

# Burj Dubai - Information

## About The Tallest Skyscraper In The World

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Towering high above the Dubai skyline, **Burj Dubai**, the world's tallest man-made construction is completed. **Burj Dubai** is a supertall **skyscraper** under construction in **Dubai**, United Arab Emirates, and is the tallest man-made structure ever built, at 818 m (2,684 ft). Construction began on 21 September 2004, and the tower is expected to be completed and ready for occupancy on 4 January 2010.



The **Burj Dubai building** is part of the 2 km<sup>2</sup> (0.8 sq mi) flagship development called "Downtown Burj Dubai" at the "First Interchange" along Sheikh Zayed Road, near Dubai's main business district. The tower's architect is Adrian Smith, who worked with Skidmore, Owings and Merrill (SOM) until 2006. The Chicago-based architecture and engineering firm SOM is in charge of the project. The primary builder is South Korean Samsung Engineering & Construction, who also built the Taipei 101 and Petronas Twin Towers. Turner Construction Company was chosen as the construction manager.

The total budget for the **Burj Dubai project** is about US\$4.1 billion, and for the entire new "Downtown Dubai", US\$20 billion. Mohamed Ali Alabbar, the CEO of Emaar Properties, speaking at the Council on Tall Buildings and Urban Habitat 8th World Congress, said that the price of office space at Burj Dubai had reached US\$4,000 per sq ft (over US\$43,000 per m<sup>2</sup>) and that the Armani Residences, also in Burj Dubai, were selling for US\$3,500 per sq ft (over US\$37,500 per m<sup>2</sup>).

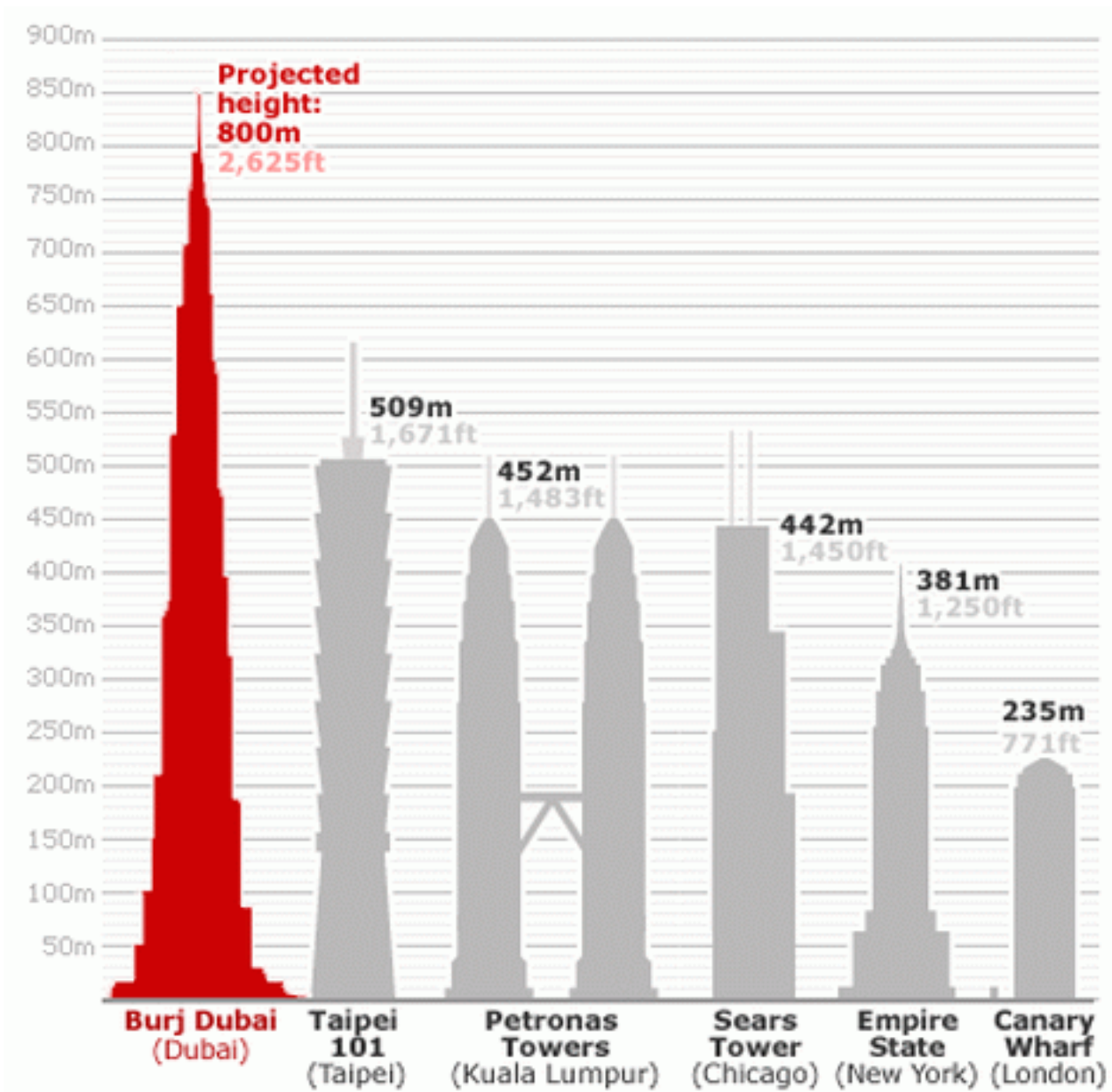
## Timeline

- 21 September 2004: Emaar contractors begin construction.
- February 2007: Surpasses the Sears Tower as the building with the most floors.
- 13 May 2007: Sets record for vertical concrete pumping on any building at 452 m (1,483 ft), surpassing the 449.2 m (1,474 ft) to which concrete was pumped during the construction of Taipei 101.
- 21 July 2007: Surpasses Taipei 101, whose height of 509.2 m (1,671 ft) made it the world's tallest building.
- 12 August 2007: Surpasses the Sears Tower antenna, which stands 527.3 m (1,730 ft).
- 12 September 2007: At 555.3 m (1,822 ft), becomes the world's tallest freestanding structure, surpassing the CN Tower in Toronto.
- 7 April 2008: At 629 m (2,064 ft), surpasses the KVLV-TV Mast to become the tallest man-made structure.
- 17 June 2008: Emaar announces that Burj Dubai's height is over 636 m (2,087 ft) and that its final height will not be given until it is completed in September 2009.
- 1 September 2008: Height tops 688 m (2,257 ft), making it the tallest man-made structure ever built, surpassing the previous record-holder, the Warsaw Radio Mast in Konstantynów, Poland.
- 17 January 2009: Topped out at 818 m (2,684 ft).
- 1 October 2009: Emaar announces that the exterior of the building is completed

## Current Records

- Tallest structure ever built: 818 m (2,684 ft) (previously Warsaw radio mast – 646.38 m (2,121 ft))
- Tallest structure: 818 m (2,684 ft) (previously KVLV-TV mast – 628.8 m (2,063 ft))
- Tallest freestanding structure: 818 m (2,684 ft) (previously CN Tower – 553.3 m (1,815 ft))
- Building with most floors: 160 (previously both 1 & 2 World Trade Center – 110)
- World's highest elevator installation
- Worlds fastest elevators at speed of 64 km/h (40 mph) or 18 m/s (59 ft/s) (previously Taipei 101 – 16.83 m/s)
- Highest vertical concrete pumping (for a building): 601 m (1,972 ft) (previously Taipei 101 – 449.2 m (1,474 ft))
- Highest vertical concrete pumping (for any construction): 601 m (1,972 ft) (previously Riva del Garda Hydroelectric Power Plant – 532 m (1,745 ft))
- The first world's tallest structure in history to include residential space

Note: Additional records for tallest skyscraper are considered unofficial. On 20 July 2007, the Executive Director of the Council on Tall Buildings and Urban Habitat (CTBUH), Antony Wood, said "We will not classify it as a building until it is complete, clad and at least partially open for business to avoid things like the Ryungyong [sic] project. Taipei 101 is thus officially the world's tallest until that happens.



Though unconfirmed, **Burj Dubai** has been rumoured to have undergone several planned **height** increases since its inception. Originally proposed as a virtual clone of the 560 m (1,837 ft) Grollo Tower proposal for Melbourne, Australia's Docklands waterfront development, the tower was redesigned with an original design by Skidmore, Owings and Merrill discussed below. Marshall Strabala, an SOM architect who worked on the project until 2006, recently said that Burj Dubai was designed to be 808 m (2,650 ft) tall. However, contradictory information abounds regarding the official height of the building, and it will only acquire the title of world's tallest building upon completion in 2010.

The **design architect of Burj Dubai**, Adrian Smith, felt that the uppermost section of the building did

not culminate elegantly with the rest of the structure, so he sought and received approval to increase it to the currently planned height. It has been explicitly stated that this change did not include any added floors, which is fitting with Smith's attempts to make the crown more slender. However, the top of the tower has a steel frame structure, unlike the lower portion's reinforced concrete.

Emaar Properties announced on 9 June 2008 that construction of Burj Dubai was delayed by upgraded finishes and would be completed only in September 2009. An Emaar spokesperson said "The luxury finishes that were decided on in 2004, when the tower was initially conceptualized, is now being replaced by upgraded finishes. The design of the apartments has also been enhanced to make them more aesthetically attractive and functionally superior." A revised completion date of 2 December 2009 was then announced.

The tower is designed by Skidmore, Owings and Merrill, which also designed the Willis Tower in Chicago, Illinois and 1 World Trade Center in New York City, among numerous other famous high-rises. The building resembles the bundled tube form of the Willis Tower, but is not a tube structure. Its design is reminiscent of Frank Lloyd Wright's vision for The Illinois, a mile high skyscraper designed for Chicago.

According to Marshall Strabala, an SOM architect who worked on the building's design team, Burj Dubai was designed based on the 73-floor Tower Palace Three, an all-residential building in Seoul, South Korea. In its early planning, **Burj Dubai** was intended to be entirely residential. **Emaar Properties** has also engaged GHD, an international multidisciplinary consulting firm, to assist with the design, review and assessment involved in the construction process.

The **design of Burj Dubai** is derived from patterning systems embodied in Islamic architecture. The design architect Adrian Smith has said the triple-lobed footprint of the building was inspired by the

flower Hymenocallis. The tower is composed of three elements arranged around a central core. As the tower rises from the flat desert base, setbacks occur at each element in an upward spiralling pattern, decreasing the cross section of the tower as it reaches toward the sky. There are 26 terraces in Burj Dubai. At the top, the central core emerges and is sculpted to form a finishing spire. A Y-shaped floor plan maximizes views of the Persian Gulf. Viewed from above or from the base, the form also evokes the onion domes of Islamic architecture. During the design process, engineers rotated the building 120 degrees from its original layout to reduce stress from prevailing winds. At its tallest point, the tower sways a total of 1.5 m (4.9 ft).

To wash the 162 floors of habitable space of **Burj Dubai**, a horizontal track has been installed on the exterior of Burj Dubai at three levels 40, 73 and 109. Each track holds a 1.5 tonne bucket machine which moves horizontally and then vertically using heavy cables. The first of the 18 buckets is being tested on the south side of the Burj Dubai at level 40. The top of the spire, however, is reserved for specialist window cleaners, who brave the heights and high winds dangling by ropes to clean the top panels.

More than 1,000 pieces of art will adorn the interiors of Burj Dubai, while the lobby of Burj Dubai will have the artwork of 196 bronze and brass alloy cymbals representing the 196 countries of the world. The visitors in the lobby will be able to hear a distinct timbre as the cymbals, plated with 18-carat gold, are struck by dripping water, intended to mimic the sound of water falling on leaves.

A total of 24,348 pieces of cladding have been installed, with the last piece, spanning six metres in length, yet to be installed.

The exterior cladding of Burj Dubai consists of 142,000 m<sup>2</sup> (1,528,000 sq ft) of reflective glazing, and aluminium and textured stainless steel spandrel panels with vertical tubular fins. The cladding system is designed to withstand Dubai's extreme summer temperatures. Additionally, at its projected height the

exterior temperature at the top of the building will be 6 °C (11 °F) cooler than at its base.

The interior will be decorated by Giorgio Armani. An Armani Hotel, the first of four by Armani, will occupy the lower 37 floors. Floors 45 through 108 will have 700 private apartments on 64 floors (which, according to the developer, sold out within eight hours of being on the market). An outdoor zero-entry swimming pool will be located on the 78th floor of the tower. Corporate offices and suites will fill most of the remaining floors, except for a 123rd floor lobby and 124th floor (about 440 m (1,444 ft)) indoor/outdoor observation deck. Burj Dubai is expected to hold up to 35,000 people at any one time. A total of 56 elevators will be installed, the fastest rising and descending at up to 10 m/s (33 ft/s). Engineers had considered installing the world's first triple-deck elevators, but the final design calls for double-deck elevators.

The graphic design identity work for the Burj Dubai is the responsibility of Brash Brands, who are based in Dubai. Design of the global launch events, communications, and visitors centers for the Burj Dubai have also been created by Brash Brands as well as the roadshow exhibition for the Armani Residences, which are part of the Armani Hotel within the Burj Dubai, which toured Milan, London, Jeddah, Moscow and Delhi.

Outside, and at a cost of Dh 800 million (US\$217 million), a record-setting fountain system was designed by WET Design, the California-based company responsible for the fountains at the Bellagio Hotel Lake in Las Vegas. Illuminated by 6,600 lights and 50 colored projectors, it is 275 m (900 ft) long and is shooting water 150 m (490 ft) into the air, accompanied by a range of classical to contemporary Arabic and world music. On 26 October 2008 Emaar announced that based on results of a naming contest the fountain would be called the Dubai Fountain.

The tower is being constructed by a South Korean company, Samsung Engineering & Construction,



which also built the Petronas Twin Towers and the Taipei 101. Samsung Engineering & Construction is building the tower in a joint venture with Besix from Belgium and Arabtec from UAE. Turner is the Project Manager on the main construction contract.

The primary structural system of Burj Dubai is reinforced concrete. Over 45,000 m<sup>3</sup> (58,900 cu yd) of concrete, weighing more than 110,000 tonnes (120,000 ST; 110,000 LT) were used to construct the concrete and steel foundation, which features 192 piles buried more than 50 m (164 ft) deep. When completed, Burj Dubai's construction will have used 330,000 m<sup>3</sup> (431,600 cu yd) of concrete and 39,000 tonnes (43,000 ST; 38,000 LT) of steel rebar, and construction will have taken 22 million man-hours.

As construction of the tower progressed, it became increasingly difficult to vertically pump the thousands of cubic metres of concrete that were required. The previous record for pumping concrete on any project was set during the extension of the Riva del Garda Hydroelectric Power Plant in Italy in 1994, when concrete was pumped to a height of 532 m (1,745 ft). Burj Dubai exceeded this height on 19 August 2007, and as of 8 November 2007 concrete was pumped to a delivery height of 601 m (1,972 ft).

In Burj Dubai, concrete was pumped to the 156th floor, while the remaining structure was built of lighter steel. Burj Dubai is highly compartmentalised, with refuge floors built every 30 floors, where people can shelter on their long walk down to safety in case of an emergency.

Special mixes of concrete are made to withstand the extreme pressures of the massive building weight; as is typical with reinforced concrete construction, each batch of concrete used was tested to ensure it could withstand certain pressures.

The consistency of the concrete used in the project was essential. It was difficult to create a concrete that could withstand both the thousands of tonnes bearing down on it and Persian Gulf temperatures that can reach 50°C (122°F). To combat this problem, the concrete was not poured during the day. Instead, ice was added to the mixture and it was poured at night when the air is cooler and the humidity is higher. A cooler concrete mixture cures evenly throughout and is therefore less likely to set too quickly and crack. Any significant cracks could have put the entire project in jeopardy.

The unique design and engineering challenges of building Burj Dubai have been featured in a number of television documentaries, including the Big, Bigger, Biggest series on the National Geographic and Five channels, and the Mega Builders series on the Discovery Channel.

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