

The Middle East

A Selection of Written Works on Iconic Towers and Global Place-Making

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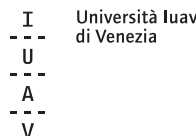


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Front Cover: Kingdom Tower, Jeddah. Source: Adrian Smith + Gordon Gill Architecture

Back Cover: Burj Al-Arab, source: Adrian Smith + Gordon Gill Architecture; Kingdom City, source: Jeddah Economic Company; Burj Khalifa, source: Prisme Entertainment Inc. & Prisme International; Cayan Tower, source: Akram Ogaily; Kingdom Tower, Jeddah, source: Adrian Smith + Gordon Gill Architecture; Capital Market Authority, source: HOK

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Introduction

In the last few decades, Middle Eastern cities have witnessed an unprecedented boom in real estate development and skyscraper construction. This rapid development can partially be attributed to an influx of capital into the region from vast oil reserves. However, though fossil fuels certainly spurred initial economic growth in the region, it is the desire to diversify from oil that has driven recent trends. Sheikh Rashid bin Saeed Al Maktoum, the ruler of Dubai from 1958 to 1990, once famously said, "My grandfather rode a camel, my father rode a camel, I drive a Mercedes, my son drives a Landrover, his son will drive a Landrover, but his son will ride a camel." This apprehension over the long-term viability of oil has driven innovation in the region to attract new economic sectors with an emphasis on global place-making and international tourism. Skyscraper construction has played a crucial role in this. Building tall, iconic structures has become a mechanism for generating value and identity within growing Middle Eastern cities, and has become the preferred method for boosting recognition and creating global destinations for these emerging municipalities.

This "build it and they will come" mentality has come to define 21st century development in the region. The Burj al Arab and the Burj Khalifa in Dubai both raised the profile of their city by creating iconic and record-breaking landmarks that attracted the attention of the international world. This model of development has subsequently been replicated around the globe. Whereas in the past, skyscrapers such as the Chrysler Building

and Willis (Sears) Tower were seen as symbols of corporate might, today's iconic towers carry the symbolic weight of entire cities.

The Burj Khalifa (once known as the Burj Dubai) was built with the explicit goal of raising the profile of Dubai on an international level. Since its completion in 2010, the Burj has not only succeeded in vaulting Dubai into global prominence, but has also spurred development both within its immediate surroundings and in the city as a whole. Its mere presence has expanded media attention, increased tourism, and attracted growing amounts of international investment to the city.

However, no project embraces the "build it and they will come" mentality more ambitiously than the Kingdom Tower in Jeddah, Saudi Arabia. When completed, Kingdom Tower will be the tallest skyscraper in the world, and the first building over a kilometer in height. Located on the northern edge of Jeddah, it will anchor Kingdom City, a 5.3-square-kilometer development that will grow out of the desert around the tower.

This publication thus begins with the development of Kingdom Tower in detail, and the technological innovations that will be implemented within the building as it rises. An introduction to the building is offered by its developer, the Jeddah Economic Company, in which the building's developmental history is examined and the developer's vision is established. A brief overview of the building's structural design is followed by an interview with one of the

building's designers, Adrian Smith of Adrian Smith + Gordon Gill Architecture.

Because of the complexities involved in building the world's tallest building, a strong emphasis must be placed on optimizing construction efficiency in order to improve safety and save both time and money. Program management approaches to the Kingdom Tower are therefore considered in detail, focusing on health and safety assurances, performance management, and construction logistics. Finally, the specific site location of the tower is analyzed from a geological perspective in order to understand the necessity for the immense foundation required to support the skyscraper. Ultimately, this case study seeks to examine not just the ways in which the Kingdom Tower draws upon pre-existing development methods and technologies, but how it will shape future innovations within the region and the world.

One area in which the Kingdom Tower is utilizing state-of-the-art technology is vertical transportation. The topic of vertical transportation, with particular emphasis on the technologies applied to the Kingdom Tower, comprises the second chapter of this book. Topics in this chapter focus on the specific elevator designs for Kingdom Tower as well as the implementation of UltraRope, an innovative technology allowing elevators to climb to the highest occupiable floors within the tower. When completed, the Kingdom Tower will have record breaking double-decker elevators that will travel 634 meters utilizing UltraRope technology.



Kingdom Tower / Kingdom City: History in the Making

Mounib Hammoud, CEO, *Jeddah Economic Company*

Jeddah Economic Company has embarked on a mission to construct Kingdom Tower, which will be the tallest building in the world upon completion. The kilometer-plus skyscraper will anchor the Kingdom City development in Jeddah, Saudi Arabia, creating a global destination for the county's second largest city.

Mankind is instinctually endowed with a fascination with place and a drive to improve it. The availability of resources and technical capability have coincided to make this time, here, now, a period of spectacular place-making in Arabia. The ancient tall buildings of Jeddah's old town were no higher than Rome's insulae. Indeed, they resemble them, with the added ingenuity of vernacular climatic adaptation. The

highest of Jeddah's old buildings – some still exist – were eight floors high, little more than twenty-five meters. And yet now, the Jeddah Economic Company (JEC) is building a structure whose foundations have been bored down into the rock four times as far as the old buildings are tall, in order to support a tower in excess of one thousand meters in height. A full kilometer plus. (Indeed, somewhat more – the precise figure is a secret yet to be announced as of 2015.) It will be the world's tallest building measured from its ground datum, plus it has basements below, and piled foundations descending well over a hundred meters into the ground beneath.

So this is it. It is happening. Jeddah. 5.3 square kilometers of sea-edge land, north of Obhur creek, the location of a new Saudi spectacular:

Kingdom Tower. And surrounding it will be a new city – Kingdom City.

The project team and Jeddah Economic Company – the body tasked with building Kingdom City – are on the ground, with every expectation and intent of topping out this technological tour de force on program. Much of this structure is steel-reinforced concrete construction. Using the renowned capability of the Saudi Binladin Group, this will be a vast monolithic concrete structure, all the way from the bottom of the piles to the topmost meters – which will indeed be steel.

Cities formerly emerged achingly slowly, in some niche of trade, some combination of resources and skills, at some quirk of geographical locus. They offered a means of



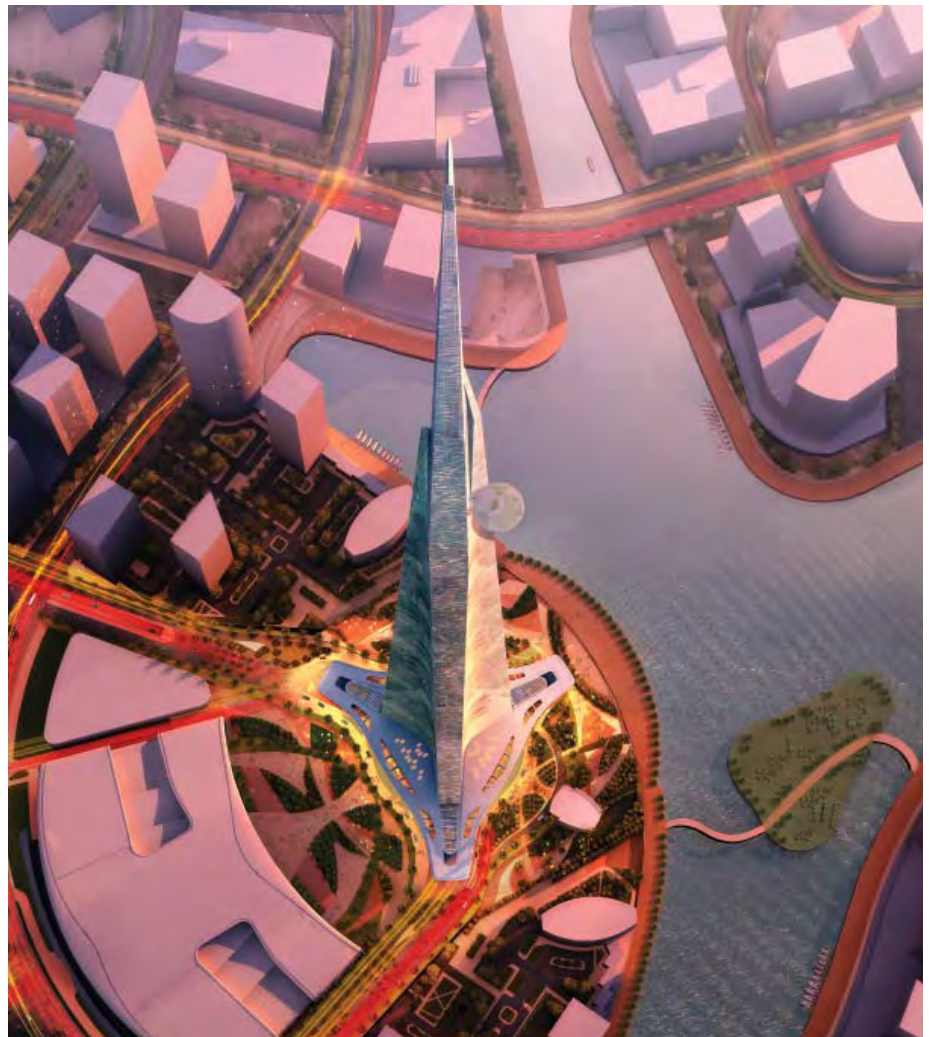
Right: Kingdom Tower render from above. Source: Adrian Smith + Gordon Gill Architecture

Bottom: View from the Mall overlooking Old Town and the water front. Source: Jeddah Economic Company

survival, when mankind was sparse on the earth, and resources – especially the key resource, energy – were desperately hard to acquire.

But what manner of prodigious economic city this will be, to warrant such a structure, anchored into the soft coralline limestone of ages on the low Red Sea coast. What will Kingdom City become?

Mankind is now in an era of growth at unprecedented speed; an era of mass spectacle, global communications, and prodigious scientific and engineering capability. Mankind lives on earth in vastly greater numbers, in far better health, and with far better education, than ever before.



Project Data: Kingdom Tower

Location: Jeddah, Saudi Arabia

Height:

Architectural: 1,000+ meters (3,281+ feet)

To Tip: 1,000+ meters (3,281+ feet)

To Observatory: 638 meters (2,092 feet)

Floors Above Ground: 167

Floors Below Ground: 2

Area: 8,127,000 m² (87,478,300 ft²)

Use: Residential / Serviced Apartments / Hotel / Office

Structural Material: Concrete

Proposed: 2011

Start of Construction: 2013

Completion Date: 2018 (expected)

Number of Elevators: 58

Top Elevator Speed: 10 m/s

Number of Apartments: 439

Number of Hotel Rooms: 200

Number of Parking Spaces: 2,205

Owner/Developer: Jeddah Economic Company; Kingdom Holding Company

Architect: Adrian Smith + Gordon Gill Architecture (design); Dar al-Handasah Shair & Partners (architect of record)

Structural Engineer: Thornton Tomasetti (design); Magnusson Klemencic Associates (peer review)

MEP Engineer: Environmental Systems Design, Inc. (design); Cosentini (peer review)

Project Manager: EC Harris; Mace

Main Contractor: Saudi Bin Laden Group

Other Consultants: Environmental Systems Design, Inc. (acoustics); Langan (civil, geotechnical, parking & traffic); Lee Herzog Consulting (façade maintenance); Rolf Jensen & Associates (fire); SWA Group (landscape); Fisher Marantz Stone (lighting); Omnium International Ltd. (quantity surveyor); Aegis Defence Services Limited (security); Fortune Shepler Consulting (vertical transportation); Forcade Associates (wayfinding)

Material Suppliers: Liebherr (crane); KONE (elevator)

The Tall Building Impact: From Local to Global

An interview with Adrian Smith, Partner, conducted by Peter Weismantle, Director of Supertall Building Technology, *Adrian Smith + Gordon Gill Architecture*

AS+GG's Director of Supertall Technology interviews AS+GG Partner Adrian Smith about the impact that supertall buildings have on a city's identity, economy, ecological impact, and ultimately, its future.

Peter Weismantle: Adrian, you were given the opportunity to speak at the 2015 CTBUH Conference in New York City. Although Chicago created the skyscraper, New York is the first city that was defined by the skyscraper, more than 100 years ago. We are now in the second decade of the 21st century, what would be a relevant topic for your talk?

Adrian Smith: I would like to discuss the nature of cities and the tall building's role in city making. And actually beyond city

making, supertall towers have a relationship with the identity of a country as well. If you think about Dubai, the first building that really put Dubai on the map was the Burj Al-Arab. And that tower made an enormous impact on what is Dubai and where is it today – it gave the city an identity.

PW: It was on their license plates when we first came in 2003.

AS: And Burj Khalifa, for example, upped that. Today you have a city that has multiple landmark identities and multiple icons. I think that as it proceeds and it moves into one of the world-class cities, it's going to have more of those.

PW: Like New York City, which has several.

AS: Exactly, New York is a perfect example. There are some European cities that are good examples too, like Montmartre, the Eiffel Tower, the Champs-Élysées – which are admittedly smaller – but they were made almost exclusively as identity pieces. And that's really what the supertall towers are – identity pieces for cities – because you can house their functions for cheaper in smaller buildings.

PW: I think you proved that in your recent density study.

AS: I also think this discussion needs to show that the role of supertall buildings is unique in the sense that not only do they provide identity for a city, and sometimes a country, but they also provide identity for a particular district within a city.



PW: Can a supertall building, considering the present situation of the world economy, be profitable?

AS: Developers are now realizing that if they own the land around the tower, they will benefit from building the tower. In Chicago for example, you have Willis Tower and the John Hancock Tower that were developed by individuals but they didn't really reap the benefit of the development that occurred subsequently around those towers.

PW: Well they didn't own the land...

AS: Right, and if you go to those towers you will see that the density nodes of Chicago are surrounding those two buildings, and perhaps a third one in the loop. High-density towers tend to attract other density, which in turn creates value. Right now we're seeing in China and Dubai, and in other places, scenarios where the developer is building and looking at the entire vision, which is much larger than the tower itself. They will realistically make money on everything else except the tower, which they'll probably break even on in 10 years, because eventually these buildings do make money.

PW: How do developers make money on these buildings?

AS: By themselves supertall buildings do not generally make a great deal of money for their developers, but they do significantly increase the value of the land and buildings around them. This happened with the development around Burj Khalifa in Dubai. People occupying buildings around the Burj are paying significantly more for the views of the tower, which has made that overall development highly profitable for Emaar Properties in Dubai. Jin Mao Tower in Shanghai was a similar example. And if the developer of the Chicago Spire had owned the adjacent parcels of land, the Spire might have been built on that premise.



Opposite: Burj Al-Arab, Dubai. Source: Adrian Smith + Gordon Gill Architecture

Top: Willis Tower, Chicago. Source: Marshall Gerometta

Iconic Office Tower Propels Saudi Arabia into the New Global Century: Challenges and Innovations

Roger Soto, Design Principal, HOK; Basem Al-Shihabi, President, Omrانيا & Associates

As the centerpiece of the King Abdullah Financial District, the Capital Market Authority (CMA) Tower is evidence of the Kingdom of Saudi Arabia's economic diversification strategy. The faceted crystalline iconic structure, which rises 385 meters and 80 stories, serves as the headquarters of the Capital Market Authority, the government organization responsible for regulating Saudi Arabian capital markets. The design responds to the design guidelines and vision set forth by the developer of the district, the Al Raidah Investment Company. The region's climatic and environmental challenges inspired the development of a high-performance integrated enclosure system that incorporates solar shading, photovoltaics, façade lighting, and an innovative façade access system. Floor plates

are designed to provide clear span lease depths that facilitate flexibility, efficiency, and natural daylight. An innovative vertical transportation system represents the world's first large-scale use of twin and double-deck elevators in one unique system. This integral sustainable design strategy is targeting LEED Gold certification.

A Financial Center in the Middle East

One of the largest and most ambitious commercial developments in the Middle East, the King Abdullah Financial District (KAJD) is a multi-phased mixed-use project that creates a world-class financial center for the Kingdom of Saudi Arabia and the entire region.

Located north of downtown Riyadh on a 1.6-million-square-meter site, the district seeks to diversify and advance the country's economy by bringing together the financial services sector and attracting foreign investment. It will position Saudi Arabia's capital city as the financial and economic nexus of the Middle East, on par with London's Canary Wharf and the world's other leading financial centers.

KAJD encompasses a gross area of approximately 3 million square meters of mixed-use development, including office buildings, a conferencing center, residential buildings, hotels, mosques, cultural facilities and museums, private recreational facilities, and a financial academy for training and developing the skills of Saudi youth. When



Opposite: Site plan of the CMA Tower viewed from above.
Source: HOK

Right: Rendering of CMA Tower. Source: Bezier

completed, the district is projected to employ more than 75,000 people.

The urban planning of KAFD was carried out by Henning Larsen, inspired by the geological forms of the region and focused on the creation of pedestrian-friendly spaces (wadi) framed by densely massed buildings. A suspended monorail system connects the district's neighborhoods to each other, and a series of sky bridges link all commercial levels so individuals can efficiently navigate the community.

The centerpiece of the development – the Capital Market Authority Tower – is the tallest of the five buildings that make up the community's Financial Plaza. Rising 385 meters, the iconic structure has 73 occupied floors and a gross floor area of 182,137 sq. m. The building's anchor tenant is the Capital Market Authority, the government organization responsible for regulating the Saudi Arabian capital markets.

Designed by HOK/Omrania Joint Venture, the tower responds to the constraints and unusual site dimensions of the urban site parcel, which encompasses approximately 5,000 sq. m. in a trapezoid-shaped polygon. Design guidelines provided specific requirements on setback and build-to lines, podium and tower height, materials, sustainability goals, and connectivity with adjacent uses. The eastern portion of the site was designated as the tower zone, while the western portion was assigned to a podium. The design of the floor plate emerged from a desire to provide clear-span lease depths that would allow flexibility, efficiency, and access to natural daylight. The resulting hexagonal-shaped plan tapers inward and outward as it rises, providing floor plates that range from 2,500 to 2,600 sq. m. of gross floor area.

The resulting geometry of the faceted crystal-like structure acknowledges a desire to create a memorable image inspired from geologic formations polished by the hand of man. This language also applies to a podium





In the last couple of decades, the Middle East has seen unprecedented urban growth that has transformed little-known trade cities into internationally recognized global destinations. Although the discovery of oil initially fueled growth in the region, contemporary development has focused on transitioning Middle Eastern markets away from reliance on fossil fuels. To that end, skyscraper construction has played a crucial role in broadening the economic limits of the region by creating iconic landmarks that attract wealthy international tourists and investors. From Dubai to Tel Aviv, a new Middle Eastern developmental methodology has emerged with emphasis placed on the role that iconic skyscrapers can play in defining urban identities.

This publication covers the evolution of tall buildings in the Middle East and examines the impact – both positive and negative – new developments have had in the region. Have tall buildings been successful in implementing the tenants of vertical urbanism? How can new developments improve upon the mistakes of previous works? A variety of architects, developers, and planners tackle these questions, drawing inspiration from their own work in the region.

Skyscrapers play an increasingly important role in creating identity within Middle Eastern cities, and the tallest buildings in the world can be found in the region. Currently under construction, Kingdom Tower in Jeddah, Saudi Arabia, will be the world's tallest building when completed. At over a kilometer in height, this monumental structure will not only raise the profile of Jeddah and anchor investment and growth, but also undoubtedly come to represent the city on a global stage. Through a thorough analysis of the Kingdom Tower and other notable Middle Eastern developments, a clear picture of regional developmental patterns emerges.

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