Singapore's tallest building: Rejuvenating the Tanjong Pagar District

CONCERA® Admixture for Control Flow Concrete

Project	Tanjong Pagar Centre
Developer	GuocoLand Limited
Architects	Architects 61; Skidmore Owings & Merrill
Main Contractor	Samsung C&T Corporation
Concrete Supplier	Pan United Concrete
GCP Solutions	CONCERA® Admixture for Control Flow Concrete

Project

Nestled in the heart of downtown Singapore, the striking 290-metre, 64-storey Tanjong Pagar Centre soars above the city. The gleaming 1.7 million square feet (158,000 square metre) skyscraper is essentially a 'vertical city' with a carefully curated mix of office space, retail shops, a luxury hotel, swanky residences and an urban park. The prestigious development's successful integration of five elements to provide a holistic work-live-play experience won the 2014 World Architecture News Award for Mixed-Use Future Projects.

"Customising concrete for the tallest building in Singapore was no small feat. Thanks to great teamwork between PanU and GCP, we created an accurate mix that not only achieved high flowability but also high quality slump retention."

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Chan Wai Mun, Director of Operations, Pan United Concrete

To expedite construction time and limit disruption in the congested financial district, the project used the top-down construction method. This allowed the basement and above ground levels to be built simultaneously. Given the access constraint of the top-down method, the project required concrete that possessed high flow, long slump retention and good rheology properties, so that kingposts could be inserted later for bore piles before the concrete could set.

Another project challenge was pouring more than 13,500 cubic metres of concrete — enough to fill five Olympic sized swimming pools — to create the Centre's gigantic raft foundation. The 3,814-square-metre foundation required one of the largest concrete foundation pours in South East Asia. For such a massive amount of concrete, it was vital to ensure that the concrete met stringent material and workmanship specifications — from temperature, durability, mix design and performance to pour preparation, delivery timeline, safety and access.

"The unique qualities of Self Compacting Concrete enabled the continuous pour of a massive 13,500 cubic metres of concrete — enough to fill 5.2 Olympic-sized swimming pools — per hour during peak operations,"

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Chan Wai Mun, Director of Operations, Pan-United Concrete.

Pan-United Concrete (PanU) and GCP Applied Technologies (GCP) assembled a dedicated team of scientists, engineers, materials and logistics specialists for the project. The team of product and admixture experts focused on gaining a deep understanding of site conditions, material requirements, delivery timelines, regulatory specifications and safety guidelines, to determine the right concrete product type with the required control flow for the raft foundation.

The interdisciplinary team found the ideal mix using the CONCERA®range of admixtures from GCP along with PanU's Self-Compacting Concrete and Retention Concrete. These specialised concrete mixes met the stringent specifications for high flow and extended slump retention.

Results

During the record-breaking 44-hour continuous pour on site, the concrete mix flowed easily in a controlled manner under the force of gravity. The segregation-resistant concrete mix also offered substantial environmental benefits—noise pollution reduction. Since the concrete fills irregular voids quickly, it eliminates the use of loud mechanical compactors, which are typically used to smoothly spread and compact the concrete for a stable foundation.

A large team from PanU and GCP worked seamlessly in 12-hour shifts on site to inspect the concrete for consistent quality and flow. The project required intricate logistics involving 120 mixer trucks, six concrete pumps and one direct discharge chute to deliver 13,500 cubic metres of concrete from 10 concrete batching plants across the island. The concrete was poured at a steady speed of one concrete truck delivery every 90 seconds and peaked at 531 cubic metres per hour.

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