Paper presented at "Globalization of Building Construction and Contracting"
The 6th Annual Seminar organized by
the Building Division of The Hong Kong Institution of Engineers in March 2007

Development of Contracting Arrangement for Delivery of Public Works Projects in Hong Kong

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Introduction

Hong Kong has invested heavily on its infrastructure. The capital works projects implemented between 2001 and 2005 cost a total of $145 billion. In recent years, the annual expenditure on capital works averages $29 billion each year. The Government will continue to set aside an average of $29 billion each year for capital works projects. To deliver these projects on time, cost effectively, safely and to the required quality is important. Adopting the right procurement approach and making skilful use of project delivery techniques would help achieve this objective.

This paper reviews the evolution of project procurement approaches and project delivery techniques in Hong Kong and discusses the way forward.

Project procurement

Project procurement activities

A project starts from inception, receives authorization through enabling legislative processes and financing, and proceeds to deliver facilities for public use. The facilities require maintenance and may have to be specifically operated on. For facilities with relatively short service life, the project finishes with the decommissioning or removal of the facilities.

Procurement refers to the processes following project inception. It comprises five key groups of activities :

a. *Design* is the formulation of concepts on how the project requirements are to be met, and development of the concept into a solid plan of how various materials and hardware are put together or installed to a set of standards, to fulfill the project requirements.

b. *Construction* is the process of acquiring the materials and hardware, and having the personnel available to transform the design into physical deliverables and facilities for fulfilling the project requirements.

c. *Management* is the identification of different phases of the delivery process and the activities involved including their independence, and the timely procurement and coordination of these activities.

d. *Operation* is the maintenance and, where necessary, manning of the facilities to fulfill the project requirements. For short-term projects, this could include decommissiong of the project.

e. Financing is the acquiring of funding which may be direct from the public purse, or raised by Government from the capital market, or raised by project undertakers who are given commercial concessions to repay the loan.

Project procurement approaches

The project proponent responsible for delivering a project may choose to undertake all the procurement activities

Key Activities	Generic Procurement Categories				
	I Design-Led	**II** Design, Build	**III** Design, Build, Operate	**IV** Management Arrangement	**V** Finance, Design,. Build, Operate
Construct	✓	✓	✓	o	✓
Design		✓	✓	o	✓
Operate			✓	o	✓
Management				✓	✓
Finance					✓

"o" – The principal agent may be required to take on some or all of these responsibilities depending on the form of management contract adopted.

by employing internal resources. However, depending on the resources and expertise available, and the characteristics and complexity of the project, he may outsource some or all of the procurement activities to outside agents. Different frameworks of procurement models have evolved, and have been developed into various forms of contract to meet the specific needs of individual projects.

Although the procurement methods adopted for different construction projects may be very diverse, they generally fall into five generic categories as listed below. What distinguishes these categories from one another is the scope of services outsourced to external service providers.

a. Category I

This is the most conventional approach of project procurement and is sometimes referred to as '*Design-Led*' because the project proponent is basically responsible for all procurement activities other than the construction of the project which is undertaken by other service providers. In this approach, the focus would be on application of engineering science to practice. It is where civil engineering started because in that early age of modern civil engineering, the person who mastered engineering science better was more likely to have the project realised. Take the Brunnel's (father and son) and the Stephenson's (father and son) for example and see how they stretch contemporary engineering knowledge to the limit.

b. Category II

In the '*Design Build*' approach, the focus would be on making the best use of the construction technology. It suits projects that demand fast response of construction techniques to circumstances, or where the method of construction is more demanding than their design, particularly for situations where there are ample choices of design. The oil refinery and pipeline projects in the Middle East that Bechtel Corporation pioneered after WW II are cases of how the contractor as the principal

agent capitalized on its experience with facility modules and logistics in an inhospitable land. The design and construction services may be procured from different service providers. If both services are outsourced to a single agent, then it will be a 'design and build' form of contract which is becoming more popular for implementing public works projects nowadays.

c. Category III

In the '*Design Build Operate*' approach, the focus would be on the operation stage which, for the type of projects involved, normally constitutes the bulk of the life cycle costs. The principal agent is given the freedom of designing and constructing the facilities to suit his operation requirements and to optimise the total cost of the project. This is the case of solid waste disposal and sewage treatment as oppose to roads and bridges, where the facilities have to be actually manned and operated, not just maintained. Again the three types of service, i. e. design, construct and operate, may be outsourced to different service providers or to a single principal agent.

d. Category IV

In the '*Management Arrangement*' approach, the client realises that due to the complex inter-relationship of different parts of design and construction activities, and perhaps aggrevated by tight project schedule, he needs someone experienced in construction to plan and manage the activities. This category covers a wide spectrum of options ranging from provision of management service for part of the delivery process to 'prime contracting' where the principal agent gets involved from the conceptual phase through to the operational stage.

e. Category V

In the '*Finance Design Construct Operate*' approach, the focus would be on the cost-effectiveness of the services that the project is delivered. Normally, the four types of service are contracted to a single principal agent, who is the party seeing a way for cost-effective delivery of the services, even taking into account the opportunity cost of the capital investment for the facilities. The project will be business driven. The many power generation plants built in the Philippines in the last decade illustrates the power of this approach.

Procurement Approaches in Hong Kong

Hong Kong adopted the conventional (*Designer-Led*) approach of project procurement as its norm because that was the approach in the UK when public works projects started in Hong Kong. Through over a hundred years of experience, a wealth of precedents, practice, and documents has accumulated. While this would still be the default approach for smaller public works projects, project managers are more forthcoming in adopting other procurement approaches for major infrastructural projects.

'*Design Build*' for public works projects involving different agents for the provision of design and construction service has been adopted for quite some time. However, the 'design and build' form of contract was more widely adopted in Hong Kong only until the early 1990's when the Airport Core Programme was launched. More recently, the approach is being adopted by all works departments for projects of various natures.

The '*Design Build Operate*' approach of procurement contracted to one principal agent was adopted in Hong Kong in the 1980's for construction and operation of municipal waste facilities. The approach successfully drew in international expertise in building and operating such facilities, and is at present used for all refuse transfer stations and landfill projects. It is being extended into the procurement of sewage treatment works.

The '*Management Arrangement*' form of project procurement, in its strict sense of a contractor experienced in construction management acting as the principal agent, was used in public works only in the case of the construction of Chek Lap Kok Airport. The tight time schedule, complexity of phasing of works, and the high construction quality required should have been reasons for adopting this approach.

The '*Finance Design Build Operate*' approach of

project procurement has become popular in parts of the world since the 1990's. Arguably, there has been a long history of this approach in Hong Kong in the provision of utilities including electricity and gas supply. For public works projects, it was used for the first cross-harbour tunnel of Hong Kong. Funding the project from the public works reserve fund would have displaced other public works projects. Priority of the provision of the cross-harbour tunnel over other projects in the face of effective cross-harbour vehicular links existing then would have generated a lot of contention. The '*Finance Design Build Operate*' approach of procurement managed this controversy by passing the decision to commercial enterprises. Since then, many transport infrastructures, including the two other cross-harbour tunnels, the Tates Cairn Tunnel and the Route 3 Country Park Section have been delivered through this approach.

By now, traditions have been established for favoured approaches of delivery of various types of projects. Standard contract documents are available for the *conventional*, '*Design Build*', and '*Design Build Operate*' approaches of procurement. Sample documents are available for the '*Finance Design Build Operate*' approach from past projects in Hong Kong but given the high stake and long contract period involved, it is always advisable to look at all elements of such a contract from afresh.

Following norms does not always give the best result. Project proponents should appreciate better the generic strength of the procurement approaches, and assess suitability of each for the project in hand, to select the most appropriate one.

Project Delivery techniques

People learn from experience especially of failures. The development of alternative project procurement approaches can be seen as a result of learning from experience to improve on project delivery. After the basic framework of procurement has been selected for a particular project, there are other measures and techniques which can serve as lubricants to improve various aspects of the project delivery process.

Project and Design Improvement Techniques

The more commonly used techniques of this type include value management, systematic risk management, life cycle costing, construction design and management, environmental assessment and buildability rating system.

a. *Value Management* is the systematic examination of project requirements and constraints by informed stakeholders, for optimizing the design and procurement approach. Facilitators are employed to help participants focus on the project and to ensure completeness of the examination. While the process is usually held during project planning, the concept of optimizing the design to meet project requirements and constraints should be borne in mind in considering variations in design. To introduce this practice to public works projects, a steering committee was established in 1997 within the Government to set guidelines and to monitor the implementation of Value Management among the Works Group of Departments. Today, Value Management studies are considered for every major public works project with an estimated cost of $200M or above.

b. *Risk Management* is the systematic identification and evaluation of project risks, planning of mitigation and contingency measures, and allocation of risk among project parties. Risk is the likelihood of incidents resulting in long delays or costly variations. Risk and insurance experts are usually employed to assist in the process. The target is to control the risk to an acceptable and equitable level for all parties while pursuing the project objective. The process should start early in project planning and be updated regularly up to the completion of works. The need to prepare a Risk Management Plan for a project was first identified in the late 1990's. Since 2005, Systematic Risk Management is carried out in all public works projects with an estimated cost of $200M or above.

c. *Life Cycle Costing* is the practice of assessing the

full cost of works beyond the design and construction phases, to the operation phase and ultimately the decommissioning of the facilities. This is to prevent expedients at the design and construction phases that would lead to high costs later. The cost may sometimes include impacts on the environment such as the environmental footprint of the project. The assessment should start early in the concept design phase and be updated regularly up to the commencement of construction, and thereafter when major variations in design are made. Life cycle costs are one of the marking attributes in the evaluation of 'design and build' tenders to ensure that the long term operating costs of a project is duly taken into consideration during the design stage.

d. *Construction Design and Management (CDM)* is a process for assessing safety hazards to site personnel during construction and to future maintenance personnel, and identification of cost effective mitigation measures and responsible parties. This is to prevent designs that lead to high safety risks. One way to achieve lower safety hazard during construction is the use of precast units designed for installation on site using low skill labour as in the case of Buildability Rating System. The safety-hazard assessment should start early in the concept design phase and be updated regularly to the commencement of construction, and thereafter when major variations in design are made. The *CDM* process has been implemented in more complex public works projects (e.g. projects above $200M). In order to promote the wider use of *CDM*, a set of comprehensive guidelines on *CDM* implementation has been promulgated for reference of the industry. HA is also considering the adoption of *CDM* in public housing projects.

e. *Environmental Assessment* is the practice of assessing environmental impact of projects during construction, operation and decommissioning; and identification of cost-effective mitigation measures, as well as responsible parties for action. This is to reduce nuisance to neighbours to an acceptable degree, and to avoid overtaxing the environment. The assessment should start early in the project conception stage and be updated when major variations in project concepts arise. Environmental assessment is a statutory duty for designated projects according to the EIA Ordinance and is administratively imposed on public works projects that are not designated projects. For all public works projects, contractors are required to draw up a systematic environmental management plan (EMP) for pollution control and prevention prior to commencement of the works, and to employ dedicated site personnel to oversee the EMP implementation.

These delivery techniques are related to due diligence and care of the project implementation personnel. As agents of the project proponent, the project personnel conduct value management, life cycle costing, and risk management to ensure that the true needs of the project proponent are appreciated and provided for with full consideration of project constraints and complete cost implications, and with equitable ways of minimizing potential impacts of the constraints on project programme and costs. The CDM, buildability rating system and environmental assessment help the project personnel discharge his duty of care to parties whom they can reasonably foresee could be affected by their decisions. Hence, CDM and the buildability rating system address the duty of care to workers for their safety. The environmental assessment addresses the duty of care to the neighbourhood of construction activities, and to the later generations in terms of protecting the environment. Alongside these, one may add other forms of assessment including traffic impact assessment and drainage impact assessment.

Tender Selection Techniques

The quality of contractors is important to smooth construction of facilities. Since 2002, Public Works projects take into account the track record of contractors in assessing their tenders in addition to the bid prices. This could either be by a marking scheme approach for

projects which quality of service or product is a major concern, or the formula approach for other projects. The marking scheme, apart from the track record, includes consideration of technical information provided by the bidders in respect of technical management capability, while the formula approach only takes into account the past performance of the tenderers.

Government keeps objective record of performance of its contractors. The system is open in that contractors are kept informed of the assessment and may appeal for reassessment. The performance ratings provide a solid basis for quantifying the track record of contractors.

Dispute Management

Disputes strain the resources of and the relationship between the parties of a contract. It is to all parties' advantage to keep them to a minimum and to resolve them speedily and amicably. Dispute management techniques in use or on trial for public works projects in Hong Kong generally fall into three categories, namely, avoidande, consensus and adjudicative.

a. Avoidance

Project partnering is the building up of mutual trust and effective communication channels among contract parties, and maintaining them throughout the duration of the contract. It is non-contractual and relies on the goodwill of all parties for implementation and success. The objective is speedy discussion and equitable resolution of issues to avoid their developing into disputes.

Contractual partnering is similar to project partnering but it is made part of the contract conditions. The New Engineering Contract (NEC) form of contract in the UK makes contractual partnering one of its focuses. It specifies how the partners work together and requires that all partners including the client are named in the schedule of partners. The schedule contains details of each partner's representative, contribution and objective, key performance indicator, target, measurement arrangement and amount of payment if the target is improved upon or achieved.

A *dispute resolution advisor* is a neutral third party who is appointed to a works contract for its duration. He maintains close knowledge of activities on site for early identification of issues and facilitation of the parties to resolve the issues.

b. Consensus

Mediation is the process of facilitated negotiation between the contracting parties in dispute for a settlement. The parties in dispute appoint a neutral third party by mutual agreement as the mediator. The settlement is non-binding and the content of the mediation proceedings could not be used for subsequent dispute resolution processes.

c. Adjudicative

A *dispute resolution panel* is a group of neutral individuals kept informed of activities on site, for resolving disputes referred to them during the course of the contract.

Adjudication is the process of establishment of facts and assessment of legal issues by an adjudicator to judge promptly on a dispute referred to him by the parties of the dispute. The judgement is binding for the duration of the contract but parties may refer the dispute for arbitration upon completion of the contract.

Arbitration is a formal process in which the arbitrator receives formal submissions and conduct hearings where needed, to establish facts and consider the law, to judge on disputes. The process could be costly and take time. The judgement is binding except for appeals against interpretation of law by the arbitrator or his conduct.

Procedures for arbitration were introduced in Hong Kong in 1989 and there is an arbitration ordinance to give the process full legal standing. Mediation was subsequently introduced and rules on mediation are available in technical circulars. A dispute resolution panel was established for the airport core projects but it

was not successful because the provision was not written with speedy resolution of disputes in mind. Dispute resolution advisors have been in use in architectural projects of HKSARG since 1991 and have been on trial in five civil engineering projects recently. The experience so far has been favourable. Non-contractual partnering practice was introduced in mid-2002 and has been applied to about 20 projects.

The long history of arbitration and mediation in Hong Kong has developed a local pool of personnel experienced in contract law in application to civil and architectural construction. They could serve the varied role of arbitrators, adjudicators, mediators and dispute resolution advisors.

Notwithstanding that Hong Kong has started with adjudicative arrangement, the trend is moving towards early identification and resolution of issues to prevent them from developing into disputes by better use of avoidance and consensual techniques, as parties see the sense of resolving issues before they develop into confrontations.

Concluding Remarks

Hong Kong has invested heavily on public works in the last four decades. A full range of procurement approaches have been used for public works projects. Standard documents and a wealth of experience have accumulated for the three most popular approaches. Traditions have been developed in respect of favoured approaches for particular project types.

More recently, project delivery techniques for assisting engineers to better discharge their due care and deligence have been adopted. Some are taking root and others are being actively introduced. A system is available for selecting construction contractors taking past performance into account.

Attention has been given to avoidance of disputes and amicable settlement. Techniques are available for the use of project personnel.

All these would be to no avail unless the project proponents and their agents are conscientious about decisions on project procurement and delivery. They should be aware of the relative generic strength of the procurement approaches and choose the most appropriate one, instead of being guided by the norm. They should focus on the spirit of the techniques that assist in the discharge of professional due care and diligence, instead of simply going through the form. They should give honest assessment of performance of contractors, so that the very good is distinguished from the average from the poor. They should respect difference in views among contract parties, be humble in understanding other's view points and aim at working out the common ground, without having to have judgments imposed on them. If such is their aspiration, then the many dispute management techniques would be of use to them.

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References

Public works policies and procedures are described in technical circulars and publications of the Environmental Transport Works Bureau. They are available on http://www.etwb.gov.hk.

Acknowledgements

The comments from the Organizing Committee of the HKIE Building Division 6th Annual Seminar are gratefully acknowledged.