Kai Tak Cruise Terminal Building – Hong Kong

Precasting and erection of 240 post-tensioned secondary beams and installation of more than 2,000t of post-tensioning

▲ *The new Cruise Terminal Building in Hong Kong is able to accommodate two 'mega' cruise ships. Its features include large column-free spans and the largest roof-top garden in Hong Kong, with incredible views of Hong Kong Island and the Kowloon Peninsula.*

Hong Kong's new Cruise Terminal Building is sited on the runway of the former Kai Tak International Airport. Thanks to its deep water and long sea frontage, the terminal functions as a new gateway for the world's largest cruise vessels.

The Cruise Terminal Building's attractive and striking envelope makes it a prominent landmark in Hong Kong. Other outstanding aspects of the structure include the innovative bridge engineering techniques adopted in its construction and the extensive use of sustainable elements.

The main building is a three-level concrete structure on a footprint of 610m x 70m, with an apron area of 850m x 35m.

Scope of works performed

- Design of all post-tensioned beams
- Supply and installation of precast secondary beams (including design, precasting, post-tensioning, installation and bearings)
- Design and post-tensioning of cast-in-situ primary and secondary box beams

The 44.7m-wide column-free layout in combination with high loading requirements meant that extensive post-tensioning was needed. Maximisation of the use of precasting and the introduction of innovative bridge construction methods were instrumental in enabling fast-track erection, with the whole project designed and built in just 36 months.

▲ *The 240 precast secondary beams were cast and stored next to the site.*

VSL undertook an extensive study to optimise the structural framing by introducing post-tensioning and precasting. Dragages Hong Kong Ltd then awarded VSL Hong Kong a subcontract at the end of 2010. The scope of works included the design, supply and installation of the precast secondary beams as well as the design and post-tensioning of the cast-in-situ primary box-shaped beams. More than 2,000t of post-tensioning steel was installed.

▲ *The precast secondary beams of the first and second floors are supported on the primary box beams.*

▲ *Custom-made steel moulds were used to create the water-drop-shaped secondary beams.*

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The iconic ‘water-drop’ shape of the secondary beams was jointly developed by VSL and the lead architect, Foster + Partners. The fully exposed concrete required a very high level of finishing works.

The precast yard for the 240 secondary beams was established next to the construction site. Five purpose-designed steel moulds were set up to cast the typically 31.5m-long and up to 125t beams in a typical cycle of 48 hours.

The casting yard was serviced by a newly fabricated 150t-capacity heavy-duty portal gantry with a 40m span and 21m under-hook height. The beams had to be stacked in three layers as storage space was limited.

The precast beams were delivered to the erection front by a heavy-duty transporter, then installed onto the primary box beams using a 300t-capacity crawler crane.

VSL’s work on site was completed in 2012.

▲ *A heavy-duty transporter moved the beams from the storage yard to the erection site.*

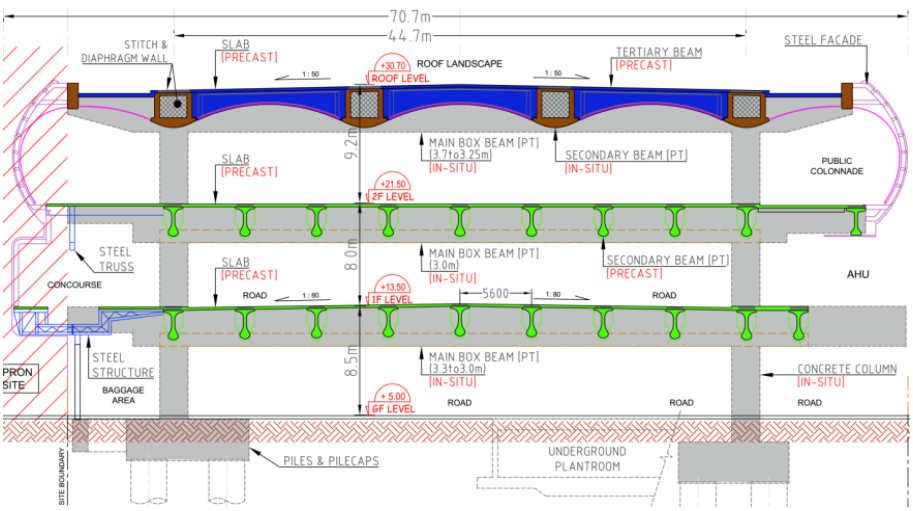
▲ *A 150t-capacity portal gantry handled the precast secondary beams at the casting yard.*

▲ *A crawler crane was used to install the 31.5m-long and up to 125 ton heavy precast secondary beams onto bearings preinstalled along the halving joint of the primary box beams.*

▲ *View of the casting yard for the precast secondary beams at early stages. The casting yard had 5 moulds for casting, one bay for curing and stressing and 2 bays for storage of the beams.*

▲ *The precast secondary beams of 1st and 2nd floor are spaced at 5.6m and support the ribbed precast slab.*

▲ *View of the Roof Floor which is supporting the landscape deck. The framing is made up of post-tensioned primary and secondary box beams, with the later supporting the precast tertiary beams.*



▲ *The three-level structural framing of the main building with the primary box beams spanning 44.7m between columns and cantilevering up to 12.65m.*

CLIENT
HKSAR Government’s Tourism Commission

PROJECT MANAGER
Architectural Services Department

DESIGN & BUILD CONTRACTOR
Dragages HK Ltd

STRUCTURAL DESIGNER
AECOM Asia Co. Ltd.

ARCHITECT
Foster + Partners Ltd.;
Wong Tung & Partners Ltd.

VSL ENTITY
VSL Hong Kong Ltd.

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