

# A Review on Kingdom Tower

<sup>1</sup>J. Sree Naga Chaitanya, <sup>2</sup>Dr. K. Chandramouli, <sup>3</sup>K. Divya, <sup>4</sup>Sk. Siddaiah

<sup>1</sup>Assistant Professor, Department of Civil Engineering, NRI Institute of Technology, Visadala (V), Medikonduru (M), Guntur, Andhra Pradesh, India

<sup>2</sup>Professor & HOD, Department of Civil Engineering, NRI Institute of Technology, Visadala (V), Medikonduru (M), Guntur, Andhra Pradesh, India

<sup>3</sup>Assistant Professor, Department of Civil Engineering, NRI Institute of Technology, Visadala (V), Medikonduru (M), Guntur, Andhra Pradesh, India

<sup>4</sup>B. Tech Scholar Department of Civil Engineering, NRI Institute of Technology, Visadala (V), Medikonduru (M), Guntur, Andhra Pradesh, India

## ABSTRACT

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This paper shows that, It is a skyscraper building project that has been put on hold. It will be the first structure in Jeddah, Saudi Arabia, to reach a height of one kilometer (3,281 feet), and it will serve as the centerpiece of the first phase of the Jeddah Economic City development and tourist destination. It is also known as Jeddah Tower.

**Keywords:** Jeddah Economic City, Kingdom Tower, Skyscraper, And Jeddah Tower.

## I. INTRODUCTION

The structure is intended to reach a height of at least 1,008.2 metres (3,308 feet) (the exact height is being kept private while in development, like the Burj Khalifa). Jeddah Tower, which is 180 metres (591 feet) taller than Dubai, United Arab Emirates' Burj Khalifa, would be the world's highest skyscraper to date at around one kilometre. The 50-hectare (120-acre) site for Jeddah Tower, together with the nearby structures, will be the first phase in the three-phase development of Jeddah Economic City. A three-phase project with a 5.2 km<sup>2</sup> piece of beachfront land that had not yet been developed was suggested (2.0 sq mi). The region is around 20 kilometres (12 miles) north of Jeddah, a port city.

HOK Architects created the design for Jeddah Economic City, which is anticipated to cost at least SR75 billion (US\$20 billion) and take ten years to complete.

## II. DESIGN

### External form:

The kingdom tower's triangle form and sloping exterior are designed to lessen wind loads, and its large surface area makes it perfect for housing units.

The 23 hectare (57 acre) region around Kingdom Tower will be known as the Kingdom Tower Water Front District and will include various residential and commercial complexes, as well as a shopping mall, with the Tower Site alone taking over 500000 m<sup>2</sup> (2,381,955 Sq. ft).

Much of the intention of the kingdom tower is to be symbolic as well as to raise the building land value rather than its own profitability, similar to many other extremely tall skyscrapers, such as the kingdom centre in Riyadh, which is generally considered to have sparked the recent significant commercial developments nearby in the district of Olaya. Since then, construction work has been stalled, partially due to the COVID-19 pandemic, and as of February 2023, it is uncertain if or when the tower will be finished.



Fig-1: Elevation of Jeddah Tower

#### Elevators:

There will be 12 escalators, 59 elevators overall, five of which will have multiple decks, in the building. The Finnish business Kone is the manufacturer of the elevators. Moreover, it will contain the world's tallest observation deck, which will be accessible via high-speed elevators that can move up to 10 metres (33 feet) per second (36 km/h or 22 mph) in both directions. Since the air pressure is over 10 kPa (1.5 psi) lower at 914 m (3,000 ft), or 10% lower than at ground level, the elevators cannot go much quicker because doing so could make passengers queasy. So that the wires are not too heavy to handle, they must also be effective.

No elevator will go from the lowest to the highest occupied floor in Jeddah Tower, however there will be three sky lobbies where transfers can be conducted. Although there has been no official disclosure of the number of floors, Smith said during a television interview that Jeddah Tower will have around 50 more floors than the Burj Khalifa, which now has 163 inhabited levels. This suggests that Jeddah Tower will have more than 200 storeys.



Fig-2: Elevators

#### Internal systems:

Environmental Systems Design, Inc., a Chicago-based company, will offer Tele data, audio/visual, security, fire protection, and acoustics engineering as well as mechanical, plumbing, electrical, and those for fire protection. Geotechnical engineering, as well as some ground-level site work like parking and transportation engineering, will be handled by Langan International. This includes designing the proposed 3,000–4,700 car underground parking garage that will be situated close to the tower but not underneath it in order to prevent

terrorism. Langan also created the foundation for the tower, which had to be able to hold the structure despite subsurface circumstances that were less than ideal, such soft rock and permeable coral, which may cause the piles to settle.

#### Economic viability:

With the aim of functioning as a largely self-sustaining organism and approaching the idea of a "vertical city," the structure is planned to have a significant quantity of retail in addition to a wide range of other distinctive services.

#### Canopy evolution:

A canopy is an overhead roof else a structure over which a fabric or metal covering is attached, able to provide shade or shelter from weather conditions such as sun, hail, snow, and rain.

The final design shows three extended, softly curved canopies that cover the horizontally to protect parking ramp entries.



Fig-3: Canopy evolution

### III. REASONS FOR SELECTION OF Y-SHAPE

- A tapered Y shaped plan was chosen which allowed the spreading of the base of the tower.

- This allowed the structure to maintain a reasonable 10:1 height to width ratio.
- In the 'Y' shape, every element can participate in resisting both gravity and lateral loads.



Fig-4: Jeddah tower shape

### IV. MATERIALS USED

Mainly two R.C.C materials will be used in this construction.

1. Concrete
2. Steel

In addition to the concrete and steel, the other materials are used. They are:

- Silicone
- Aluminium
- Glass
- High performance concrete (HPC)
- Low permeability
- High durability
- It includes fly ash and Portland cement.
- For reducing cracks, due to high temperature concreting is done only at night.

- Two largest concrete pumping machines in the world which are used for this purpose.
- Approx. 80000 tons of steel will be used in this construction.

#### Foundation detail:

- After the geological investigation, it was clear that piled foundation would be appropriate for the tower.
- The pile depths range from 45 m at the wings to 105 m at the centre of the tower.
- The raft has a thickness of 4.5m at the centre area and increases to 5m at the ends of the wings.



Fig-5: Foundation details of Jeddah tower

#### Balconies in a Kingdom tower:

- The balconies in this type of building are not very common.
- However, this design includes balconies for a variety of reasons. First, weather conditions in Jeddah are tolerable.
- At the highest levels of this tower, reduced air temperatures and increases wind speeds.

#### V. CONCLUSION

Finally, the construction of this tower proves that height does not matter any civil engineering construction. Projects of the nature of kingdom tower will create a future jobs and opportunities, and will become the central piece of a new urban centre. It will be one of the unique tallest buildings in the world. For rising such a city in the sky, several new techniques have been used. The buttressed core structural system has made a great change in the structural system of skyscrapers.

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