



## **A Review of World's Tallest Skyscraper – The Burj Khalifa, Dubai**

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### **ABSTRACT:**

The BURJ KHALIFA is not simply to be the world's highest building but it is world's highest aspirations having final height of 828 meters and iconic structures of dubai as well as world. These kind of sky scrappers like TAIPEI, WORLD TRADE CENTRE, PETRONUS TOWER are example of engineering excellence. These structure shows how engineering can go beyond our imagination and shows that with the help of engineering and determination we can construct HERITAGE structures of modern era. All though these structures are very costly and construction is very tough but it shows how we develop in our civic amenities. Design, detailing, architecture, construction and all other parameters can lead us towards the construction of BURJ KHALIFA and many such others exceptional sky scrappers.

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**KEYWORDS:** Burj - Khalifa, Global icon, Form work, Case Study.

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### **I. INTRODUCTION**

A building that shatters all previous height record at 828m – a team of 90 SOM designers and engineers combined cutting edge technology and culturally influenced design to create a global icon that will serve as a model for future urban centres. While heights may be the obvious attribute that sets Burj Khalifa apart, the architectural, engineering and interior design is unparalleled.

Aesthetically, the Burj Khalifa is a brilliant shared of glass piercing the Arabian sky. Three main shafts arranged in a Y shape form it. Their setbacks taper in a spiral pattern until the Burj Khalifa becomes a spire in the sky. Burj Khalifa set a new record for vertical concrete pumping for a building by pumping to over 460 meters. The construction has required an estimated 330000 sqm of cement, 39000 tons of steel rebar and 142000 sqm of glass. The foundation slab of the tower is 80000 sq.ft in size and piling over 50m deep. In just 1325 days since excavation work started in January 2004, Burj Khalifa became the tallest free- standing structure in the world.[1]

- Record for highest installation of an alluminum and glass façade at height of 512m.
- 45000 tons of concrete for foundation it self which is equivalent to 18 olympic sized swimming pools.
- Towee features world's fastest elevator at speed of 18m/ sec.

#### **A. Foundation and site condition:**

The tower foundations consist of a pile-supported raft. The solid reinforced concrete raft is [4] 3.7m thick and was poured utilizing C-50 self-consolidating concrete. The raft was constructed in 4 separate pours and each raft pour occurred over at least a 24-hour period. 194 bored cast-in-place piles support the tower raft. The piles are 1.5 m in diameter and approx. 43 meter long with design capacity of 3000 tones each. The ground water in which the Burj Khalifa sub structure is constructed contains concentrations of unto 4.5 per-cent, and sulfates of unto 0.6 percent. Hence they are the primary consideration in designing the piles and raft foundations durability. Due to present aggressive conditions caused by the extremely corrosive ground water condition, they added corrosion inhibitors to the concrete mix. The concrete was also design as fully self-consolidating concrete with a slump flow of 675 +/- 75mm.

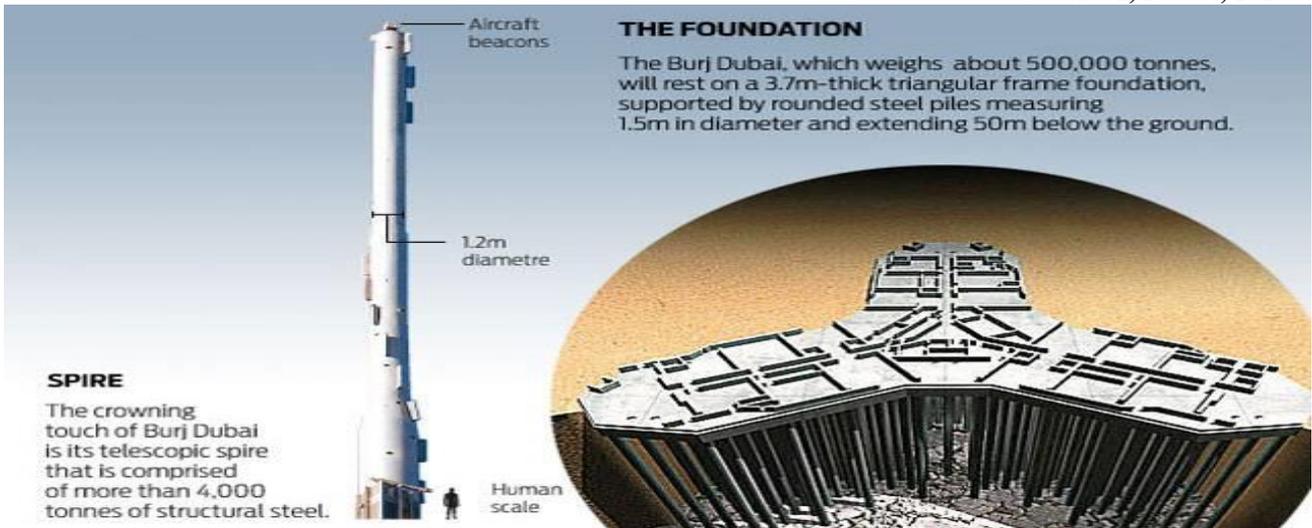


Figure 1. Foundation Details[4]

**B. Structural System :**

- Burj Khalifa has “refuge floors” at 25 to 30 storey intervals that are more fire resistant and have separate air supplies in case of emergency.
- “Y” shaped design helped to reduce the wind force on the tower.
- The structural system can be described as a “BUTTRESSED” core.
- The setbacks are organized such that the tower’s width changes at each setback.
- Concrete plays a very important role in making structures stable and sound in load transferring.

**C. Structural analysis and design :**

- The centre hexagonal reinforced concrete core walls provide torsional resistance to the structure.
- The concrete wall strength ranges from C80 – C60 cube strength and utilises portland cement and fly ash.
- The wall and column sizes were optimized using virtual work LA GRANGE multiplier methodology.
- Thickness of perimeter wall was kept 600mm to avoid shrinkage in concrete.
- A high performance cladding system was employed to withstand extreme temp. during summer.
- Primary material includes reflective glazing, aluminium and textured stainless steel spandrel panels.

**D. Interior Design :**

- The interior was decorated by George Armani’s design.[2]
- The hotel includes exclusive corporate suits, business centers, for luxurious pools and spa and observation platform and fitness center measuring 150000 sq.ft.
- An zero entry swimming pool is located on 78 floor of tower.
- 160 guest room and 900 Burj Khalifa residency along with fine dining restaurant on level 122.



Figure 2. Interior Of Burj Khalifa[1]

**II. CONSTRUCTION HIGHLIGHTS**

- Over 45000 cubic meter of concrete was used for concrete and steel foundations.[4]
- Construction has taken 22 million man hours.
- The vast project involves more 380 skilled engineers and on site technicians.

- The total weight of aluminium used in Burj Khalifa is equivalent to that of 5 A 380 aircrafts.
- The amount of rebar used for tower is 31400 metric ton laid end to end these would extend over quarter of way around the world.
- The total length of stainless steel bull knox fins are 293 times the height of EIFFEL TOWER in PARIS.
- The concrete pressure during pumping to this level was nearly 200 bars.
- The Burj Khalifa tested for winds up to 125 miles/hour.

### III. CONSTRUCTION RECORDS

- Tallest building in world.[4]
- Tallest freestanding structure.
- Highest numbers of storeys.
- Highest occupied floors
- Highest outdoor observation deck.
- Elevator with longest travel distance.
- Tallest service elevator.

### IV. COMPARISON

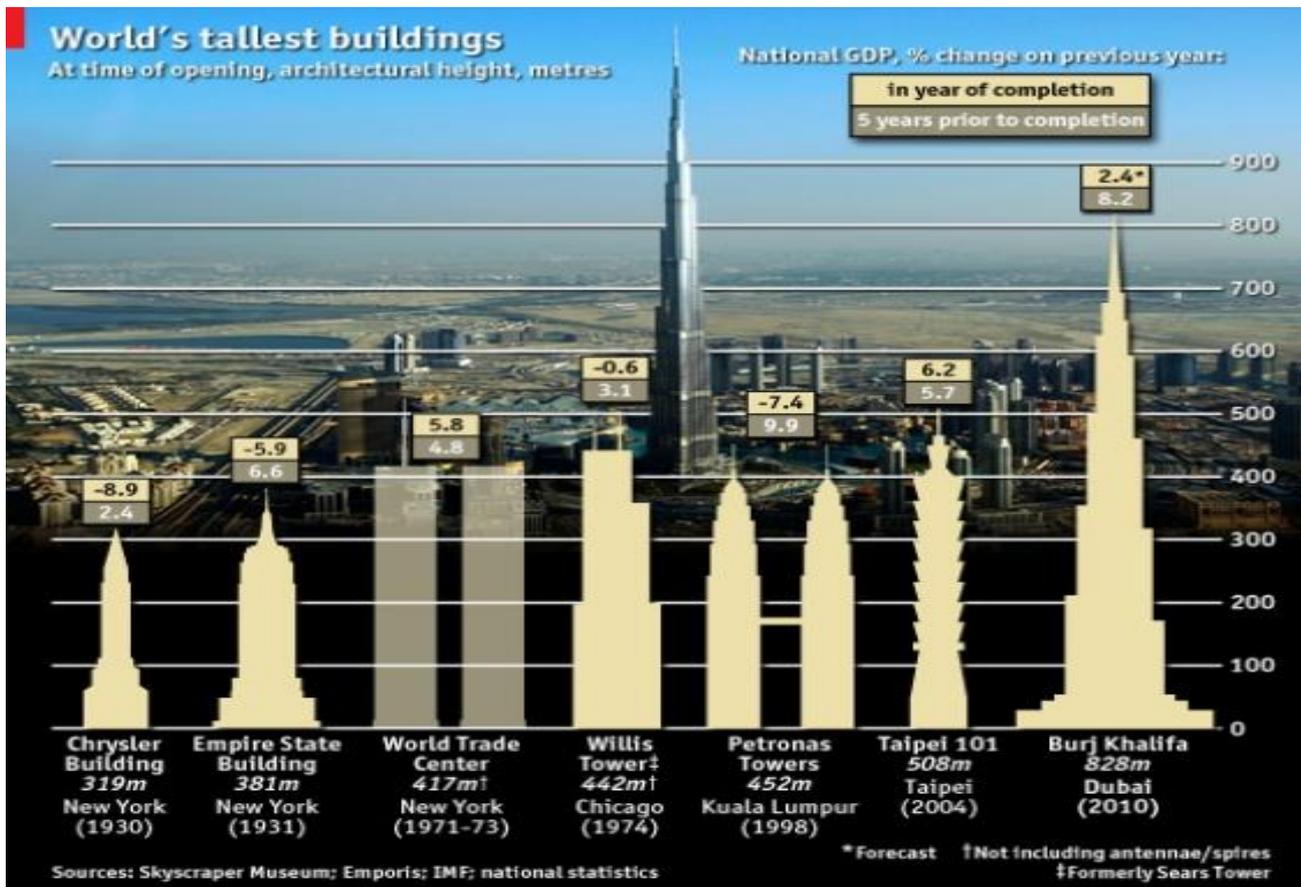


FIGURE 3. COMPARISONS WITH STRUCTURES[3]

### IV. CONCLUSION

We can say that Burj Khalifa is real wonder of new era. Country like Dubai can generate lots of money by constructing these kinds of structures. Although these structures are very costly but it is helpful for country's GDP and it is good for tourism development. It is good for construction industry and for a skill development of civil engineering fields. These structures are very difficult to construct and it is real challenge for engineers. We as engineers prove our selves by creating such kind of structures. Along with Burj Khalifa petronas tower, Burj al Arab is very advance and modern structures.

### REFERENCES

- [1] [http://flashydubai.com/images/burj\\_khalifa\\_pics\\_18.jpg](http://flashydubai.com/images/burj_khalifa_pics_18.jpg)
- [2] <https://www.google.co.in/search?rls=en&tbm=isch&q=interior+of+burj+khalifa&ei=XjMeVY21E5SfugSnkIC4B>
- [3] [http://www.som.com/projects/burj\\_khalifa](http://www.som.com/projects/burj_khalifa)
- [4] <https://www.youtube.com/watch?v=zKJNZTS1Gco>
- [5] [www.google.com](http://www.google.com)