How Water Works in Skyscrapers

A Look Through The Tallest Building in the World – The Burj Khalifa

Started in 2004, the Burj Khalifa officially opened January 4, 2010 rising to 828 meters (163 stories).

It's more than twice as tall as the Empire State Building (381 meters) and 35 stories taller than the world's second tallest building, Shanghai Tower.

It was originally called Burj Dubai and renamed Burj Khalifa in tribute to the head of the United Arab Emirates, and ruler of Abu Dhabi, Sheikh Khalifa bin Zayed Al Nahyan, who financially assisted Dubai.

The Amount of Supplies It Took To Build

The Foundation

Over 58,900 cubic yards of concrete, **weighing more than 110,000 tons**, were used to construct the concrete and steel foundation.

This includes 192 piles buried more than 164 ft deep.

The Structure

The tower was constructed using 431,600 cubic yards of concrete and 31,400 metric tons of rebar–**laid end to end this would extend over a quarter of the way around the world.**

Construction took more than 22 million man-hours.

How Much Water The Burj Khalifa Actually Uses

249,908 gallons of water...
The average daily supply of water throughout Burj Khalifa's water system, through 62 miles of pipes.

*The average family uses 400 gallons per day, so the Burj Khalifa uses **more than 600x** that amount.*

An additional 132 miles of piping supplies the fire emergency system and 21 miles supplies chilled water for the air conditioning system.

The water available on-site is desalinated sea water from the Persian Gulf.

How Water Is Distributed

Having one giant water pump at the base of the Burj Khalifa would be dangerous due to the amount of pressure needed to force the water up the height of the skyscraper. Therefore, the tower is designed to pump water upwards to a series of tanks.

The pumps have the pressures of 30 bar (unit of pressure).

1 bar = 14.5 pound-force per square inch

Seven double-story mechanical floors house the equipment that bring the Burj Khalifa to life.

The mechanical floors house:

- Electrical sub-stations
- Water tanks
- Pumps
- Air handling units

The drainage pipes are nearly 2 feet in diameter.

The Burj Khalifa uses a single-stack drainage system.

A single-stack drainage system doesn't separate wastewater.

The Challenges

Condensation

Dubai's hot and humid climate combined with the building's cooling system create a significant amount of condenstation.

This water is collected and drained in a separate piping system to a holding tank in the basement parking garage.

*About **15 million gallons** of water is produced yearly from condensation.*

Wind

Because the Burj Khalifa building can move with heavy winds, engineers needed to account for this movement throughout the building's plumbing system.

Pipe guides and ball joints were installed at various building levels, enabling free movement of the pipework while accounting for seismic vibrations, building deflection and acoustic requirements.

Water Temperature

The incoming water can reach as high as 104 degrees F in the summer and 68 F in the winter.

Pre-cooling of the water is required in the summer.

Fun Facts

The water system is soundproofed, so guests can't hear the water flowing through the building!

Aside from holding the World Record for being the tallest building in the world, Burj Khalifa holds six other World Records, including highest occupied floor.

The weight of the concrete used to construct the tower is equivalent to 100,000 elephants.

According to one guest of the Burj Khalifa, it only took about one minute to reach the 124th floor, making this one of the fastest elevators in the world.

The design of the tower is inspired by the shape of the Hymenocallis flower.

At the peak of construction, 12,000 workers worked on the building per day.

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