

## Word's Tallest Building Rises in Dubai

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Designers of the Burj Khalifa used a buttressed core design to allow it to become the world's tallest building. [Courtesy Emaar Properties]

Rising like a steel and glass splinter from the desert and surrounded by its own man-made lake, the world's tallest building has opened for business in Dubai. The Burj Khalifa (originally Burj Dubai) shatters the previous record set by Taipei 101 in Taiwan by 319 meters (1047 ft). It also holds the title of tallest freestanding man-made structure, topping the Toronto's CN Tower while still under construction. It differs also in that it is meant to be primarily a residential building. The buildings database website Emporis.com calls it "The first world's tallest building since prehistoric times to include residential space."

Even among its own class of skyscrapers—those called the "supertalls"—the Burj excels. The Willis Tower in Chicago, known for most of its existence as the Sears Tower, held that record for 22 years until 1996. Dubai's new landmark almost doubles its height at 828 meters (2717 ft). "Burj" also means "tower" in Arabic. The change in the second part of its name came about when Dubai ran low on funds to finish the project and His Highness Sheikh Khalifa bin Zayed Al Nahyan, ruler of neighboring United Arab Emirate state, Abu Dhabi, stepped in with financing. Conceived of and designed when Dubai was flush and the global market was riding high, the Burj's financial future now may be uncertain, but its engineering and design remain remarkable.

Most striking is the structure's jagged-thorn shape, flared in three parts at the base which tapers upward in a gleaming spiral via what look like an offset series of cylinders. The shapes suggest the once-revolutionary "bundled tube" design of the Willis Tower, which uses solid elements bundled with open tubes to support great height. But as the number of solid elements increases with height, a building like the Burj Khalifa would have been left with only a thin perimeter of open space surrounding a center of supportive tubes. Instead, the firm Skidmore Owings & Merrill (which designed and engineered both buildings) came up with the "buttressed core" design, essentially three narrow rectangular buildings joined in a "pinwheel" arrangement with each wing bracing the two others.

The outline of the building's tri-lobed footprint that results mimics the open-petal shape of a native desert flower. This abstract design masks the essential function of helping to keep the tall building upright. Not only do they brace each other, but on the ground the three lobes act as a tripod base that's more stable than a four-cornered square building would be. Carried upward, the wings of the Y-shape remain but gradually shorten in cross section. The utility of this became even more apparent in the desert's high winds, compensated for at one point by rotating the building design by 120 degrees. At heights at which a flat-sided structure would act as a giant sail, these fins redistribute the force of wind and channel it away from the building.

What results is a flight of fancy, a seemingly impossible structure grounded in engineering and structural design that allow it to pierce the sky.

—**Jessa Forte Netting**

#### References

[Structural design of high-rise towers](#)

#### For Further Study

[Buildings, Structural design, Structure \(engineering\)](#)

#### Related Web Sites:

Skidmore Owings & Merrill: [Buttressed core video lecture](#)

<http://www.burjdubaiskyscraper.com/>

[EMPORIS.COM](http://EMPORIS.COM)

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