist typhoon winds and earthquake loads through four critical conditions while providing a very slender tower to fully utilize the office architecture.  
- The structure of the tower includes:  
  - 536-foot-tall octagonal central reinforced concrete core, linked by eight mega columns made of reinforced concrete by Structural Steel Engineers,  
  - outrigger trusses on each level, all 480 ft. or 148 meters, reinforced smooth, 9.5 inches thick  
- The outrigger system should be designed, engineered, and constructed to interact thoroughly with the various components of natural environments.

**Core:**  
- The core houses the primary building service functions, including elevator lobbies, mechanical/electrical/mechanical core, and washrooms.  
- The 6 heavily reinforced outrigger frames, each with composite mega columns,  
- The outrigger trusses between levels 65-87 engage the 3D structural steel core/caps system.  
- The outrigger truss system which frames the top of the building between level 86 and 87 engages the tower  
- The outrigger trusses are identical between levels 65 and 87.  
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**Megacolumns:**  
- The composite mega-columns vary from 3000 x 3000 mm at the foundation, to 3000 x 3000 mm at level 87.  
- The concrete height for mega-columns vary from 4 to 8 meters.  

**Tower:**  
- The building's major tenant is the five-star, 550-room Shanghai Grand Hotel, which occupies floors 68-87.  
- The hotel's main entry is on the 58th floor.  
- The tower has an aspect of 9.2:1 when considering the full building height, 3.1:1 to the last fully occupied floor.  
- The following page is a section drawing of the tower system on the hotel levels, illustrating the two different service core areas on the tower, illustrating the two different service core areas.

**Outrigger Truss:**  
- The outrigger truss system includes outrigger columns and outrigger system.  
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**Supporting:**  
- The support system for the outrigger trusses is a steel frame structure.
Pinned joint

- The design to control building behavior resulted in the use of pinned columns and moment frames.
- The trusses could also be modified during the normal construction process allowing the members to be pinned at the specified floor of floor they needed to function as rigid floor for permanent use. This allowed the trusses to act as an anchor for extended floor of time during handling. As a result, the trusses were built in very soft rubber strips due to their movements.

Concrete structural levels

- BS536
- METU

Thermal expansion/contraction

- It is important to ensure that all units are correctly aligned and secured to prevent differential movement of the building structure.
- Some of the advantages of this system include:
  1. Ability to assemble units in parallel with high precision.
  2. Lower field fabrication cost as units can be fabricated on site as they are transferred to the structure.
  3. Solid structural design with a simple, consistent fabrication process.

Curtain wall

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