THE HONG KONG CONVENTION AND EXHIBITION CENTRE (HKCEC) AN UNUSUAL BUT HIGHLY SUCCESSFUL PROCUREMENT EXAMPLE

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Introduction

This paper describes the inception, conception and realisation of the Hong Kong Convention and Exhibition Centre (HKCEC) and by broad analysis identify the major reasons for the project success. The inception process and some relevant design details are first presented. The reasons why the project was successful are then analysed.

Inception

During 1984, the TDC commissioned an "indicative scheme" by Hong Kong architectural firm, Ng Chun Man & Associates. This was made available to hotel groups, property developers and contractors throughout the world and, as a result, nine consortia, from Canada, France, Hong Kong, the USA, Japan, the United Kingdom & Singapore, including the Stage Two Consultants, asked to be placed on the tender list. Detailed proposals were finally received from four groups and, after two months of negotiations, the project was awarded in December 1984 to Polytown Company Limited, a subsidiary of the Hong Kong-based New World Development Company Limited.

Under the terms agreed between the two parties, the entire project would be financed by New World. The TDC would retain the exhibition & convention facilities while New World would be assigned the hotels, office block and service tower portions of the complex. New World would also be responsible for marketing, furnishing, and operating the exhibition centre complex by appointing an internationally renowned operator to be approved by the TDC.

On 28th February 1985, the Government formally granted the 7.7 acre Wanchai waterfront site, Island Lot. No. 8593, to the Hong Kong Trade Development Council for its new Convention and Exhibition Centre for a term of 75 years at a Crown rent of $1,000 per annum. New World appointed Polytown Company - a subsidiary company as Project managers in December 1984.

At the end of 1985, the formal development agreement between the TDC and Polytown Company Limited was signed. Under it Polytown would be assigned, "subject to the fulfilment of certain conditions", a substantial portion of the Council's interest in the land granted by Government, representating the commercial portions of the development, while the TDC would at all times retain ownership of the Convention and Exhibition Centre itself. In addition, Polytown would give the TDC three floors of space in the office tower, rent free, for a period of up to 75 years.

Conception

A major difference between the Hong Kong Centre and other international facilities was that, because of site constraints, the Hong Kong Centre would have to be built vertically with its exhibition and convention halls "stacked" on top of one another.

Under the terms of the Development Agreement, Polytown as the developer was responsible for overall design of the project in acceptance with the agreed amended Indicative Design and for the appointment of its own consultants and contractors subject to approval of the clients through C-Fin who had been appointed Project Leader by TDC.

Preparation of all the tender documentation relating to construction, the invitation of tenders and the award, control and supervision of the construction contracts were the direct responsibility of Polytown. All costs incurred by consultants, contractors, sub-contractors, suppliers and manufacturers etc. in developing the project, were also borne by Polytown.

Polytown Company commissioned a further site investigation contract in order to verify the ground conditions and also confirmed the firm of local Architects and Engineers, Ng Chun Man & Associates in association with Building Services Consultant, Parsons Brinckerhoff (Asia) Ltd., and Quantity Surveyors, Langdon, Every & Seah. These firms redrew the complex on the basis of the potentially viable scheme and prepared drawings and specifications (known as the Indicative Design) within three months.

By definition a fast track scheme is one-where construction work starts before designs are completed. On this project, conception and realisation went hand in hand for a considerable period. In the early days of realisation, conceptual activity was also intense on such activities as defining necessity, then identification, and choice for specialist consultants, Government interface, entrustments, requirements of conditions of grant, and QA/QC policy.

Realisation

The project team decided to save time by going ahead with piling in advance of a fully detailed design of the main structure. Polytown was confident to do this since the main contractor was to be Hip Hing on a cost plus basis. Because Hip Hing are part of the New World group no difficult claims for costs and delay were envisaged [or met].

The decision to go ahead with piling in advance of the detailed design was a particularly courageous one. The centre was to be a state of the art world class centre of a new type of building. Combined Convention and Exhibition Centres were still rare and there was not a large body of knowledge available. Also the site had severe space restrictions. However, the developer had confidence in his project management team, his designers, and the main contractor. The developer felt that the 9-12 months gained would compensate for any costs involved for abortive or varied work. This confidence was justified by events even though some significant changes to columns and loadings to pile caps were introduced as piling continued.

Piling

Time was pressing and, as a result, the developer awarded the HK$124 million piling contract to two contractors - Vibro (HK) Ltd., who were responsible for the eastern section, and Franki Contractors Ltd., for the western section.

Podium Structure

As the design developed it became apparent that, with the very large span exhibition floors and considerable vertical distances between the main exhibition floors, some major construction problems existed. In addition, the overall programme of work presented a compressed construction period for the construction of the podium structure containing the exhibition halls. Various methods of construction were investigated and possible alternative suitable design arrangements were examined within the configuration of columns. The cost and programme implications were examined to find the optimum solution.

After extensive studies, calculations and estimates it was decided to opt for a steel structure for buildability, speed, reliability, limitations of access and delivery of materials, flexibility and impact on M/E + Services. The major advantage of the steel structure for the podium (including transfer plates) was that the main structure frame was erected in a relatively short time whilst the floor slabs at different levels could be concreted at the same time. This ensured that:-

a. The floor space was handed over to E&M installation and finishing at an early stage.

b. The tower superstructure was commenced earlier.

The steel frame allowed architectural design of 'portals' to both the North and South elevations and for vertical hanging of the glazed mullion walls.

Concrete

To meet the consistently large productivity requirements for both foundations and superstructure up to three "Wet Process" batching plants were used with a total output of 200cu.m/HR. Steel decks were employed at the steel framed podium floors so as to speed up the overall construction work. Both steel decks allowed direct penetration of steel bolts welding to the flange of steel beam which was fast and had the advantage of ensuring composite construction.

The main contractor delivered concrete by high pressure pumps but also had up to 7 tower cranes on the job site. 1 tower crane for each tower, two for the podium area and one for the garage area. In addition large man hoists were situated, one at the west elevation and one at the eastern elevation. A number of material hoists and refuse outlets were situated at strategic points.

Acoustic Considerations

Because of the cramped site a vertical design solution was needed for the HKCEC which presented unusual challenges in the acoustic design. In particular, the protection of the conference spaces from the substantial impacts created in the exhibition halls located above them. The HKCEC has large cargo lifts which allow 40ft containers to be driven onto the exhibition floor. The manoeuvring of such large vehicles, unloading, hammering and fixing associated with exhibitions brought substantial impulsive forces into the structure.

The most sensitive areas were to the convention hall and the two theatres. The convention hall, being large and normally served by sound reinforcement was slightly less critical than the theatres where lower background noise limits were appropriate for natural speech. The theatres were built as totally isolated 'box-in-box' structures mounted on isolation pads. The acoustic protection of the convention hall was achieved by means of a double slab, with the upper slab being isolated from the structure. The convention hall walls were isolated from the floor of the exhibition hall and a floated heavy ceiling installed.

Architectural Finishes

Ceilings in the centre were predominantly finished in gypsumboard in an attempt to retain a softness in feeling. Where ceiling access and installation of services were critical, e.g. the convention hall where ceiling installed facilities included lighting, infra red sensors, motorised hosts lighting bridges etc., the ceiling was constructed in polyester, coated aluminium panels. In the exhibition halls where flexibility and freedom of access was even more essential the ceiling was formed by an open grid of aluminium I sections.

Floors in the concourse areas subject to heavy wearing had polished Caledonia granite with flamed strips. In the prefunction and meeting room corridor areas, broadloom 100% wool carpet was used. In the convention hall, where floor access and flexibility was required, 580 x 580 Interface Carpet tiles were installed. Where heavy-duty usage and varying layouts were envisaged in the exhibition halls, the floor was just finished in concrete with hardener additive.

Walls in most public areas were flamed Caledonia granite. The convention hall was finished in fabric panels with acoustic lining. The theatres were finished in aluminium panels, both solid and perforated, with a polyester-powder coating. The theatre prefunction was finished in sacramore panelling. The main prefunction was finished in white Carrara marble. While the exhibition halls were finished in specially fabricated panels of galvanised mild steel framing and weldmesh infill, with air supply and return grilles behind wherever necessary. In more intimate areas like the meeting rooms and the cafeteria, a vinyl-surfaced wall covering was used. Over 600,000 sq.m. of wall plastering was carried out on the complex.

Electrical and Mechanical Services

Some of the unique design features of the building services system concepts adopted in the project included:

- Use of sea water for air-conditioning system heat rejection and as a dummy load of winter space and hot water heating.
- An unique seawater pump house designed and integrated with the architectural and civil designs.
- A centralised heat pump system for hot water heating.
- A super-large variable air volume and heat recovery air handling system for exhibition hall.
- An innovative smoke control system for exhibition hall.
- A very comprehensive utilities provisions for exhibition hall.
- The world's largest hydraulic lift system for exhibition mechanical handling.
- An energy efficient control system for hotel and office towers.
- A state-of-the-art integrated information and teleconference systems.
- An intelligent integrated fire detection, security, public address and building management system.

External Facade

Pre-assembled two-sided structural glazed horizontal strip window-wall system with 10mm thick heat strengthened reflective glass with hand-set (dry fixed) granite panels at the spandrel covering the concrete parapets, was utilized for the main external facade of the Centre which consists of approximately 20,000 window units equivalent of 55,360 sq.m. of window-wall area and 30156 sq.m. of granite panels. Tolerances of +6mm for up/down, + 0-29mm for in/out and +25mm for left/right were allowed for placing prior to the windows. Two sides (the verticals) were structurally glazed. The horizontals were conventionally glazed.

The granite panels were hand set utilising continuous aluminium kerf type anchors which also served as a continuous back-up gutter at each floor. Special steel anchors were attached to cast in place inserts in the face of the concrete spandrel beam to attach the granite to the building structure and to transfer both dead load and wind load (including typhoon conditions).

Glazed Mullion Walls

The large all glass system between GM10 and 14 was a suspended 19mm thick tempered clear glass system utilizing structural silicone, patch plate fittings and bolted splice connections. The glass was by Saint Gobain and the system fabricated and installed by CFEM and PMB of France. To our knowledge this is the tallest suspended glass mullion system in existence. The northern portal is the largest glazed mullion wall in the world. The system was hung from the roof structure with steel rods. The wind forces were transmitted horizontally to the floors at various levels. The difference in floor levels necessitated deep mullions and aesthetic reasons demanded clear glass. The Atrium glass was 19mm glazed with 4 side structural silicone adhesive and anchored to a stainless steel clad steel framing system, all of which was supplied and installed by Builders Federal of Hong Kong.

Client Satisfaction

It has been generally accepted that the clients were very satisfied that their requirements for time, cost, aesthetics, function and maintainability were met.

Event	Start on site	Completion
Original intention of Client	June 86	Dec 88
Final estimate to TDC	June 86	Dec 88
Programme (TDC portion)	June 86	June 88
Actual (TDC portion)	June 86	Nov 88

Table 1: Programme changes during construction of the project.

'N.B. It was an agreed project management decision to programme for June 1988 knowing there was a 6 months cushion against unforeseen eventualities (such as deleting columns!).

Reasons for Success

The Decision to use Private Initiative

The decision during the early days of conception to use private initiative to develop the centre was the right one. Fast tracking is a risky business much better suited to private ventures than government. The procurement was by BOO transfer in the case of the hotels and commercial towers and B.O. transfer in the case of the Convention & Exhibition Centre. Further there was a considerable need for "design and build" throughout the contract. Certainly an unusual but highly successful procurement example.

In House Contractor

A major reason for success was the use of an in-house contractor of the size and experience of Hip Hing. Being part of the New World group they were motivated to achieve the group's goals of programme, cost, and quality. No delays for claim or design changes were made. Hip Hing sat in on major debates on designs, programmes, budgets. They played a significant role in all these areas, so that buildable, economic solutions were found.

Leadership of the two Chairman

Undoubtedly the leadership of Baroness Lydia Dunn for the TDC and Dato Dr. Cheng Yu Tung for New World played a major role in the success of the project. They choose their principal players well and were prepared to delegate. Clear decisive decision making meant a fast track project had every chance of success. No nepotism, favouritism or undue influence was present in the project and a high degree of professionalism, integrity and ethic was in evidence and was indeed essential to fast tracking. Both chairmen visited the site at least once every month.

Project Management

Following the two chairmens example C-Fin and Polytown worked well together and agreed that the management system and the operating systems were separate absolutely. In C-Fin and Polytown no member of the managing system undertook operating system activities. This gave management a more objective viewpoint.

It was felt that because of the high complexity of the project and the high risk involved through fast tracking the project needed a well proven extensive project management organisation with detailed and extensive control, and management information systems.

Total Commitment of all parties to the Concept

Not only was vertical fast tracking prevalent throughout the project down through the hierarchy but horizontal fast tracking through synergy and team work of working parties, groups and committees.

Contract

The novel project and organisation structure demanded novel contractual arrangements arranged for TDC by C-Fin. A special form of contract and conditions was therefore drawn up where milestones to be achieved were written in. Polytown paid a substantial bond which was progressively released as each milestone was attained.

The Involvement of M.Ds of companies

A clause was put in every consultant's, contractor's and subcontractor's contract that if necessary the M.D. of the company concerned would attend a project get together with the senior management of C-Fin and Polytown. This was a useful device to get the total commitment of the particular company to a programme or delivery date or whatever important matter bearing in mind that bad news travels upwards slowly in any organisation.

Minimising Differentiation

Contributors to the project could be separated by:

a) Skills (Technology)
b) Location (Territory)
c) Sequence (Time)
d) Sentience by profession only
e) Sentience by profession and firm

Recognising these factors, every step necessary was taken to break down barriers of undue loyalty to profession or company, to share technology, locations and to parallel activities.

Brainstorming

Monthly brainstorming sessions were hold at Ng Chan Man's office where Polytown, Hip Hing and the major consultants looked at designs, costs, programme, buildability, technical considerations etc. This had a double benefit. The first of welding the group together so that everyone felt a part of the project and contributor. Secondly by thinking ahead, problems were foreseen and solved in good time.

Maximising Integration

The architects, M/E and other consultants were brought to sit in the maximum number possible to work closely in working groups with each other the project management team, and contractors.

Finance

New World were chosen since they had a strong financial base. They are a major company on the stock exchange with very good financial standing.

Chinese Culture

The majority of consultants and contractors were Chinese. It is in the Chinese culture to avoid confrontation.

The philosophy of "Qang Xi", i.e. of long term relationship, also helped greatly.

Nightmare Scenarios

Both Project management teams devised nightmare scenarios and planned accordingly.

Use of Ceiling working platforms

Their use in areas of high ceiling height enabled concurrent working on floors and ceilings.

External Environment

Using a systems analogy the external environment created very few problems. The technology whilst modern was manageable and estimatable not like a Concorde or Space project. No new legislation damaged the project like say a nuclear power station. No wars of strikes affected the project although we used 4000 labourers at peak productivity.

Use of control samples

Early setting up of agreed control samples led to much less abortive work which could have detrimentally affected the programmes and quality of the work.

Use of selected sub contractors

Essential in QA/QC project. Explanation and commitment to the fast track concept and QA/QC requirements were prerequisites in accepting tenders. The number of tenderers were limited as a consequence.

Orientation

Before selecting a subcontractor or signing a contract interviews were held and explanations given of the requirements of fast track, QA/QC, attendance at meetings, involvement of M.D. detailed manpower and management resources had to be produced and emphasis was put on properly qualified personnel in charge of project and on site at leat 75% of the time. The high profile of the client and major personalities of the project was stressed and a commitment had to be sensed.

Communications

Effective coordination was highly dependant on successful communication. Amongst project management's responsibilities was the chairing of coordination meetings and the control and routing of documents and correspondence.

Coordination

Co-ordination was a complicated task and a continuous process. It required continuous efforts from every discipline of the project team throughout the design and construction stages.

Management Culture

Using a management by objectives analogy the culture was of the right supportive form.

Resource Analysis

As soon as drawings were detailed project management took off quantities and compared them with the programme to work out required productivity rates allowing whatever learning curves necessary.

Site Walks

A feature of the project were the site walks with chairmen monthly. With C-Fin biweekly and with Hip Hing M.D. weekly, these site walks increased as the project neared completion. The M/E groups also conducted special site walks weekly.

Government Assistance

The project enjoyed priority status. Relationships with BDD and Highway Authority were good.

Trouble Shooting

Senior management of C-Fin and Polytown would meet as required and sort out any problem areas. Problems were never allowed to hang unresolved.

Consultants

The consultants played a major fact in achieving the fast track project. Their designs were accurate and fast. Their attitude to site problems was positive and flexible. Should a problem arise due say to tolerance they would find an on site adaptation or solution which did not hold up the work. Very little delay was caused by design delay which reflects enormous credit on their flair and ingenuity.

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