

Guangzhou TV-tower

Structural description

The build ability of the nodes was an important challenge while designing the 610meter tall Guangzhou TV and Sightseeing tower.

Although none of the 1100 steel nodes are identical, we still succeeded in creating one single type of node.

The structure consist of a open lattice-structure that is twisted over it's axis, therefore creating a tightening waist halfway up the building. This twist has created a slender grace-full profile.

The design of the lattice-grid is not only a structural one but is also driven by esthetic and architectural and environmental considerations.

The rings are placed on the far inside of the columns so that they miss each other spatially and are connected off-center. This will make that the inside view is dominated by the rings, while the view from the outside is dominated by the sloping columns.

All rings are placed under an angle of 15 degrees, so that both an opening is created for the entrance at the base of the tower, as well as that a sloping deck is created at the top of the building, offering magnificent views over the city.

The ring distances are laid out in a gradient that is denser toward the middle of the tower in order to produce a more intimate and closed space within the structure, while at the same time putting steel where it is most efficient.

Columns rings and diagonals form together a web that varies over the section of the tower. The columns are all perfectly straight although the lean over to one direction, giving the tower a dynamic twist. They taper from bottom to top, so to further amplify the perspective view up along the tower. The diagonals are more or less everywhere the same at 800mm. they consist of straight tubes that run between columns fixing the web of nodes into a stiff web. The rings are placed on the inside and their diameter is fixed at 800mm, they are truly round, following the curvature of the façade that runs along the inside.

At the bottom of the tower the columns are 2m in diameter, constructed of 50mm thick plated steel that is bend fully round in 3.7m wide bands that are welded together. At the top of the tower the column diameter is reduced to 1100mm with a plate thickness of 30mm. Where the columns where initially thought off as telescopically stepping in small steps of about 20mm, they are finally designed to truly taper, giving a amazingly perspective effect.

Core description

The core of the television tower consists of a concrete elliptical shaft with a short and long diameter of 15.6m and 18.6m respectively, that has been constructed with the help of a sliding formwork.

The nodes and tubes of the steel web, that give the tower is characterizing profile, are fully prefabricated and delivered by truck to the site from the Prefabrication factory in Shanghai. The elements are first connected by bolts, and only after the tubes all around have been welded together, the bolt connections are being burned off.

Only After the first six rings and all the matching columns and tubes are constructed, the columns are lined out and filled with concrete for stability and fire-proofing.

While building, the contractor initially worked with 5 cranes. But from +100m onwards the three cranes positioned outside of the lattice-structure were taken down, and they continued with only two cranes till the structure and core were completed. The antenna

extends another 150 meter. The antenna will be prefabricated in parts that will be lifted to the platform and there put together, and telescopically pushed out starting with the top-end, till the antenna has been completed.

Site-progress

Since the winning of the scheme, wind tunnel tests, fire- and load tests have been completed. And since the groundbreaking ceremony in November 2005 the foundation and piling, and the whole of the steel-structure has now been assembled above ground. The tower is due to be completed at the end of 2009, in order to be fully operational for the 2010 Asian Games.

Credits:

Architect: Information Based Architecture

Designed by: Mark Hemel & Barbara Kuit

Structure; Arup

Local design Institute: Guangzhou Design Institute

Client: Guangzhou Xin Xin TV and Sightseeing Co. Ltd.