A 'greener' kind of skyscraper

When father and son architect team Yoram and Sholem Cimet set off to build a major tower in Mexico City's Glorieta Insurgentes area, they knew they had an exceptional project on their hands. "The rotunda here of the Glorieta los Insurgentes has some of the main avenues of the city going through it. It's the central part of Mexico City and the main transport hub: the first subway line and the first metro bus line run through here," explains Yoram. He estimates that with the bus and train circulation combined with automobile, foot, and bicycle traffic, more than 500,000 people move through the rotunda adjacent to the building each day.

Brett Fillmore, ProAll, Calgary, Alberta, Canada

Covering 5600m^2 of floor space, the building is 25 storeys high, not including the three-floor underground parkade. The building will feature a heliport, a rooftop garden and – beneath the basement levels – fully operational water and sewage treatment plants.

The inclusion of these facilities means that, with the uptake of rainwater during Mexico City's four- or five-month rainy season, the building will be 100% water self-sufficient. This feature is part of a larger initiative for Torre Glorieta – achieving LEED status.

Developed by the United States Green Building Council, Leadership in Energy and Environmental Design (LEED) is a building certification process to promote the design and construction of energy-efficient buildings that use sustainable resources and materials. LEED uses a point system to evaluate the environmental merits of a project, with categories such as energy and atmosphere, innovation in design and sustainable sites.

"When we designed the building and commenced construction, we knew we had to comply with the highest standards internationally," explains Yoram, "we were building in a very important jobsite with a very important design. We knew we needed to comply with LEED and to be sustainable."

For Torre Glorieta, the building's self-recycling water system combined with other design elements such as hyper-efficient air conditioning, plumbing and lighting to warrant not only LEED certification but also achieve Gold

Main image: The mix design uses micro fibres to control cracking in the slabs. Inset, right: The finished tower will cover 5600m² of floor space. Below: A ProAll Reimer Mixer is loaded with stone and sand while pouring at the base of the building.

status – the second highest rating possible.

Beyond environmental concerns, Yoram and Sholem had some other *pescado* to fry before construction on the building could begin.

By far the largest and most complicated of these was concrete. The finished Torre Glorieta has over 25,000m^3 of concrete and the vast majority of it required specialised problem solving to pour.

"No aspect of this project is standard," explains Yoram, "not the plot of land, or the architectural design and especially not the concrete design." The two biggest obstacles affecting the Cimets' project were swampy ground and high seismic activity.

Above: The 25-storey building has been under construction since 2014.

Challenges

Mexico City is built on a drained lake. In order to stabilise the building in such soft soil, massive underground pilings and walls had to be poured, some as voluminous as 380m³ at a time – a major risk in a labyrinthine city with unpredictable traffic delays and a project where one late load would prove disastrous.

Another geographical obstacle working against the Constructora Cimet team is the fact that metropolitan Mexico City stands in a notable earthquake zone, where seismic activity is frequent and occasionally heavy. Consequently, the Torre Glorieta's columns needed to be flexural and possess a certifiable degree of elasticity, characteristics that had to be implemented into the concrete design. For Yoram, this was a major challenge to the degree that, "no concrete company in Mexico would guarantee that the elastic modulus of the concrete would be met," he says. So, not only was excellent-quality concrete utterly critical to the project, but the concrete designs were unique and varied, ranging from 30MPa to 55MPa – and suppliers were unable to meet the requirements. The Cimets had no choice but to produce their own concrete, on-site.

Through research, the Cimet team decided on a mobile concrete mixer. Of the mobile mixers on the market, ProAll Reimer Mixers emerged as the most high-performance option, specialising in creating quality, cost-effective on-site mixing. All the components – stone, sand, cement and water – are loaded into separate compartments on one truck, trailer, or static-mounted unit. The components are metered and mixed into fresh concrete in a high-production mixing auger for a consistent, fresh mix anywhere, anytime. The mixers excel in conventional commercial and industrial projects, as well as more specialised applications such as back-fill/soil stabilisation, continuous pour, floor screed/topping, precast, remote location and shotcrete. For the Cimets, it was a turnkey solution.

Using a mobile mixer meant the material was mixed immediately, producing the freshest possible concrete for the building's columns and guaranteeing that the elastic modulus of the mix design would be met. Since a Reimer Mixer can be loaded as it pours, it also meant that the building's gigantic monolithic foundation pours could be achieved, even if it meant pouring for more than 24 hours continuously. So, the Cimets had the control they were looking for, but the quality was another question: they needed to ensure standards were being met. Their solution – on-site laboratory certification, with curing and compression tests on demand. So, with over 25,000m³ of concrete and each pour tested by an external lab, how did the volumetric mixer's concrete perform? "We had no failures on test results," explains Yoram.

A greener mixer

With such lofty environmental objectives, how would this non-traditional approach to concrete affect the project's status as a Gold LEED building? Using a mobile mixer not only left the LEED certification intact, it was enhanced. "When we tried various formulas, we realised that we were saving a great deal of energy in the production of the concrete, since it was a simple method, without having to rely on concrete coming from a plant some distance away. So there are savings in both transport and in the machinery needed to produce the concrete. In addition, there's no waste – we use all the concrete we produce; a very important factor for those at LEED."

For Sholem and Yoram Cimet, choosing a volumetric mixer meant a solution to several significant problems, and it was a vital component of the project's success. However, as Yoram describes, the ramifications of this project may stretch much further. "Having the production of concrete on-site made a huge difference in the building's construction. It was very cost-effective and proved to be a fast method of construction. I'm pretty sure other construction companies will start looking at the method and adopt it, as it worked wonders for us and I'm sure it would for anyone else. I'd like to say that I think the way this building has been constructed and the way it was designed architecturally and structurally will change the methods of construction in Mexico City and maybe worldwide." ■

Left: The mixer uses a high-speed auger to complete the concrete mixing process. Above left: The job site featured a testing lab where samples were constantly being cured and tested.