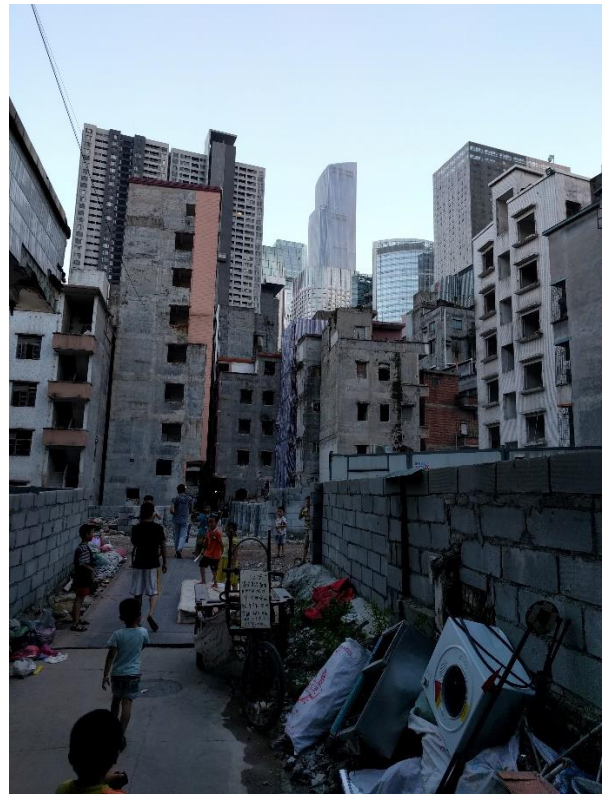
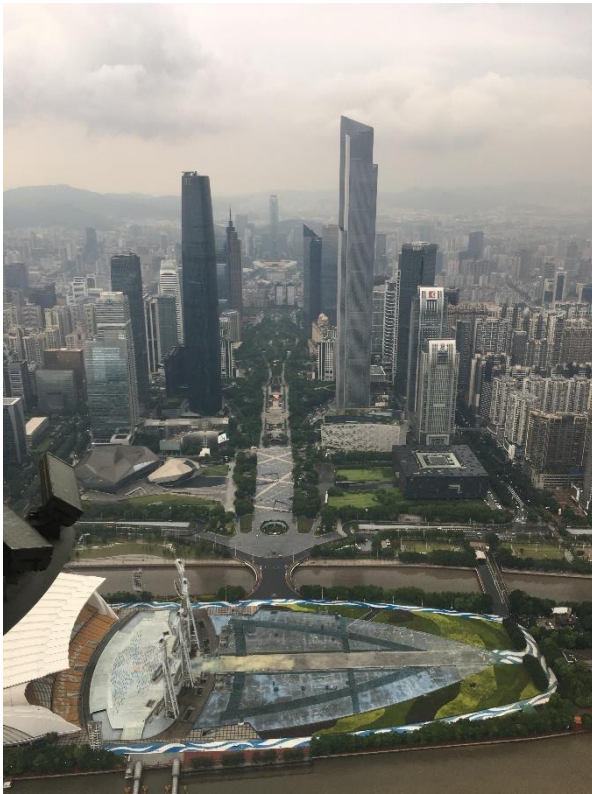


City of contrast

Old streets making way for giants of steel and glass – by Hermen van de Minkelis



Every year U-BASE, association for Building Engineering and Structural Engineering students organizes an intercontinental study tour for students and a few staff members. This year as well, a committee of seven persons had the honor to choose a location and prepare two weeks of activities for the 25 participants. It was decided to go China; land of contrasts, where narrow streets and traditional Chinese streets are rapidly being overruled by large malls, subway systems and shining glass towers as far as the eye can reach. Among the cities we visited, this contrast was best noticed in the thousand-year-old city of Guangzhou. Let's take a look at the steel and glass giants that rise above the city and the old streets that fade in their shadows.

Giants of steel and glass

One of our first destinations in Guangzhou was the new town district. It should not be a surprise that a group of Civil Engineering student would visit such a place since most of the modern architectural and engineering marvels are located there. Examples are the 530-meter-high Chow Tai Fook Centre, the shining International Finance Centre and the most energy efficient supertall in the world; the pearl river tower. These massive towers, together with a large museum, an opera house and numerous other high-rise buildings are situated on both sides of a stretched-out park that has a brand-new metro line running underneath it. Across the river, in extension of the park, stands the mighty Canton tower that forms a landmark within the cityscape like the Eifel tower does for Paris.



Guangzhou Tower

With a height of 600 meters, the Guangzhou tower is the tallest structure in the city and one of the tallest in the world. The structure stands free within the skyline and has a particularly elegant shape which ensured that it had already caught the eye of all participating Civil Engineering students before we even got to visit the structure. Most of the students already knew about the building for multiple reasons; It had been on a television program about large towers, both architects of the tower are Dutch and furthermore, some of the students attended a workshop for a course at the TU Delft in which they modelled the tower in a parametric design program called grasshopper. Some knowledge about the structural design was already passed around within the group because the lecturer who gave the workshop had actually worked on the structural design and he had told the students about the challenges that he came across. Everyone was excited to see the Canton tower from nearby but before that opportunity arrived we took a visit to the Guangzhou office of engineering firm ARUP where we were given a more detailed explanation about the structure by one of the engineers on the project.

Structural design

A team of engineers from Arup was formed to optimize the structure of the tower; the basic shape was chosen by the architect. The concept of the structure is simple enough; a steel frame on the outside that is connected to a concrete core. The frame consists of 28 twisted columns, oval shaped rings and diagonal braces. With these three different elements, lots of variations could be created and in order to find an optimum, the entire frame was put in a parametric design program. This was done in the time that there was a scarce availability of such programs and for that reason a team within Arup wrote the script themselves. With the software, lots of parameters could be varied such as the number of rings, number of columns, diameter of the rings, etc. A variation of connection between the concrete core and the steel frame have been put in place as well; in the top and near the bottom, moment resistant connections are placed while connection over the rest of the height are just hinged connections that prevent radial and lateral deformation. The connections help to make the core and the frame work together and make the structure much stiffer as a whole. even though the Canton tower is a stiff structure, yet another trick is applied to resist extreme wind loads during typhoon season; two large tuned mass dampers are located at the top of the tower. these dampers consist of

a passive part and an active part that are both free to move in the horizontal plane. The system helps to limit horizontal movement.



Construction

The process of constructing started out with the rise of the concrete core; this was done using steps of 5.2 meters at a time. Construction of the steel frame followed in quick paste. The frame was prefabricated on another location and transported to the construction site over the Zhujiang river. On location, the elements were put in place using temporary bolted connections after which the seams were welded together and the bolted connections were removed again. In the case of the Canton tower, welded connections are chosen because these are stiffer than bolted connections but welding on the building site is more common in China than in Europe anyway because labor costs are much lower in China. Another interesting fact about the structure is the fact that all vertical columns are filled with concrete. This is once again done to increase stiffness but it also plays an important role in fire safety.

Streets in the shade

After admiring the grandeur of new town, we deviated from the central park to find dinner. We crossed a 6-lane road on an elevated pathway and another one through an underground passage and just like that we arrived at a lively, but narrow street that seemed to be the entrance to a crowded old neighborhood. Lots of people were carrying around goods to sell or were cooking up wok dishes in the street and instead of cars there were only a few bikes and mopeds laying around which might have had something to do with the fact that most parts of the road were unpaved. A few steps into the street, things became even more exotic; we saw cages with living chickens and buckets with fish that were being slaughtered on the spot; we saw small temples where old ladies were drinking tea; we

explored side streets that gradually became so narrow that we had to walk sideways to get through. Some of these darker places showed signs of prostitution but these places were being monitored by police agents and even though the streets were filthy, in general, the atmosphere in the neighborhood was friendly and relaxed.

The only thing that seemed to be amiss in the community was the fact that at some places there were piles of debris on locations where buildings used to be. Children were playing on these piles but chances are good that children used to live in the building that stood there, just weeks before we got to see it; in the outskirts of maze there were actually demolition teams driving around in excavators and tearing down property while life around it just continued. This scene was the impersonation of China's rapid and uneven real estate development. It took a bit of investigation to find out how this type of neighborhoods came to coincide with the massive structures, shopping malls and roads that we had seen earlier and whether there is a chance that the bulldozing will stop at some point.



Urban villages

The place that we went to, turned out to be something called an urban village. Its perimeters coincide with, what use to be a small community surrounded by rice fields and nature. From the 70s on, a lot has changed in the area though. Policy was made to renew Chinese society and to stimulate large growth of cities; the rural areas around the old town of Guangzhou and the rest of the area stretching out around the pearl river delta became subject to rapid urban expansion. However, it turned out that it was difficult to compensate and replace people from all the villages so the city scape just grew around them. Because these little strips of lands within the new city limits are officially classified as being rural territory, Chinese building regulations don't apply there. This allowed villagers to fill their lands with very densely packed homes that could be rented out to migrants for a good profit. That is how a lot of vibrant, crowded communities came to develop; a concept referred to as urban villages.

As urban development once boosted life within the boundaries of the villages, a turning point has already been passed about a decade ago after which such developments have become a threat to the

existence of the enclosed communities. Ground prices within the city limits have skyrocketed and wealth in China has reached standards within which narrow, dark and filthy streets have become intolerable. Many communities are strategically being expropriated by large real estate developers and in cases that money and the prospect of a new homes don't work, the use of force is not uncommon. The urban villages are becoming rarer and even though their value is becoming more appreciated in the recent years for reasons like tourism and increasing interest in their authenticity, there is not much resistance against powerful corporations and demolition teams. It will just be a matter of time before the old streets that we saw will form the foundation for yet another mall or glass tower. Eventually a few of this kind of places will be preserved but their important role within the city will disappear and become just a memory from the past within modern-day Chinese society.