Guest Column

dedicated to the dissemination of information from other organizations

Drivers of Innovation

By Jan Klerks

Jan Klerks is the Communications Manager of the Council on Tall Buildings and Urban Habitat. He is the editor of the CTBUH Journal and has built the online tall buildings database. Jan may be contacted at ***jklerks@ctbuh.org****.*

One of the very few drawbacks of working for the Council on Tall Buildings and Urban Habitat is that most of your friends have problems remembering how to properly pronounce its tongue-breaking acronym, CTBUH. Things would have been a lot easier if the founders would have stuck to the focus of tall buildings, but the awareness that the space in between tall buildings is just as important as the buildings themselves justified its extended name. Actually, when looking at tall buildings today, we might consider rebranding the organization as the Council on Tall Buildings, Urban Habitat, Superstructures, Urban Intensity, Iconic Structures, Sustainability and Social Environment. However, if we were to adopt that, we would be left with no friends at all, I'm afraid. But it would definitely reflect what tall buildings are all about.

The Council was founded in 1969 as a Joint Committee of the American Society of Civil Engineers (ASCE) and the International Association for Bridge and Structural Engineering (IABSE) in an effort to evaluate and coordinate significant and international tall buildings research. In those early days, given the scope of the two fostering organizations, it was very much a 'tech boys' club in which the cultural aspects of tall buildings were hardly addressed. It was simply assumed that tall buildings exist to cope with urban growth, and that it was up to the engineers to solve the technical problems that came with that.

In those days, the future was always bigger and brighter. Visions of the future imagined smiling people who are swiftly getting around in airborne cars and happily living in shiny, supertall structures connected by skybridges. It's the time in which *superstructures* emerged in the American cityscape, such as the Sears (Willis) Tower, John Hancock Center and Standard Oil building (Aon Center) in Chicago and the World Trade Center towers in New York City. Building taller called for technical innovations never seen before, which is one of the most exciting aspects of tall buildings; superstructures as drivers of innovation for architects, engineers and developers, who want to build taller, newer and better than ever before.

But doing something new also means bumping into problems which haven't been discovered yet. After some recent visits to Russia, I learned that one of the big issues they encounter there is that their building code wasn't written with the development of modern tall buildings in mind. Thus, developers find themselves constantly bickering with local authorities over the interpretation of the code, or struggle to change the codes or adopt new ones as they continue to develop. However, the size of tall building projects allow developers to invest time and money into solving new problems. Tall buildings, in this context, are drivers of innovation.

Empire State Building. Courtesy of Jan Klerks.

Although usually taken for granted, structural safety has always been a big issue in the engineering of tall buildings. Over the course of time, this profession has often reinvented itself when it comes to tall buildings. Roman emperors Julius Caesar, Augustus and Nero all set maximum building heights for ancient Rome, as tall structures had a rather large tendency to plummet. In the middle ages, towers would regularly collapse because of structural failure or natural disasters, such as lightning. The European historic cityscape is scattered with unfinished towers that never reached their originally indented height because the structure started to lean during construction.

Student Design Response from the Antony Wood Studio on Tall Buildings in the context of Mumbai, India. Courtesy of CTBUH.

For centuries, towers were iconic and power-boasting incidents in the urban landscape. It wasn't until late in the 19th century that several technical inventions gave rise to a more utilitarian use. The development of the safe passenger elevator, the introduction of iron and, later, steel framing and new lighting systems all helped trigger the era of the sky-scraper. Several buildings have been singled out as the first skyscraper in an American context because of the height-related structural or technical inventions they incorporated: the Equitable Building in New York as the first building to use elevators as a means for the construction of tall buildings, the Tribune Building and the Western Union Building in New York (both completed in 1875) for being the firsts buildings to use passenger elevators and the first to show the actual number of stories of the building on the exterior. The Home Insurance Building in Chicago (1885) is recognized for being the first building that made full use of steel framing technology

The 20th century has introduced many new drivers for tall buildings. The most rational reason to build tall is to cope with urban density and high land prices. In theory, city centers are considered as places that make sense for tall buildings because that's where everyone wants to be, so the demand for space is high. To some extent, this rationale is correct. In island states such as Singapore and Hong Kong, space is a scarce commodity which cannot easily be solved through efficient urban transport or sprawling outwards. In these cases, tall buildings are indeed an economic necessity.

Rapid economic and social development can also be a driver for tall buildings. Having to cope with millions of people migrating from the countryside to the cities looking for a better life, China finds itself in a position in which it needs to develop housing by the hundreds of thousands, fast. Tall buildings in this context are a product of economies of scale, structural efficiency and reproducibility. It reminds us of the time in which tall buildings, or flats as Europeans call them, were built to offer affordable yet quality social housing in developed countries in the mid 20th century. However, some of these developments eventually created more social problems than they ever solved, and it will be interesting to see how they will develop over time in the new economies.

But there are also numerous cases in which tall buildings are a sought-after and exclusive piece of real estate. This could be regarded as the difference between a tall building and a skyscraper; both are tall but the latter aspires to stand out and be tall. The current world's tallest, the 828-meter (2,717-feet tall) Burj Khalifa in Dubai, was not built because the desert is so expensive. It was built as a symbol of Dubai as an emerging global hub, and also as a focal point for the Burj Dubai development area. It is doubtful, however, if the tower itself is a big money maker. The better profit is most likely to be found in the development of the surrounding area, which can be marketed as a front row seat with free exposure to the media outings generated by the building. Structurally, the Burj Khalifa relies on proven strategies such as the tripod principle and the tapered shape. However, the extreme height and scale of the project was cause for many improvements and enhancements to existing practical knowledge and procedures. Not only will designers inevitably bump into exciting

Willis Tower. Courtesy of Antony Wood.

Home Insurance Building. Courtesy of Norman Ramsay Collection.

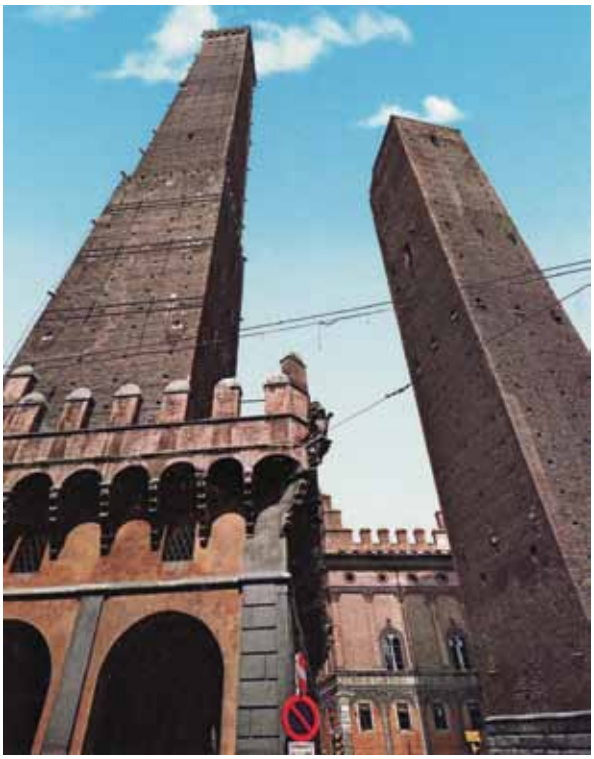
new problems when going to a height that has never been done before, but known problems become exponentially more problematic when building very tall. This might explain why one of the larger meeting rooms inside the Burj Khalifa's construction office was dubbed 'The War Room'.

Burj Khalifa is clearly an excellent example of the idea that the height of a building is primarily limited by the depth of the pockets of those who wish to make a statement. The statement as a driver appears to be important in the Middle East, where cities are manifesting themselves through tall buildings that come in some very artistic forms and shapes. One may genuinely wonder, however, if the number of buildings with an iconic presence is not devaluating the meaning of that driver in the first place.

Tall buildings that stand out because of their height and iconic presence can be a showcase of engineering if you know how to look at them. Chicago's Willis Tower is an excellent example of a bundled tube system, which was developed to significantly reduce steel usage while simultaneously increasing floor plan efficiency. The architecture of Chicago's Hancock Center is formed by its expressive structural system and gentle sloping façades. By expressively showing these strategies, the structure becomes the architecture. The danger with that is any subsequent building which adopts the same structural approach may be considered a reproduction, especially among architects who typically strive for a unique individual expression.

Today we're living in an age of iconic towers that curve, twist, bend, shear and generally look like sculptures or look like they are technically impossible. Such projects are becoming popular in cities wishing to make a statement, typically in some of the emerging countries. A "starchitect" who is known for renouncing the classic tower in favor of buildings which are instantly recognized by their iconic shape is Rem Koolhaas of the Rotterdam-based Office of Metropolitan Architecture. In the 2008 documentary, "A Kind of Architect", Koolhaas explains the 'context-free' building, and, interestingly, introduces the structural engineer, Cecil Balmondis of Arup: the guy who makes it all possible. Together they coined the phrase 'stupid but smart', which refers to the idea that it's okay if a structural system looks a bit unorthodox, especially when it is visible, as long as it is the most efficient solution. It just adds to the architecture. The message is that in this iconic age, the engineers really should be credited for realizing the imagination of the architects.

A recent theme which the tall buildings world has embraced is sustainability. Now here is a topic that we all can agree is a respectable and a timely one. Unfortunately, sustainability is also a bit of a slippery topic. One train of thought reasons that skyscrapers are good for sustainability because tall buildings increase urban density, which can create an incentive for walkable spaces and the use of public transport. Other sources point out that tall buildings contain relatively more embodied energy in the materials than in low-rise buildings. In all, the author believes that we just don't know whether tall buildings are sustainable by nature. But there is definitely a timely challenge to engineers to



Bologna Towers. Courtesy of Norman Ramsay Collection.

design structures which use materials even more efficiently than they already do.

Some have chosen to make a big visible statement, such as incorporating wind turbines in the design or putting trees on roof tops. As the monetary gains of these features appear to be hard to translate into actual numbers, the danger is that future generations might judge this as simply a fashion statement. But there are also a number of less exposed and less sexy strategies out there which are holistic, smart and sensible. Fortunately, because of Ludwig Mies van der Rohe, we all know that less can also mean more, so financially there definitely is an incentive to regard the costs of sustainable practices as an investment in future cost savings. It is interesting to notice how greening has become an extra incentive to preserve and refurbish buildings where their qualities have been distinctive and become part of architectural heritage. The recent green retrofit program of the Empire State Building in New York City is a good example of that.

Looking at the history of tall buildings, we can also predict their future. One observation is that, as buildings continue to grow taller, we're now at a point where we need to coin new phrase. Roughly based on a numerical coincidence, the term Supertall is already being used for buildings over 300 meters, or roughly 1,000 feet. The term Megatall is making its way into popular culture as an indicator of tall buildings over 600 meters (or approximately 2,000 feet). At the 2009 Chicago conference, architect Eric Kuhne introduced the term Starcatcher to label his 1,001 meter tall Burj Mubarak Al Kabir project in Kuwait.

Yet another development in tall buildings refers to the introduction of tall buildings, or even groups of tall buildings, which don't stand out because of their vertical prominence but more so because of their horizontal development. The 2009 overall winner of the CTBUH Best Tall Building award, the Linked Hybrid Complex in Beijing, and the 2010 winner for the Best Tall Building Asia & Australasia region, Singapore's Pinnacle@ Duxton, are great examples of both the relationship tall buildings are establishing with their horizontal environment and the social environments which are created.

Looking at the output of various academic tall building studios around the world, we see another emerging trend towards remarkably 'open' skins – as if these buildings are trying to open up to the city that surrounds them. This is a very positive development; hopefully, the students of today will be able to realize their ideas as the architects of tomorrow.

In light of these developments, we are witnessing the birth of a tall building type which doesn't just scrape the sky. Perhaps more in common with the already-familiar term groundscraper (as a building or podium that extends its horizontal connection with the ground), more and more buildings will try to open up to the city on all levels. Maybe in the future, we will call these buildings cityscrapers or urbanscrapers. Whatever their name, it is exciting to see that the tall building is again a frontrunner in the way we shape our cities.

Looking back and forth at tall buildings of the past and present, one tenet continues to hold true for the many people involved, and especially for the engineers – tall buildings challenge your knowledge, wisdom and, above all, your creativity. That's probably the main reason why we find them so fascinating.▪

Burj Kahlifa. Courtesy of Peter Weismantle, Chicago.