

## Cost Control in the Chinese Construction Sector

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### Abstract

China has been moving away from a planned economy system towards a market economy. The cost engineering system in China has also been evolving to suit this socialist economy system. The paper examined the recent development of some elements of cost engineering relating to the construction sectors as follows and provided some comments thereon :

- The cost control process - 5 key stages of cost assessment
- Tendering and Bidding System
- Bills of Quantities and All-in-rates
- Contract Forms
- Qualifications Control

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### China: Background

China is the world's most populous country, with a population in excess of 1.3 billion. It has a continuous culture stretching back for nearly 4000 years.

The capital of China is Beijing and its largest city is Shanghai. In the early 1980's China dismantled collective farming and allowed private enterprise again – a crucial move came some 30 years after the nation's liberation and the rest is history. Now it is one of the world's top exporters and is attracting record amounts of foreign investment. In turn it is investing billions of dollars abroad.

As a member of the World Trade Organization, China benefits from having access to foreign markets. In turn it has to expose itself to competition from foreign countries.

China is located in East Asia; there are a number of countries adjoining it such as Russia and Mongolia in the North, Korea in the East, India, Vietnam and Laos in the West. It covers an area of 9,528,000 sq km, making it the third-largest country in the world, just behind Russia and Canada.

Since the communist regime decided to open up China to foreign investment in 1978, the country has become one of the world's fastest growing economies and is among it's 10 largest. In 2008 China's GDP was about USD4,360 billion and it's growth rates in GDP are close to 11% per year over the past few years.

In 2008, the total fixed asset investment in China is about USD2,500 billion which includes investment in Real Estate of about USD440 billion. The growth in investment in Real Estate in the past 5 years ranges from 21% to 27%.

As far as construction and property investment are concerned the most active localities of Beijing, Shanghai, Shenzhen and Guangzhou are now being closely followed by some other so called second tier cities such as Chongqing, Chengdu, Tianjin, Shenyang and Wuhan, etc..

Some say that China in itself is a 'big construction site'. The yearly construction output for the past 5 years has averaged 1.8 billion square metres, which is equivalent to 5,000 Pentagons in the USA.

### **History of Cost Control and Cost Engineering in China**

The cost engineering approach in China was based on that in USSR which was first introduced to it in the 1950's by the China Construction Bank at that time. Though there have been reforms (or development) in the subsequent years the basic principles have not changed much. The Government publishes the 'norms' of construction costs in a standardized format for each trade of construction throughout the Nation. There are different versions, one for each of the major provinces/cities to cater for its particular geographical factors. The total construction cost of a project is basically the total of direct costs, in-direct costs, the planned profit and taxes. In the 1960's, most construction projects in China were funded by the Government and cost control methods had to follow the Government rules under the different construction stages. The fact that all-in-rates (composite rates) had long been used in international markets was known but was not adopted. In the late 1970's, China opened its market to foreign countries and foreign investments together with the western styles of cost control and management techniques were introduced to the construction sector of China. Towards the end of the 20th century, there was a consensus that the method of building up prices for construction works was an area to be reformed in order to reflect the market price level and the efficiency of individual enterprises in handling resources.

The expiry of the 5-year transitional period since China entered the World Trade Organization plus the current trend of globalization of economies have together caused China to accelerate its opening-up of the construction market.

China has been moving away from a planned economy system and is now somewhere on its way towards a market economy, though the road ahead is still long and winding. On one hand it has brought in some western practices whilst on the other hand it has streamlined the existing practices by removing inappropriate ones and maintaining the efficient and workable ones, in order to open up the market to foreign capital.

In the following sections we will review the normal cost control process for construction work in China, the current system of tendering and bidding, the Standard Forms of Contract used, the use of Bills of Quantities, the use of 'all-in-rates' for pricing estimates or tenders and the qualifications required for cost consultancy firms and cost engineers.

## The Cost Control process – 5 key stages of cost assessment

Due to the heavy capital investment, long construction period and complex nature of construction projects, the cost control process normally involves 5 key stages of cost estimating and assessment over the lifespan of a project, each using different calculation and estimating methods.

### 1. Feasibility Stage

- Feasibility Estimate

This is an important document for making decisions as to the feasibility of the project. It sets down the budget limit for a project which normally should not be exceeded.

Due to the limited information available at this feasibility stage the estimate would just be a rough indication of costs based on historical data.

### 2. Preliminary Design Stage

- Preliminary Estimate based on preliminary design information

This estimate is an update of the Feasibility Estimate upon receipt of subsequent design development information. This document is essential in supporting the submission of the Preliminary design to the Government Planning Department for approval.

If the Preliminary Estimate exceeds the budget set in the feasibility estimate either additional funding is to be sought or a revision to the design is required to bring down the estimate to within the budget.

### 3. Detailed Design Stage

- Detailed Design Estimate

This estimate is prepared on the basis of an itemized build-up according to the recognized rules and method of measurement, after completion of the detailed construction drawings. Under a tender situation if this estimate is completed by the Developer then it can be used as the Pre-tender Estimate which must be submitted to the Tender Bureau for record purposes. The Pre-tender Estimate, duly signed and stamped by a Registered Cost Engineer, is also a prerequisite for the issue of the Construction Permit for the Works.

If the tender sums received are deviated from the Pre-tender Estimate and the deviation amount is beyond the limits set out in the marking scheme for the tender assessment, the tender exercise has to be cancelled and a re-tender action is to be carried out.

4. Construction Stage

- Interim cost assessments of Works

These are the cost assessments carried out during the construction stage in order to determine the value of work executed. The time intervals between consecutive intervals are dependent upon the contract agreement, which can either be monthly or on a milestone basis. The interim assessments also form the basis for interim payments to finance the cashflow of the Contractor.

These cost assessments are not estimates but detailed measurements and they are continuous throughout the construction period and eventually building up the final costs of the works.

5. Post Completion Stage

- Final Account Assessment

This is an accurate assessment of the final cost of the works after the project is completed, taking into account of all relevant drawings and other information, the work properly completed and costs properly incurred in the project.

The statement of final account will be signed and stamped by a Registered Cost Engineer and will become a conclusive document to be submitted by the Owner/ Developer to the Government upon the completion of the project. It is the only document certifying the total cost of the project.

The above five key stages of the cost control process are sometimes supplemented by a series of dynamic cost studies carried out by the Cost Engineer during the construction stage to estimate the cost effects of any changes proposed by the Developer/Owner so as to assist them to decide whether or not to issue a change order to the original design of the project to the Contractor for construction.

An updated Contract Sum will normally be estimated by the Cost Engineer, including all contract adjustments, and reported to the Developer/Owner in a regular (monthly or bi-monthly) cost report (or financial statement).

The method of assessment for all the above is normally based on measurement from drawn information to arrive at the quantities of work, which are then priced at the unit rates of either the Norm System, the All-In-Rate System or a combination of both, as the case may be.

However in the feasibility stage when the drawn information is limited, it is very often difficult to arrive at an accurate cost estimate.

## **Tendering and Bidding System**

Tendering has been the most widely used method for the procurement of construction projects in China. Since the introduction of the tendering system in the 1980's, tendering and bidding has been widely used in the procurement of consultancy services, site investigation, design, construction supervision and supply of materials etc.

The Tendering and Bidding Law of the PRC 2000, which was implemented on 1<sup>st</sup> January 2000 is the first set of Laws in China consolidating the legal provisions for the tendering and bidding system.

The tendering system under this Law has certain salient features. Among others they include :

- It requires compulsory tendering for infrastructure facilities, public projects affecting social benefits and social security; projects funded wholly or partly by the Government, projects funded by international organizations and projects funded by loans or aid from foreign governments, etc.
- It sets out that tender exercises can be classified into open or selective tendering.
- It requires that tendering has to be handled by tendering agencies that possess the necessary qualifications, unless the organization that calls the tender has the competence to handle the tendering exercise.
- All tender exercises are to be taken place under the supervision of the Tender Bureau which ensures that the rules and procedures of tendering are complied with.
- It requires that tendering has to be handled with fairness, openness and impartiality. The methods of publicizing the invitation to open tender via the media are specified. The marking and scheme for the assessment of incoming tenders must be clearly given at the time of tender in the tender documents. Tendering in China normally requires a tenderer to submit a technical submission and a pricing submission (priced bills of quantities) separately. The successful tender will be determined under a marking system by a tender assessment committee which will combine the technical scores and the pricing result of individual tenderers for comparison before recommending a tender for acceptance, rather than solely selecting the lowest priced tender.
- It sets out the requirement for a tender assessment committee. Within this committee two-thirds of its members are experts to be selected from a panel of experts kept by the government, and outweighs the number of representatives from the owner. This committee assesses the tenders according to the project marking scheme and makes recommendations as to the prospective successful tender for the Owner's acceptance.

## **Bills of Quantities and All-In-Rates**

The use of norms in determining construction costs has been very useful in the past, when China was operated as a planned economy. However this system restricts individual enterprises from tendering based on their own resources or advantages such as using a special type of plant or skilled tradesmen to speed up production or reduce the tender price. As a result, the win-win situation wherein the Developer can obtain the best price from the lowest tender and an efficient and competent tenderer can win a tender by putting in the lowest bid cannot be achieved and this is not in line with the rules of the international competitive market.

In February 2003, The Code of valuation with bill (of) quantity of construction works (GB50500 – 2003) was published jointly by The Ministry of Housing and Urban – Rural Development (MOHURD) and the General Administration of Quality Supervision, Inspection and Quarantine of the People’s Republic of China. A new 2008 version, which includes additional guidelines on other contract administration practices such as variations, claims and dispute resolution was subsequently issued in July 2008 for use, superceding the 2003 edition.

The Code sets out the rules and procedures to regulate the preparation of bills of quantities on the basis of drawings, specifications and other requirements and site conditions. This mirrors generally the overseas methods of producing bills of quantities.

The Bill of Quantities contains sections of work items and these are generally to be priced by ‘All-In-Rates’ which have to be inclusive of all costs of labour, materials, plant, management, risks plus profit and taxes etc.

The Code requires that tender documents for all medium and large sized construction projects which are funded wholly or partly by the Government to be based on Bills of Quantities prepared according to this document.

All construction projects using bills of quantities as the basis of obtaining tenders have to follow the Code in the preparation of pre-tender estimates, tendering prices, determination of the contract sum and adjustments and the project final account.

The benefits of using Bills of Quantities, as have been practiced overseas, are:

- Bills of Quantities allow tenderers a uniform basis (the same set of work items with quantities prepared by the Owner) on which to prepare a competitive tender.
- No risk to the tenderers of under measurement as subsequent adjustment for differences with actual quantities is allowed.
- Sound basis for valuation of variations.
- Sound basis for interim payments.
- Sound basis for final accounts.
- Good cost data (codified items ease analyses).

This is a major reform in construction cost assessment as it encourages the industry players to formulate their tender prices on their own, based on their resources, management efficiency and by making reference to competitive market prices and rates.

It is noted, however, that not all contractors have the knowledge, analyses and data of their own resources or management. Therefore some tenders are still being priced by tenderers using an estimate of the labour and material content and pricing those using rates from the published norm, some tenderers are using the labour and material contents from the norm together with market prices and only a few are pricing the tender using their own production and cost data.

However within the same class of contractors their method of pricing are quite similar. For major projects the tenders are usually competent enough to use all rates based on their own in house cost data.

Separate sections of items and rules have been prepared for Building Works, Mechanical and Electrical Installation Works, Utility Services Work, Landscaping Work.

### **Contract Forms**

At present, the most commonly used forms of contract in China are local forms of contract prepared on the basis on the Standard Form of Construction Contract issued jointly by the State Administration for Industry and Commerce and the Ministry of Construction in 1999, with modifications made to suit particular local market conditions and practices.

For international or overseas clients, the Standard Form of Contract used is normally the FIDIC (Federation Internationale des Ingenieurs – Conseils) Form of Contract for construction. This International Form of Construction Contract was first introduced to China by the World Bank in 1985 in connection with its loan for the construction of some highway projects there. This International Form of Construction Contract was properly translated and published in Chinese and is widely used by International developers and well accepted by the owners including Government departments and Government funded organizations. The Ministry of Construction accepted this Standard Form of Contract as satisfying the regulatory framework of the Government.

There are however, some developers from overseas or Hong Kong who insist on using a modified version of the UK Joint Contract Tribunal Standard Forms or the Hong Kong Institute of Architects Form of Building Contract. Some major developers from Hong Kong or overseas have even drawn up their individual bespoke types of contract but their use is becoming limited since such forms are non-standard and are not well known to the local industry. Also, there were cases that these custom made contracts forms are drafted up with a different approach of risk allocations from the China's 'Preferred' practice and some of the terms were hence considered unfair terms not supported by the Government.

## **Qualification Control**

Qualification control in China is a system under which a professional organization or a professional has to achieve a professional qualification or being registered in a recognized professional qualification system before it can carry out its professional services allowable under the Law.

### Organizations

Under the Construction Law of the PRC, similar to contractors, architects and engineers, the qualifications of Tendering Agents and Cost Consultancy organizations are being controlled. The bases used to assess the qualifications mainly comprise the registered capital, the number of qualified (or registered) professionals, performance records and relevant experience.

#### 1. Tendering Agents

The Agents are classified as either Grade A or Grade B. For Grade A organizations there are no limits on either the value or location of the projects while Grade B organizations can provide services to projects with value not exceeding RMB100,000,000, with generally no limit as to location.

#### 2. Construction Costs Consultancies

The Consultants are again classified into 2 categories, namely Grade A and Grade B. There are no limits to either the location or size of projects for Grade A consultants while Grade B consultants can only provide consultancy services on medium and small sized projects with a value of not exceeding RMB50,000,000 within its own province or locality.

Overseas consultants can apply for qualifications to practice in China, however, almost all of the Grade A Tender Agencies and Construction Cost Consultants are Chinese organizations, except for one leading international cost consultancy practice from Hong Kong which has achieved Grade A qualifications as both a Tendering Agency and a Cost Consultancy.

In the meantime most overseas or non-local cost consultancy companies providing services in China have to carry out their work in cooperation/association with a Local Cost Consultancy which has the necessary qualifications to endorse the deliverables such as pre-tender estimates, statement of final account, etc. with the a stamp recognized by Government.



### Individuals – Registered Cost Engineers

In the mid 1980's China adopted a policy of recognition of professionals such as lawyers, accountants, teachers, architects, medical doctors etc. In the 1990's the recognition of construction professionals by Registration took place. Registered Cost Engineers are professionals recognized as being able to provide cost control for construction projects.

The assessment criteria for registration are mainly based on academic qualifications, a pass in the country-wide Cost Engineer qualifying examination (the first examination was started in 1997), relevant experience and being employed in an organization undertaking cost consultancy related duties.

There are about 700,000 Registered Cost Engineers in China, amongst whom are 65 cost engineers and quantity surveyors from the Hong Kong Special Administration Region who have achieved this qualification.

In fact in many other countries, although they do recognize the status of the professionally qualified cost engineers or quantity surveyors, the law does not require that the cost engineering duties or documents be undertaken or certified by a class of 'qualified' or 'registered' professionals. In China this is not the case. The Tendering and Bidding Law of the PRC requires that certain estimates and cost engineering documents such as pre-tender estimates, submitted tenders and final account statements are to be signed and duly stamped by a Registered Cost Engineer.

### **Conclusions**

1. The cost engineering system in China has gradually been evolving to suit a socialist market economy system. Some notable examples are:
  - the wide use of bills of quantities as tender documents for both public and private projects;
  - the use of all-in-rates based on competitive market prices and an enterprise's own resource management in estimating and tendering;
  - the establishment of a framework for tendering and bidding control;
  - the use of International forms Contract for execution of construction contracts;
  - the establishment of qualification controls on consultancies; and
  - the establishment of a qualification for practicing cost engineers by the registration of Cost Engineering professionals.

However it will take time for the whole of a big country like China to follow all these changes as the regional economic strength varies drastically and therefore different parts of the Country are developing their construction and real estate activities at different paces.

2. In order to facilitate the implementation of these new changes the cost data derived from the markets at different localities have to be collected, analysed and published to all who are interested.

The quality and competence of the existing cost engineering professionals should be raised by further training in order to undertake cost engineering tasks effectively.

More registered cost engineers should be trained either by the local or overseas cost engineering institutes or by running undergraduate or postgraduate Cost Engineering courses at local universities.

3. Among the five key stages of cost assessment, it is noted that the estimate for the first stage, namely the feasibility stage, is prepared on very limited information, and preparing a reasonable estimate for this rough indication of cost is still very difficult for local cost engineers. The cost estimating techniques for feasibility studies used by Hong Kong and overseas cost engineers, which depend a lot on single rate estimates based on the analysed data from past relevant projects, can be referred to in order to strengthen this part of the cost assessment process.

4. Some requirements contained in the Tendering and Bidding Law are still too rigid, e.g. a construction contract between two private enterprises may not be entered into without going through the tendering procedures, even if the two contracting parties are commercial partners in the past with a good and long-standing relationship. There are other rigid rules such as if the incoming tender sums are deviated from the pre-tender estimate beyond the limits set out in the Marking Scheme for the tender assessment the tender exercise has to be cancelled under the Law and the project is to be re-tendered.

Moreover in the tender assessment meeting, the number of experts who are to take part in recommending the successful tenderer(s) has to be two-thirds of the total number of attendees at the meeting, hence outweighing the number of representatives of the project owner, and normally even a very large project is subject to a short assessment meeting of a day or so by the tender assessment committee. There are the remains of the typical planned economy features which are centering on collective interest and indifferent to the individuals. The rules are simply hard and fast – but not necessarily efficient. It is thought that despite there may be circumstances under which these legal requirements can be dispensed with or exempted from, these expressed rigid legal provisions may appear to be lacking open market initiatives.

5. Cost engineering in China is not progressing very far from its origins, and the tasks which most enterprises and cost engineers now focus on are still the fundamental aspects of cost engineering such as measurement, estimating and cost assessment. In contrast, the cost engineering emphases overseas are more aimed at value added activities such as value management, life-cycle costing, risk analysis, international alternative dispute resolution methods, different types of financial arrangement for project procurement such as Public Private Partnering, guaranteed maximum price and project monitoring for project financing, etc. Whilst some of these new elements may have been introduced into certain major construction projects by overseas clients or professionals they are considered novel and hardly be seen as part of the normal cost engineering activities in China.

However it is hoped that the Chinese Government, the construction industry stakeholders, the cost engineers and cost engineering institutes and Universities will, by concerted effort and hard work, soon catch up with all these advanced elements of cost engineering.

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