

4.5 Case Studies

4.5.1 Tseung Kwan O Area 74 Phase 4

Client: The Hong Kong Housing Authority

Main Contractor: Dragages at Travaux Publics

Contract Sum: HK\$ 1,100 million

Contract Period: December 98 – December 2000

Project Description

The building contract comprises:

- ✧ Six 40 storey Concord Blocks (Option 1)
- ✧ One 7 storey carport
- ✧ Associated external works



Figure 4.23 Overview of the site

Low-Waste Technologies Adopted

1. Large panel steel formwork

The Housing Authority has specified the use of large panel steel formwork for the construction of load-bearing walls. Over timber formwork this will save time in erecting, striking and re-erecting as the steel formwork is handled as one unit. One set of formwork can be repetitively used throughout the block. However, it takes 6 days to complete one floor because the tower crane is very fully loaded. With traditional timber formwork, a 4-day floor cycle can be achieved. In addition, the cost of steel formwork is 25% higher than the cost of timber formwork for this project.



Figure 4.24 Large panel steel formwork

2. Semi-precast slab

The semi-precast slab is adopted for floors. A 70mm thick precast slab serves as the formwork for an 80mm insitu concrete layer, thus forming a 150mm thick concrete floor. This saves time in erecting and striking the timber formwork as well as forming smooth ceiling finishes for the floor below. However, the precast slab must be handled and transported with

care to prevent its cracking.



Figure 4.25 Semi-precast slabs

3. Precast façade

The precast façade is prefabricated off-site and transported to the site, stored at ground level and lifted to the required floor by tower crane in a vertical 'hung' position.



Figure 4.26 Precast façade



Figure 4.27 Precast façade

4. Precast staircase

Another feature is the precast staircase, which is constructed in units of 8 risers.



Figure 4.28 Precast staircase

5. Dry wall

The 'Ytong' dry wall system is used to form the partitions in the flats. Ytong Autoclaved Aerated Concrete (AAC) is manufactured from sand, lime, PFA, cement, water and aluminum powder. It is composed of calcium silicate hydrates and many small pores. The accuracy of Ytong size can easily be controlled because the size of the product will not vary after casting. Also, the shrinkage of the Ytong product is small at only up to 0.055%. In addition, the product is very light – with a density which ranges from 400-700kg/m³. It can be cut into different sizes according to requirements by simple equipment such as a hand saw or an electric cutter. It has the advantage of easy assembly and disassembly to give a flexible layout to the flat without any of the waste producing concreting processes.



Figure 4.29 Dry Wall



Figure 4.30 Storage of dry wall panels

6. Spray plastering

Spray plastering is faster than traditional cement sand plaster. Although the cost of spray plastering is double that of traditional plastering, it is considered as a defective free product, providing a very smooth and accurate surface.



Figure 4.31 A wall finished by spray plastering

- Gondola was used for applying external finishes.



Figure 4.32 Gondola used for applying external finishes

- Tubular scaffolding was used for constructing the carport, saving the use of bamboo scaffolding



Figure 4.33 Tubular scaffolding for constructing the carport

4.5.2 Tung Chung Station Development Package II Project

Client: Tung Chung Station Development Co., Ltd.

Architect: Anthony Ng Architects Ltd.

Structural Engineer: Maunsell Consultants Asia Ltd.

E & M Consultant: Meinhardt (M&E) Ltd.

Quantity Surveyor: Levett and Bailey Chartered Quantity Surveyors

Main Contractor: Hyundai Engineering & Construction Co., Ltd.

Contract Sum: HK\$ 2,278 million

Contract Period: 730 calendar days

Gross Floor Area: 99,700m²



Figure 4.34 Overview of the site

Project Description

The project comprises the following:

- ✧ Superstructure works for five 50 storey high rise residential blocks
- ✧ Basement carpark construction
- ✧ Substructure and superstructure works for club house & attached E&M building

- ✧ Substructure and superstructure works for retail, low rise carpark & kindergarten
- ✧ Substructure and superstructure works for open plaza
- ✧ Construction of linkbridges A & B

Low-Waste Technologies Adopted

1. UPVC column formwork

UPVC column formwork was used to construct the 2500mm diameter large circular columns at the podium floors below the transfer plate. Rib Loc column forms are made by spirally winding a ribbed plastic profile into a tube. This enables column forms to be constructed which are strong, light in weight, easy to strip and which provide a superior surface finish. The surface also incorporates the inherent "waxiness" of extruded plastic thus no form oil is required. Square timbers are fixed at the foot of column formwork for stabilisation to stop the formwork moving away from its position. Vertical bracing timbers are used against possible movement while concreting.

The advantages of UPVC columns are:

- Light weight – easy to handle
- Easy to strip – time efficient
- Any size – 150 - 3000mm
- Strong – resists rain or chemical damage on site
- Smooth – superior off form finish
- Adaptable – for oval shapes of beam cut-outs
- Cost efficient – over the duration of the complete job
- Occupational health & safety – dramatically reduced injury risk

Because Rib Loc circular column formwork is light. Australia, USA., Japan and Germany began substituting conventional timber and steel circular column formwork by the Rib Loc circular formwork some ten years ago. The Rib Loc circular column formwork was recently introduced to and was well received by Hong Kong builders and developers and has been successfully used in Government Housing Estate Projects and the Gold Coast and LRT Sam Shing Interchange

Podium projects. The feedback from both management and site personnel is encouraging: the time and cost involved in constructing circular column have been significantly reduced.

The material cost of Rib Loc column formwork ranges from HK\$57 per meter for a 150mm internal diameter to HK\$2661 per metre for a 3000mm internal diameter. The transportation cost is HK\$650 per trip. These cost data relate to January 2000.



Figure 4.35 UPVC column formwork

2. Aluminum formwork

“Mivan” aluminum formwork is used for typical floors to avoid the use of timber formwork. The unit rate of timber formwork is HK\$ 120-130m² while the unit rate of aluminum formwork is HK\$ 150-160m². However, aluminum formwork can be reused over 100 times. For this project, it is reported that there are no time and cost effects in comparison with conventional formwork system. A 5-day floor cycle is achieved. Aluminum formwork is easy to handle but there are more joints.



Figure 4.36 Aluminum Formwork



Figure 4.37 Aluminum formwork used to construct the balcony

3. Structural steel temporary sales office, the steel can be reused or recycled.



Figure 4.38 Structural steel temporary sales office

4. Metal panel site office, thus saving the use of timber.



Figure 4.39 Metal panel site office

4.5.3 The Centre, 99 Queen's Road Central

Developer: Cheung Kong (Holding) Ltd. / Land Development Corporation

Architect: Dennis Lau & Ng Chun Man Architects & Engineers

Main Contractor: Paul Y-ITC Construction Ltd.

Contract Sum: HK\$ 3 billion

Contract period: December 1995 – December 1997

Project Description

This 80-storey commercial building covers a site area of 8816 m². The Centre is largely devoted to office units, although ground to level one is house retail space. The building's entrance hall is on the 6/F, while the 42/F is a sky lobby. Various facilities are available including a day nursery, public open spaces and underground car parks.

Low-Waste Technologies Adopted

1. Steel structure

The basement and podium were constructed using reinforced concrete and composite columns, while the office tower was built using a structural steel frame. It can reduce the total weight of the steel structure by using this special method to infill the concrete to the box column. In order to complete the project on schedule in 730 days, a steel frame was used to save time. The steel members, which were imported from Taiwan, the Philippines and Japan increased the pace of construction as they were of good quality craftsmanship and could be used without too many amendments.

2. Composite floor

The composite floor, which acts as a diaphragm structure tying and providing rigidity to the vertical steel members, was constructed of reinforcement concrete laid on a ribbed steel deck as the permanent shutter. Thus, formwork was saved.

3. Curtain wall system

The building employs a unitized curtain wall system, which leaves most of the clumsy fabrication works to the manufacturer's factory, thus making site installation fairly simple. Specially designed double-decked work platforms were used for the installation of the wall units. This saved the use of scaffolding.

4. Dry wall system

A dry wall system was used instead of a traditional brick wall, helping to reduce the building's weight. As a result, the interior partition is more flexible and the cost lower. There was a chance, however, that the dry walls might be damaged by rain water. To solve this problem, canopies were set up inside the building, and wet trades were avoided.

(Source: Construction & Contract News No. 3 1997)