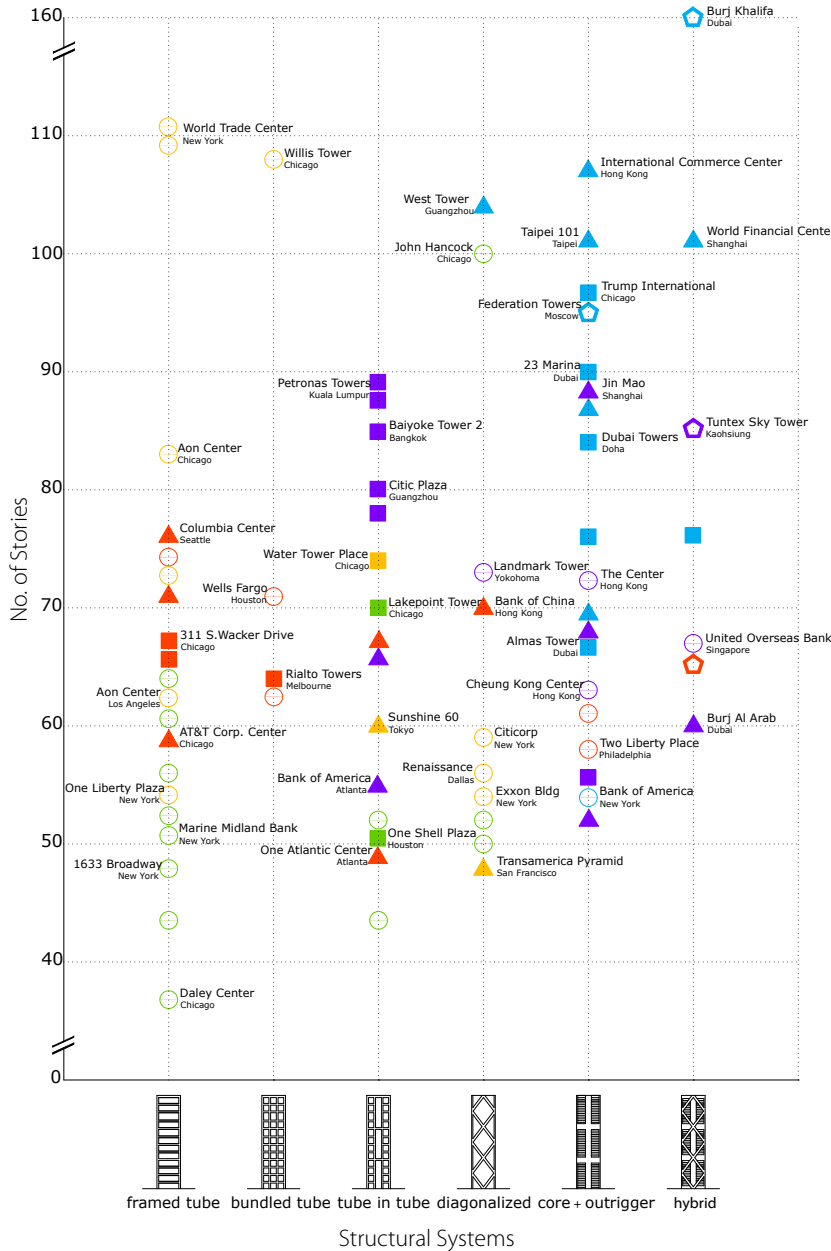


Tall Buildings in Numbers

Tall Buildings, Structural Systems and Materials

Structural System Categorization for Tall Buildings Completed 1961–2010



Structural Systems	No. of Buildings
framed tube	20
bundled tube	4
tube in tube	15
diagonalized	10
core + outrigger	19
hybrid	7
Total	75

Notes:

(1) 75 of the tallest buildings completed between 1961 and 2010 were studied, with at least ten from each decade. These buildings were all drawn from the twenty tallest completed each decade.

(2) Six categories have been determined to classify tall building structural systems over the past five decades. They are namely:

- Framed Tube (system of rigid frames)
- Bundled Tube (combination of framed tubes)
- Tube in Tube (central and peripheral framed tubes)
- Diagonalized (trussed tubes, diagrids or braced frames)
- Core + Outrigger (central lateral system linked to the perimeter system through outriggers)
- Hybrid (combined use of any two or more structural systems, e.g., diagonalized outrigger core)

(3) A steel tall building is defined as one where the main vertical and lateral structural elements and floor systems are constructed from steel. A concrete tall building is defined as one where the main vertical and lateral structural elements and floor systems are constructed from concrete. A composite tall building utilizes a combination of both steel and concrete acting compositely in the main structural elements. A mixed-structure tall building is any building that utilizes distinct steel or concrete systems above or below each other. There are two main types of mixed-structural system: A steel/concrete tall building indicates a steel structural system located above a concrete structural system, with the opposite true of a concrete/steel building. For more information on CTBUH tall building height criteria see: <http://criteria.ctbuh.org>

Of the 50 years studied, only the decade 1981–1990 saw tall buildings constructed in each of the six structural categories presented.

framed tube
bundled tube
tube in tube
diagonalized
core + outrigger
hybrid

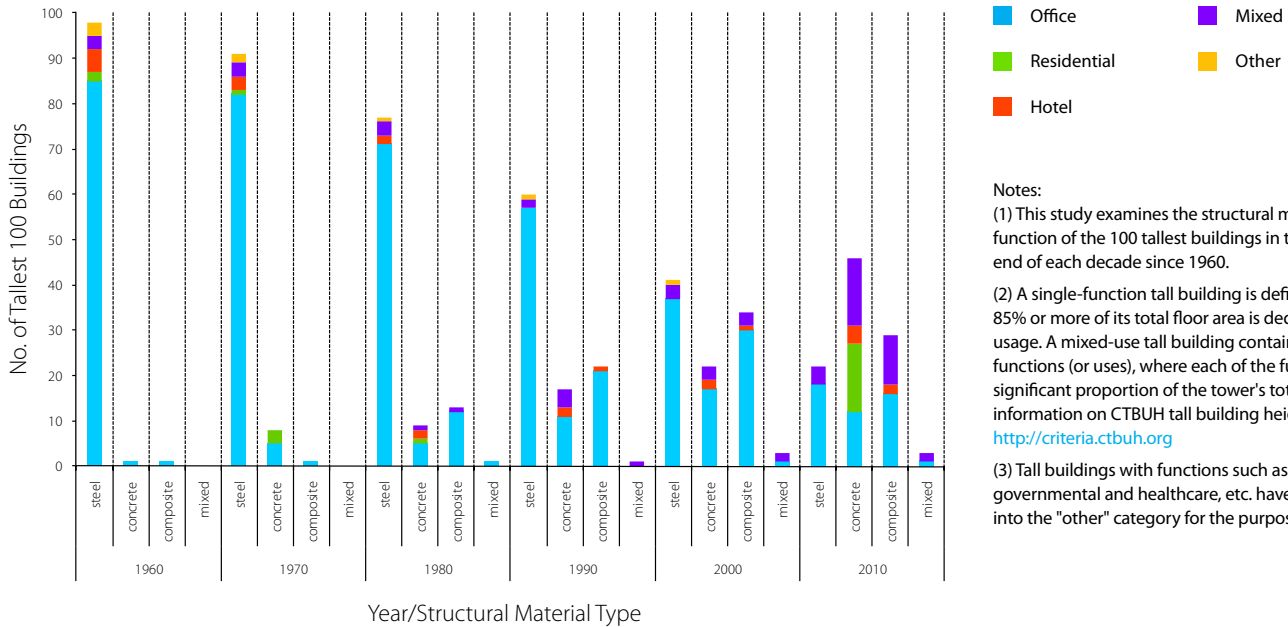
All of the buildings studied using the framed tube structural system were completed prior to 1990, with 75% constructed using steel.



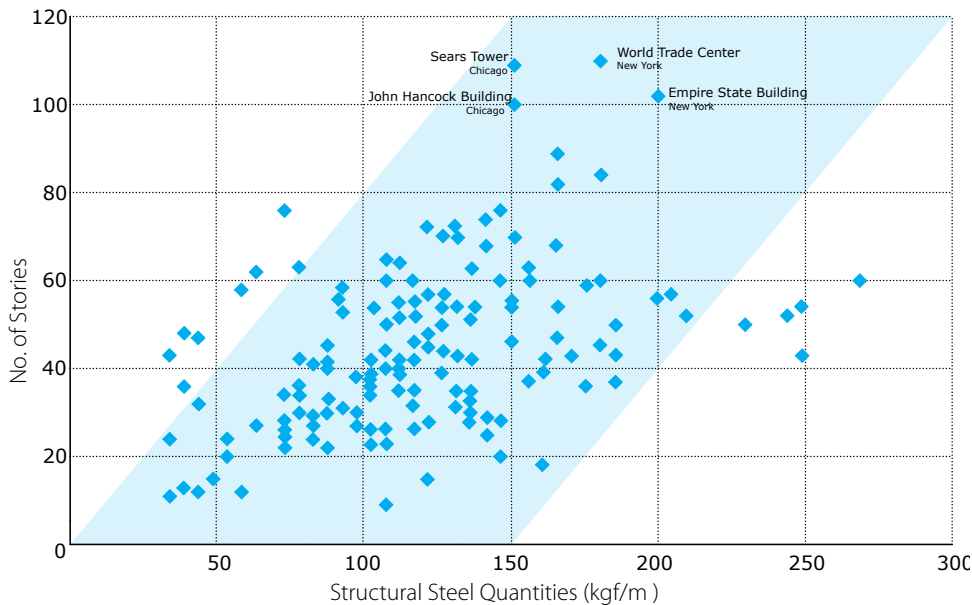
73% of the tall buildings studied in the 2000s adopt a core + outrigger structural system. Of these approximately 50% are constructed with concrete.



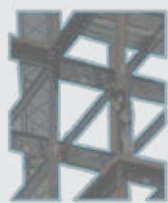
Structural Material Comparison of the 100 Tallest Buildings in the World each decade from 1960–2010



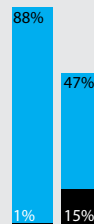
Structural Steel Weight in Comparison to the Height of a Tall Building



The number of 100 tallest buildings constructed using steel has reduced by at least 15% each decade since 1970. By the end of 2010, only 22% of the 100 tallest buildings will be steel.



From 1960–2000, an average of 88% of the 100 tallest buildings were offices and only 1% residential. By the end of 2010, the number of offices will reduce to 47% and residential towers increase to 15%.



Despite a similar height, the John Hancock Building in Chicago uses 25% less structural steel per unit floor area than the Empire State Building in New York.

