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3. New Alexandra House, Hong Kong

Owner: The Hongkong Land Co. Ltd.
Engineer: Mitchell, McFarlane, Brentnall & Partners
Contractor: Paul Y Construction Co. Ltd.

New Alexandra House occupies a site in the heart of Hong Kong's busy Central District on which two previous developments have stood, and forms part of the Owners overall scheme for Central redevelopment. Speed of redevelopment was a critical factor, and demolition of the existing 13 storey building and the construction of the new building was carried out in 27 months. From the date of taking over the site the main Contractor completed the structure in 18 months. It was essential for speed of construction methods to be considered in the design.

The Tower

The office tower rises 124,36 m approximately above road level and is designed to resist wind forces up to a maximum pressure of 3,591 KPa. It was necessary to establish how the wind loading was proportioned between the stiff central core and the external columns, which include four large corner re-entrant columns. A special computer analysis was evolved to solve this problem, 80 o/o of the wind being shown to be taken on the central core. Consequently the core was designed to resist all wind forces, and columns strengthened to resist any wind moments which might develop in them.

To obtain a light, economical structure without internal columns in the tower, ribbed slabs were adopted and were confined to a 508 mm depth of construction. This was achieved by using wide flat diagonal beams spanning between the re-entrant corners and the corners of the central core, with the ribbed slab construction elsewhere. A live load of 4,788 KPa was used for the floor design, with supporting beams designed for 2,394 KPa.

Generally 25,855 MPa 28-day strength concrete was specified for the superstructure with 41,368 MPa 28-day strength concrete for all vertical members below the 26th floor level. Special details were prepared to permit the slip-forming of the central core.

The Podium

The two level podium is designed for shopping, banking and public area live loads, with a cantilevered walkway at first floor level. Two covered footbridges, spanning 18,29 m and 22,86 m, link the podium concourse to Prince's Building and Union House. Their design utilises 1524 mm deep Autofab beams at Roof level from which the remainder of the construction is suspended.

The Basement & Foundations

The two level basement constructed under the entire podium is in 41,368 MPa 28-day strength watertight concrete construction. The general depth below ground level to underside of foundations is 9,91 m. This depth increases to 14.33 m for the triangle formed at the junction of Chater Road and Des Voeux Road, and this area is reserved for Mass Transit purposes. Large openings have been formed in the basement walls to provide access to the future Chater and Pedder Street Stations. Sheet piling forms a temporary seal to these openings.

The raft foundation rests upon 707 No. 597 mm diameter Frankipiles and is 2,438 m thick under the tower block and 1,219 m thick elsewhere. Each pile has an individual capacity of 145 tons, 592 of the piles are concentrated under the tower. The average concreted pile length is 7,32 m and achieves the required set in the lower measures of coarse silty sand. Several problems related to the construction of the foundation and basement:

- Existing single basement of old Alexandra House
- Existing 432 mm diameter Vibro piles (788 No.) capacity 60 tons
- Existing short timber piles
- Presence of rubble mound near Ice House Street
- High water level of 1,524 m (Road level + 3,962 m approx.) subject to tidal influence
- The importance of non-disturbance to adjoining Central District major roadways.

Due to the comparatively small capacity of the existing piles and the time factor involved in attempting to extract them, they were left in, with the new higher capacity piles fitting in remaining spaces. Methods and sequences of construction were carefully pre-planned and involved driving an inner ring of sheet piles within which the tower raft could be constructed first. This section could then be used to prop against for the perimeter construction. Good use was also made of existing sheet piling which related to the old basement.

Photographer's Impression of the new Alexandra House

Construction

Due to the restricted nature of the site, construction of the substructure within the tower area followed by the tower itself, was carried out ahead of other areas. This involved 24 hour pours of up to 1680 m3 for the raft, slipforming the centre core at about ten floors above the general tower floor construction, and a five day cycle for completing each of the 1116 sq.m. floors around the core.

Slipforming enabled a tower crane to be jacked up with the core, which served the whole of the tower area.

A dual purpose materials/passenger hoist was erected initially inside the core, leaving special openings through the floors, serving slipform and tower floor construction purposes.

A purpose designed steel support system incorporating easily handled units, together with fibre-glass moulds, provided means of setting up for the standard insitu tee-rib floor in keeping with traditional carpenters methods but utilising the advantages of rapid assembly and striking. One set of moulds for a complete floor was sufficient for the full height of the tower. Temporary openings left as floors were cast, allowed vertical movement of the support system using simple chain block lifting, thereby avoiding reliance on the tower crane.

Concrete pumping was adopted to achieve placing rates of up to 20 cu.m. per hour for tower floors even at the higher levels. The maximum height pumped was approximately 122 m, with 30 m of horizontal line in use at the level.

A steel external scaffold was used, providing improved access for finishing works and allowing enclosures for the tower within safety netting.

The following total quantities of high tensile and mild steel reinforcement and concrete were used in the project:

	Substructure	Superstructure
Reinforcement	2010 tons	2120 tons
Concrete	8527 m3	16487 m3

(L.R. Thompson)

Hongkong Land's Alexandra House making rapid progress towards completion