

JEDDAH SKY TOWER

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Abstract

This work proposes an iconic landmark for Jeddah presented in a Sky Tower that would possess a symbolic, aesthetic and historical value. In this work, three case studies were evaluated. Based on the case study analysis, the estimated gross floor area for the sky tower is 23607 m². The sky tower is comprised of several zones such as main lobby, commercial area, cultural area, amenities, sky pod, offices rental and administration. Furthermore, in this work, three sites were proposed for constructing the sky tower. Based on site evaluation analysis, site 3 was selected as the proposed development site, as it had attained the highest evaluation score of 93. This sky tower would bear recreational facilities for unforgettable experiences creating a "sense of place" for Jeddah as well as boost its tourism attraction. Jeddah Sky Tower would reflect the beauty, the cultural and innovative ingenuity and the social richness of Jeddah acting as a high profitable enterprise influencing a variety of visitors to approach.

Keywords-- sky tower, design, architecture, iconic, Saudi Arabia

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INTRODUCTION

The need for shelter was the first step since the beginning of the architectural industry throughout the ages, which amplified and flourished with the relative human development [1]. Architecture is a key component in the community that guides the design, use and maintenance of the built environment, bringing together the arts, ecology, science and technology from buildings, hospitals, schools, universities, factories, businesses, roads and government spaces [2]. Architecture has been promoted from just a construction function to wider aspects through globalization. It has encouraged architects to develop exotic designs that enhance the publicity of a town with a more appealing and acknowledged picture to become a tourist destination, cultural hub, business district, and so on [3].

Consequently, iconic architecture produces a separate and recognizable picture of the town. It represents the identity as well as the particular aesthetic or symbolic or historical values connected to a place, making it famous as a construction in the industry between architects, planners, technicians and the public [3]. Iconic structures are strong instruments for marketing towns to become highly photogenic tourist destinations and an arch tourism fuel to create advertising and attract tourists [4]. Therefore, the image of an iconic building could usually turn to a symbol of the new identity of the city, giving them a visible distinction and positioning themselves as destinations, for example, how the Burj Khalifa was a symbol of Dubai [5].

Towers have been used throughout history to either honor important events or establish particular points in a certain location [6]. This vertical structure provides architecture a more elegant and pleasant glance from an artistic point of view [7]. Jeddah is the capital of Saudi Arabia and it one of the most visited places around the globe. Jeddah serves as a tourist spot for visitor of Makkah and it is also a port city with commercial hub for tourist. Therefore, this work proposes the development of an iconic landmark, Jeddah Sky Tower in Jeddah's skyline boosting Jeddah's tourism by creating an entertainment hub with a variety of recreational facilities and a sky tower overlooking the city.

CASE STUDIES

In this work, three case studies were analysed . The case studies

selected are:

- Toronto CN tower
- Blossoming Dubai Tower
- Taiwan Tower

Toronto CN tower

Toronto CN tower is located at Toronto, Canada (Figure 1). It was designed by architect John Andrews. This building has an site area of 159000 m² and gross floor area of 167000 m². The structure of this tower is comprised of tower, glass floor, pod, revolving floor and exterior elevator. It was build using futurism material such as glass, steel, concrete and reinforced concrete. The sky pod is 7 stories and consists of indoor and outdoor observation decks and a revolving restaurant. The tower is backed by a Y-shaped foundation, with each side gracefully widening to blend into a main hexagonal nucleus. The tower includes fast lifts, double sheet, armor-plated windows, a rotating café and viewing places at the top of the tower. This building has several facilities such as sports center, heritage center and convention center.



Figure 1. Toronto CN tower

Blossoming Dubai Tower

Blossoming Dubai Tower is located at Dubai, United Arab Emirates (UAE) (Figure 2). It was designed by Petra Consultants Architects. This building has a gross area of 12000 m² and site area of 8075 m². The building combines the elegance of a symmetric geometry with a challenging spiral direction. The design was based on the form of a blooming flower. This facility is fitted with 2 elevators operating on spiral rails rotating 135 degrees up 138 meters from the door to the cafeteria juncture. In addition, two staircases equipped in the building's spiraling components for emergency situations. Ground level includes children's library, public entrance, lower ground ramp, lower ground lifts, and lower ground floor skylights. Lower ground level includes tickets near the lifts, public entrance, conference hall, conference lobby and services. In addition, the viewing deck consist of indoor and outdoor spaces. This building has the following zones, which are reception, conference hall, conference lobby, ticket entrance, services, children library, sky cafeteria and sky view deck. The tower is surrounded by extensive grounds, a lake and a number of ponds at the base of the tower, as well as numerous entertainment activities for all ages including the Panoramic Tower.



Figure 2. Blossoming Dubai Tower

Taiwan Tower

Taiwan Tower is located at Taichung, Taiwan (Figure 3). This building has a gross area of 27000 m² and site area of 10000 m². The tower was designed on the basis of a technological tree concept whose trunk contains a track on which eight spatial leaves glide up and down the trunk (eight being an important number in the local culture). The eight platforms are observation decks: zeppelin-like elevators that hold 50 – 80 people each. The floating observatories are self-supporting by helium balloons and are made of lightweight materials and covered with a PTFE membrane. They are driven by a strong electro-magnetic force interrelated in the building's energy use and reuse.

The platforms add a vertical dimension to the cultural and museum area. They allow visitors to view the city from many different elevation points, while also providing a view of the other seven observation decks in motion. Furthermore, this building has few areas such as information centres, conference spaces, sky lounge, restaurants, museums and offices.



Figure 3. Taiwan Tower

PROGRAM ASSUMPTION AND SPACE DETAILS

For the proposed sky tower, the estimated gross floor area is 23607 m². Furthermore, the net area is 16525 m². Table 1 shows the zone division of the proposed sky tower. Based on Table 1, the zones of the proposed sky tower are main lobby, commercial area, cultural area, amenities, sky pod, offices rental and administration.

Table 1. Space details

Zones	Percent age (%)	Gross Floor Area (m ²)	Net Area (m ²)	Floors	Footprint (m ²)
Main lobby	12	2609	1826	1	2609
Commercial	7	1740	1218	1	1740
Cultural	19	4487	3141	2	2244
Amenities	33	7733	5413	2	3866
Sky pod	13	3180	2226	4	795
Office rental	14	3429	2400	2	1715
Administration	2	429	300	1	429
Total	100	23607	16525	-	13397

PROPOSED SITE

Proposed site: Site 1

For Site 1 (Figure 4), this site is located in the heart of Jeddah, Saudi Arabia, at the intersection of two important commercial roads Al-Andalus Road and Prince Mohammed Bin Abdul Aziz Street, with a total area of 46,200 m²

Proposed site: Site 2

For Site 2 (Figure 5), it is located in the southern region of Jeddah, Saudi Arabia, at two main streets Al- Andalus and King Abdullah Road, with a total area of 56,975 m².

Proposed site: Site 3

For Site 3 (Figure 6), the site is located at the northern part of Jeddah, Saudi Arabia, at the intersection of two major streets Prince Naif and Al-Kurnaysh Road, with a total area of 44 200 m²



Figure 4. Site 1



Figure 5. Site 2



Figure 6. Site 3

SITE EVALUATION AND ANALYSIS

For the sky tower construction, this work has proposed 3 potential sites. Hence, site evaluation analysis was done to select the most appropriate site. Site evaluation was done in terms of views, visibility, surrounding, accessibility and circulation, security and safety, shape, and future development plans. In this analysis, weighting factor (WF) was used, where 1 = not very important, 2 = slightly more important, and 3 = important. Table 2 shows the site evaluation score for site 1, site 2 and site 3. Based on Table 2, site 3 has exhibited the highest score of 93, compared to site 2 with 82 and site 1 with 90. Thus, site 3 was selected as the proposed development site. This site is located in front of Al-Nawras Roundabout, Al-Nawras Resort and has a view of the waterfront. It is accessible from three main roads: Al-Malik Road, Al-Cornich Road and Prince Naief Street. In addition, the site is surrounded by a number of landmarks such as, Al Nawras Resort, Al Nawras Roundabout, Rosewood Hotel, Lamar Tower as well as the future developments. In terms of climate, the site is considered to be while it has warm temperature in winter. Furthermore, The prevailing wind over Jeddah is from of the Red Sea. These winds are usually moderate winds. Figure 7 shows the proposed zoning for the site.

Table 2. Site evaluation

Criteria	Site 1	Site 2	Site 3
Views (WF=4)	19	16	19
Visibility(WF=3)	15	13	15
Surrounding(WF=3)	13	12	15
Accessibility(WF=3)	14	14	14
Security(WF=2)	7	8	9
Shape(WF=2)	8	7	8
Future development(WF=3)	14	12	13
Total	90	82	93



Figure 7. Final conceptual zoning

PROJECT DESIGN

The Jeddah Sky Tower will be a reflection of the physical beauty, the cultural and innovative ingenuity and the social richness of Saudi Arabia specifically Jeddah as a part of the Gulf - Middle East area to the entire world. The iconic sky tower that will be an architectural and cultural tourist attraction, enhancing the skyline of the city by being a fantastic, meaningful, educational and ecological architectural landmark. Furthermore, Jeddah sky tower is an observation tower with an outstanding structure that will stand as a landmark in Jeddah's skyline. The sky tower is comprised of several zones such as main lobby, cultural, commercial, amenities, and sky pod. Figure 8 and Figure 9 shows the proposed design of the sky tower. The sky pod is comprised of 360 ° degree restaurant, observation deck, sky lounge and a bungee jump deck. As for the commercial zone, it is comprised of restaurants, cafes and mega stores. Moreover, for the cultural zone, it is comprised of planetarium and exhibition halls. Sky tower has been intended to deliver elevated efficiency in the case of natural events such as fire accidents, wind storms or earth quake. The sky tower is built from high-strength, high-performance cement. The primary design of the sky tower is a concrete strengthened shaft. The top levels of the sky tower were built using composite materials, structural steel, pre-cast concrete and strengthened concrete. The top of the pod structure is completed in an aluminum cladding with transparent blue glasses. Furthermore, the tower is a model for green architecture. All circulation is vertically integrated. Likewise, natural ventilation of various functional areas has been created. Photovoltaic panels on the outside of the tower generate the electrical energy. The rainwater is gathered from all sites in a tank located in the cellar where a purification plant allows water to be recycled for cleaning, irrigation of the common fields and running water for bathrooms.



Figure 8. Top view of sky tower



Figure 9. Overall view of the tower

CONCLUSION

In this work, a proposal on developing Jeddah Sky Tower at Saudi Arabia was presented. For the proposed sky tower, the estimated gross floor area is 23607 m². This sky tower is comprised of several zones such as main lobby, commercial area, cultural area, amenities, sky pod, offices rental and administration. The development of this sky tower is expected to enhance to Jeddah as a tourism spot and contribute to the economy of Saudi Arabia.

REFERENCES

1. Sarkisian M. *Designing tall buildings: structure as architecture*. Routledge; 2016 Jan 8.
2. Doumbouya L, Gao G, Guan C. Adoption of the Building Information Modeling (BIM) for construction project effectiveness: The review of BIM benefits. *American Journal of Civil Engineering and Architecture*. 2016 Apr;4(3):74-9.
3. Lau LK. Building a Modern City: Legacies of Residential Development and Architectural Adaptation in Colonial Hong Kong. *Journal of the Royal Asiatic Society*. 2018 Apr;28(2):339-53.
4. Khan HU. Because We Can: Globalization and Technology Enabling Iconic Architectural Excesses. *International Journal of Islamic Architecture*. 2018 Mar 1;7(1):5-26.
5. Roudbari S. Crowdsourced and crowd-pleasing: the new architectural awards and the city. *Journal of Urban Design*. 2018 Mar 4;23(2):206-22.
6. Jovanovic J, Sun X, Cekic Z, Koprivica S. Sustainable Innovation in Architectural Design. In *International Conference "New Technologies, Development and Applications"* 2019 Jun 27 (pp. 746-757). Springer, Cham.
7. Mahdavinejad M, Bitaab N. From Smart-Eco Building to High-Performance Architecture: Optimization of Energy Consumption in Architecture of Developing Countries. In *IOP Conference Series: Earth and Environmental Science* 2017 Aug (Vol. 83, No. 1, p. 012020). IOP Publishing.