

# Enlightening Guidance from International Construction Management

Report on Suggestions to Reform of Construction  
Management in China

*Yang Jiayi*

Architect

Beijing New Building Material CO. LTD, P.R.China

## Summary

China is a developing country that has the most quantities of housing construction in the world. With its closing to join the World Trade Organization (WTO.), more and more foreign enterprises invest in Chinese infrastructure. More projects concerning foreign affairs lead to chances of co-operation between Chinese and foreign engineers. So the development of Chinese building industry needs to approach international conventions in all aspects. It is the requirement on development of building construction in China. Also, it is the obligation on urgent of concerning foreign affairs grows with each passing day. The article summarises the whole course of a housing project, which was the personal experience of the author, such as design stage, production stage and so on. It shows the present situation and peculiarity on housing construction management in China. Meanwhile it gives some constructive suggestions to reform of Chinese housing construction management by comparing the way of international construction management.

## Introduction

### Aim of the paper

The housing building construction management is the most representative sample among the all kinds of building construction management. Because it is always the most quantities of construction compared with other kinds of building. So it is very important to develop the housing construction management. China is a developing country with its economy entering a stage of high-speed development for its policy of reforming and opening to the outside world. And China will join the WTO soon. At the same time, the construction management in China is approaching international conventions in all aspects too. But it will take Chinese a long time to understand and accept the international conventions. The course approached to international construction management need be deepened continuously. Meanwhile

we must think about the national condition in China. On the other hand, world need know the present situation and peculiarity on construction management in China. Because it is very helpful to foreign enterprises when they invest in infrastructure to China.

Therefore the first goal in this paper is to show the present condition and speciality of construction management in China from one side. And the second goal is to give some constructive suggestions to reform on Chinese housing construction management at last by comparing the difference between the CCM and ICM.

## Background in China

### Natural Conditions

China's area is about 9.6 million square kilometres. But only 12% of area are flatland suitable for development of agriculture and urban areas. Most of land is covered with mountainous region, plateau and hilly ground. For its different geographic condition, China's climate is very various. It stretches from subtropical to cold and from maritime to continental climate. There are high temperature and a heavy rain in whole country generally in summer; in winter there is more difference in temperature between the Southern area and the North. The annual average rainfalls decrease by degrees from 1500mm in Southeast area to 50mm in Northwest areas. In design of buildings several climatic factors are considered: orientation of building, thermal insulation either from heat or cold, protection against wind and dust. Meanwhile earthquake takes place in China frequently. 45% of large and middle cities in China are situated in earthquake zones. So among these natural factors, earthquake and wind are the most important factors considered by structural engineers.

### Population

China's population is around 1.27 billion, 67% population living in rural area. With the development of market economy, the surplus labourers and surplus population will move into cities. So the urban populations grow rapidly. How to deal with the problem of urban housing becomes important increasingly.

### The Economy

From 1978 to present, China kept the high rate of annual growth for national economy. It reached above 7% in 1999, although all over the world were affected by economic crisis in East-South Asia. But the low economic benefit is a difficult problem in the process of Chinese economy development and is not easy to solve. From a long-term point of view, the shortage of resources and the increase of population will be the biggest obstruction for Chinese economic development.

### Housing Policy in P.R.China

Like most other developing countries, housing policy emerged in China after the Second World War. Before that although industrialisation and urbanisation in China had begun, but, because of invasion from outside and the civil war in a long period, housing problem has comparatively been a minor problem of the society. The government had never had opportunity to deal with housing problem. Urban housing was built mainly individually or by private developer.

After the Communist Party established its power in the mainland in 1949, it put all its energy into remolding the State mechanism and the recovering of the production concerning national economy and People's livelihood. In addition of the Korea War, housing construction for urban residents was almost ceased. Until the mid 1950s, as the establishment of social system and state order, the large scale economic construction began. After that was the big amount of housing--employees' family dormitories and workers' new villages. The difference is that the former is belonging to the State organs or enterprises, but the latter to the municipalities. (The relative housing policies at that time.) In rural area, until now almost all the housing for peasants are private houses. So, except land policy, there is no housing policy in countryside. In urban area, the housing policy of China has the main features of other socialist countries, but has some its own characteristics. Generally, housing has completely become a part of public utility and therefore lost its economic function to individuals. The character of absolute equalitarianism and privilege are

reflected correspondingly in housing. This directly led to no relationship between the need or satisfaction and his economic level. On one side, resident can't own more area even if he has money; on the other hand, owing to the Chinese communist economic policy (low income and low consumption at the development stage, housing as a public utility), urban residents commonly has no ability to build their own housing. Privately developed housing almost disappeared in cities. In addition from middle 1960s to late 1970s, the construction of public housing decreased to the bottom level because of Cultural Revolution. In a word, housing has been in extreme shortage in Chinese cities.

As the national economy was reform in the direction of market economy, housing policy in China began to introduce market mechanism into housing construction. From middle 1980s, besides continuing to enact new housing standards, construction of housing increased rapidly. Reform of types of tenure and rent policy began: privatization of housing ownership and rising rents, a way, hoped by government, by which to resolve the source of cost. However, the change of policy only changed the channel of capital, not the resource. So the capital gained was limited. But, anyhow, the reform guided the housing system into a right rail.

During 1990s as the nation economy in mainland China are improving, the living condition of urban residents was risen rapidly. The government has been paying great attention to housing construction. A series of relation policies to encourage developing housing were issued. Such as providing loan on housing to average purchaser, cancelling housing distributed as a welfare, increasing housing subsidy as wages, public housing enter the market and so on. In addition, from 1995, government has been carrying out "shelter projects", which main task is to increase floor area with 150 million m<sup>2</sup> within 5 years, and now it has been completed. This housing is sold with low profit to meet low and middle income residential requirement. So the rate of developing housing is high now, e.g. in Beijing, from January to November in 1999, the GFA completed is about 2.6 million m<sup>2</sup> and GFA in constructing is 18 million m<sup>2</sup>.

From 1997, the central government established the new policy that housing as one of the supporting industry will become a kind of new economic increasing aspect. At present there is gradual transition on housing from type of quantity whose main goal is taking shelter to type of quality whose main objective is seeking the higher requirement of function, environment even information and internet etc. In 2000, the Ministry of Construction demanded that we must speed up the development of "housing industrialisation". To operate in co-ordination for it, a series of policies and laws will be issued.

To construction management, Ministry of Construction issued the "notice about developing the construction supervision" in July 1988. It was the sign that the reform in project construction got into a new stage. It is the system of construction supervision referring to international conventions and considering the national condition in China. From 1996, construction supervision was carried out overall. At present client, contractor, and supervisor are three main roles structuring the construction market in China.

## Facts about the actors and project

As the background presented above, in 1998 we would build housing for dealing with the problem of housing for the staff and workers in our company. Our company is a state enterprise whose main goal is creating the systems housing in China. We manufacture new building materials, such as lightweight steel construction and lighthouse steel joist, gypsum board, mineral wool board, rock wool, plastic-steel windows, UPVC pipe for water supply and drainage, and assemble them to a integral building. We have six subcompany including architecture design institute, construction and decoration company, Dept. of development of real estate and so on. Total numbers of personnel are 1800. 300 are staff the others are workers. We have a residential quarter named Beixin -hometown for our personnel. In this area there are 22 housing built from 1979--1999. The total GFA is about 70000m<sup>2</sup>, about 1000 families lived here. According to the new policy of housing in China, all old public housing had been sold to personnel with a welfare price by the end of 1998. Before the end of 1999, there was the last housing with a welfare price sold. Now in China, only two kinds of housing will be sold with their different price, one is market price

as commodities; another one is affordable housing price for average purchaser. So the end of 1999 must have finished our project sold with welfare price.

As follows there is concise description and data about project.

### Actors

- Client: Beijing New Building Material CO.Ltd.(BNBM)
- Project management: Dept. of Capital construction in BNBM.
- Consultant: Architecture Design Institute OF BNBM
- Contractor: Hebei NO.4 Construction and Decoration Company
- Supervision: Beijing Xinwei Construction Supervision Centre
- Financial agencies: the People's Construction Bank of China
- Public Authorities: Beijing city Planning and Administration Bureau; Beijing Commission of Construction

### The basic data about the project

- The name of the project: NO.16 housing in BNBM
- Situation: BNHT residential quarter
- GFA: 9382 m<sup>2</sup>; PA: 1480 m<sup>2</sup>
- Number of stories: 6 (no basement)
- Dwelling size: 3 bedrooms(12 families); 2 bedrooms(108 families)
- Structural style: frame-shear wall structure
- Estimated cost of the project: 10,650,000 Yuan ( RMB.) (about 1.29 million USD.)
- Estimated time of the project: 11 months
- Scheduled start time: 1998.12.01
- Scheduled completion data: 1999.11.01

## Design stage

### Project organisation

The same as the other project in our company this housing project had been approved by board at the end of last year and arranged in yearly plan. According to the yearly plan, the Department of Capital Construction (DCC.) started to prepare the project in June 1998. The DCC. in our company is an organization on construction management for own project such as factory, housing, office building... It is responsible for construction management, building maintenance and drawing up the yearly plan of project construction in our company. To set up this organization is for many projects starting during these years. (In fact many enterprise in China don't have it now.) The whole members in the DCC. are described in **Figure 1**. We have 1 architect as the manager of the DCC., 3 civil engineers as the main project manager for project, 1 budgetary engineer as financial manager, 1 quantity surveyor as a manager's assistant. Moreover one associate chief engineer on construction in our company instructs us on technical supervision.

So in this project we planned to appoint a civil engineer as the main project manager in charge of the whole stage, which named contracting officer in China. In addition one cost engineer was responsible for estimate cost and final cost, one quantity surveyor for the preparation of tender documents and declaration to public authorities... In short, for the project the group consisted of the three men representative of client.

To design we had own architectural design institute, so we procured it for the designing activities, which we recommended it to board in company. To construction we decided to appoint contractor through competitive tendering. It was a best way for client. On the other hand for the better controlling the quality, time, cost of the project, we would entrust a supervision company with the project, which was the stipulation of the building law in China. With the experience on co-operating with the Beijing Xinwei construction supervision centre, we tended to contract it. To this project we planned to entrust supervision with construction stage. At present in Chinese construction Market, most projects were supervised in construction stage, few in design stage. Because it was not long time that

construction supervision system was carried out overall the China. It need develop constantly. Then we can of course know the project organisation from the **figure 2** clear.

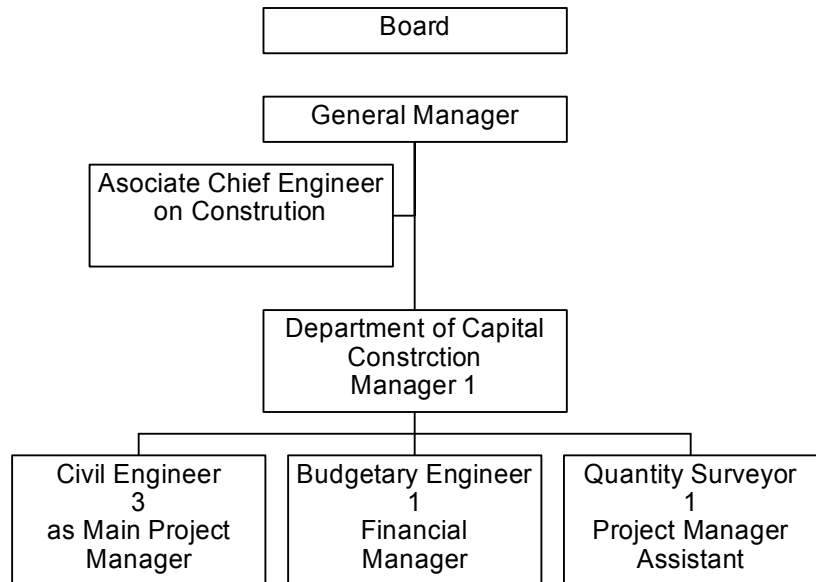


Figure 1: The Client Organisation

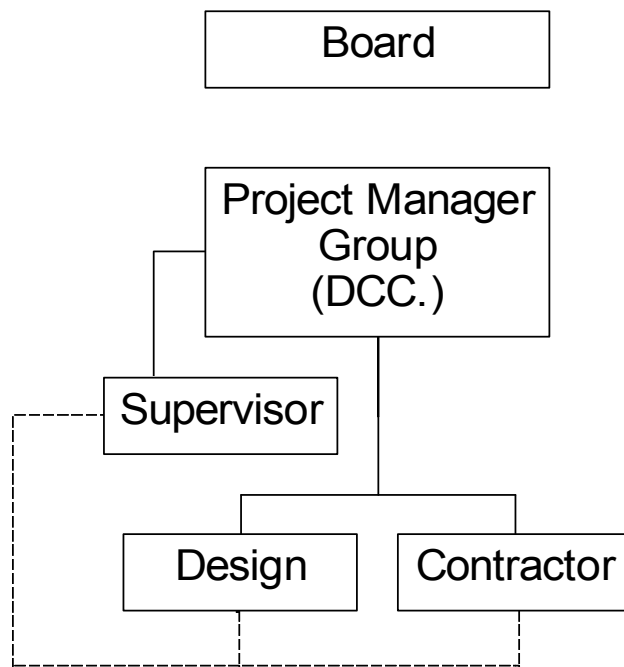


Figure 2: The Project Organisation

To preparing for design of the project, the DCC was responsible for collecting the information of user (investigating the situation of 22 buildings about 1000 families in BNHT area and gathering the statistic about the housing) and finding out the housing standard and cost in housing market. The informations as a basis for making

strategic decision were fed back to company board. Actually we had defect to make the budget in brief stage. Because when we drew up the yearly plan of construction, only basis for the project was the empirical data from public authorities. Sometimes it's more higher than actual cost in market, e.g. **table1** was the construction cost on square metre basis in Beijing, 1998. (*In part*)

Table 1: cost on square metre basis in Beijing, 1998 (from Beijing Commission of Construction)

Classification of project	Cost per m <sup>2</sup> Yuan (RMB)	Classification of project	Cost per m <sup>2</sup> Yuan (RMB)
<b>DWELLING</b>		<b>FACTORY BUILDING</b>	
• Low-rise general standard	1200-1500	• RC.structure with light load(7.5kpa)	1400-1700
• Low-rise high standard	2000-2400	• Single-story RCS. GS.	1600-1900
• Multi-storey general standard	1000-1100	• Single-story SS.GS	2000-2200
• Multi-storey high standard	1500-1800	• Multi-storey RCS.	1800-2100
• High-rise general standard	1500-1600	• Multi-storey SS.	3000-3700
• High-rise high standard	2000-2300		

**Note** :RCS.-reinforced concrete structure; SS.-steel structure; GS.-general standard  
1 USD= 8.27 yuan (RMB.)

Follow the decision of housing standard, the DCC began to draw up the design entrusting document including the design program which we presented the description of all requirements in detail, such as the families, dwelling size, stories, some facilities and so on. The project manager would separately list the design requirements according to different specialities just like architecture, structure, electric, etc. The step was very important for the project. As we known from ICM course that about 80% of final cost is determined after the brief stage and about 15% of the final cost can be influenced in design stage. By an experienced project manager, a design entrusting document drawn up would present the design standard clear to designer. So it must lead to reduce the times of modifying the scheme design and shorten the time of the scheme. Moreover it benefit estimating the rough cost early. Therefore we of course attached importance to this process. But it is not difficult to find that we have some defects on making a budget for the total project in brief stages. Only according to the empirical data from public authorities we got the project cost, which would be our amount of investment. Owing to few of economic analysis, it directly led to the cost project out of control in designing. Still we put more energy in design stage not in brief stage. In fact most clients in China don't have their own professional team in construction management, just like DCC with professional. To the civil building project usually they would not employ the professional to undertake the project in brief stage. I think it is the main reason that many projects experience cost overruns.

At the same time another work declaring the project to public authorities was done by the project management group paralleling the design. The main relational public authorities are City Planning and Administration Bureau (CPAB) and City Committee of Construction (CCC). From CPAB, we must get the certification of building planning including property line, advocacy planning and requirement about environment of the project. From CCC we must get the "building permit". Actually it's not easy to get them for its complex process. For example, in Beijing, only getting through the process in 12 subordinated departments of the CCC, such as Energy Saving Office, Tendering Management Office, Environmental Protection Bureau, etc, can we obtain the building permit which is the certification of commencement of work at last. And these 12 departments were not located the same place. They were distributed over all quarters in the city. So it was a miracle that you can take the two department's seal of approval in a day. Very often it took us 4 or 5 months to finish the work relating to public authorities in design stage. Therefore one side we need a rational plan to co-ordinate the designing and declaring to public

authorities. On the other hand we had a higher demand for the quantity surveyor who must be familiar with these processes, as a skilful clerk did, and support the project manager to joint the design institute and public authorities. Otherwise the progress of the project must be delayed.

In addition we need entrust the exploration institute with the exploration on the site and supply the exploration as a design basis to designer in pre-design stage.

## Procurement-Contracting

To this project, we directly appointed the architectural design institute in our company. At present in China, the clients only tender for the designing of large public building. The process of design tender is similar with the international conventions. Obviously it's very helpful to client from designing tender. This is an important enlightening guidance from ICM, which we should enlarge the scope of designing tender from public building to civil building. Comparing the charge for designing tender with project cost control, which one is important? Actually the charge for designing tender is of no consequence compared with the final cost of the project.

In order to get similar conditions in the procurement process for different consulting services in China, the general service fee norms of exploration and design were created. The first editions of these rules were in 1970s, and were reedited every 4 – 5 years. The newest editions were in 1999. In China most of architectural design institutes belong to state. As for design fee, according to present norm, it is 1%-3% of the project cost. But as a rule the design fee of housing is 3% of the cost, for developing housing project. To institute, the schedule of design considering the project plan of client must be presented to client when they contracted. There are two different ways for the client to pay the design contractor. One kind is consulted in contract with each other, called “progress price”, in which the payment was divided into three stages: end of scheme, preparation preliminary drawings, presentation of all working drawing. Another kind payment is “lump sum”, usually in small project. In China the licensed architect and licensed engineer system was implemented. All working drawing can't become effective for construction unless the licensed architect signed them. Normally the architect is the leader of the design group. So to this project a architect as the leader of the design group which also consisted of one structural engineer, one electrical engineer, two water and heating services engineers and one cost engineer, was responsible for the whole design. During the design stage, the project manager communicated with the architect sometimes. The designers adjusted the scheme in time according to information fed back from the client. After the scheme was approved by the client, the designers can continue the working drawing.

## Project planning

Project planning in accordance with the yearly plan of construction in company must be drawn up by project manager considering the whole project in early stage. Usually the new yearly plan of construction had been drawn up by DCC at the end of last year. After it was approved by company board the DCC must arrange them in detail including the scope, brief requirement, cost, the commencement time, the schedule of payment of every project. When a new project starting, project manager must draw up the project plan. The main contents include:

- Requirement of scheduled progress ( including three stages: the brief, design and production)
- Organisation ( including division of labour in detail corresponding to their limits of authority)
- The way of integrating the users, consultant and contractor with project (especially to industrial project) such as the time, address of the regular meeting etc.
- Suggestion of selecting the consultant and supervision company for company board

We may find that in this project plan there are no contents about quality assurance. It is really a flaw to our project. Further our scheduled progress is usually vague, presented only with words. So it is not strict in controlling the process of project. In real process we sometimes finished the process out of the schedule. From ICM we

know that the scheduled progress will of course be more feasible, strict and effective for the project if we use the way of bar charts or CPM.

## Project financing

As we know from contents mentioned above, there are requirements of payments on amounts and schedule both in yearly plan of construction by DCC and project plan by project manager. In my company another department called Dept. of finance, which is responsible for the management of the whole fund in company, is in charge of project management. The yearly plan and project plan, as the basis of financing must be sent to Dept. finance. Then the manager of the financial Dept. arranges the fund considering the financial condition in company and ensures the project in smooth.

Like this project, we loaned from the People's Construction Bank of China. Now in China we were supported in housing construction loan by housing policy from government, especially to deal with the housing problem of large and middle state enterprise.

During the co-operation with the Dept. of finance, we sometimes met the problem that the progress payment can not be paid to contractor in time. There are three main reasons followed:

- Insufficient communication between the project manager and the Dept. of finance
- Limited the power of the project management group even of the DCC ( 1.the project manager can not arrange fund in company; 2.sometimes the funds for the project are diverted to other emergent project in company)
- Not in detail on project plan about amounts and time of payment

As a result of delay on payment, it directly led to dispute between the client and contractor, even to shut down. Then the project manager had to mediate with much energy. But what is the root cause? And how shall we do? In my opinion the key is to simplify the administrative structure. Also this is the main goal of reform on system of organisation in China.

## Budget and budget control

How to budget a construction project? In China the cost engineers make the budget of project according to the working drawing and national or local norm for detailed estimates. In the contract with the consultant, the budget of the project must be presented with the working drawing. But it actually is a kind of approximate estimate. The result of the budget is a synthetical price based on working drawing and norm for detailed estimates in Beijing, not on bills of quantities. Further in China almost all architectural design institutes don't deliver bills of quantities of the project. For ensuring its accuracy, our costs engineer in the project management group as well as made a budget according to the working drawing. This budget is very important to the client, which it was a main reference to judge the correction of budget made by consultant and the bid. The project manager compared these two budgets, analysed the difference between them and checked the working drawing. Then the comments of adjusting in part were fed back to designer for controlling the cost of project. The designer adjusted the drawing at last. After the last finished revise, the working drawing would be one of the tender documents. Also this is the last chance for the client to adjust the design before the tender of construction.

For us there are some difficult problem presented below:

1. As the basis of economic analysis for the client, the design institutes present the budget of project only one time. There is no earlier budget from consultant. It certainly will land the client in the passive position that the client can not continuously and wholly control the cost in the design stage. Because after the delivery of the working drawing and budgets, there are only one or two chances to adjust the design.
2. In China usually the budget from design institute are not exact. Because most experienced budgetary engineer serve in construction firm and state specialised consultancy. Normally the cost engineers in design institutes lack the real experience of construction on the site.



3. The sluggishness of the norm for estimates: in China every 5-6 years the norm for estimates has been amended. Sometimes the prices on norm are more different from the market at that time.

## Information technology

In China almost all architectural design institutes realise designing by Auto CAD and other design software, which are developed based on Auto CAD. To budget by computer is not spread widely. Some cost engineers make the budget with a kind of software called “Budget Master”. But there are still some defects in it. To some special project or parts of the project, it often shows its incapability. Moreover we can not joint the design software to estimate system and get the budget directly from Auto CAD. It is the requirement on urgent of developing the especial budget software based on Auto CAD learning from international advanced experience. As to construction stage, the computers are much less used by contractor. Even we can seldom find computers in the site office. Therefore it is our goal that we can continuously estimate the cost for the project using the modern information and technology during the whole design, construction stage even to property management. Also it is one of the important ways developing the construction management level.

## Conclusions

From previous analysis of the design stage, in short the brief and design stages are the most important stage (to the client or project manager) on controlling the total cost of project. The clients (or project manager) must try their best to do it in these two stages, especially in brief one. Usually the project manager is the key man.

At the same time we have found our defects in management. Following it is a point by point account of defects and the suggestions on how to improve.

The parts of shortcoming:

1. Organisation cumbersome and overstaffed
  - For cumbersome and overstaffed department in government, there are more tedious formalities to project during the progress of permissions from authorities.
  - In enterprise especially to state enterprise, it is not reasonable on organisation for project, too more branch of department, lacking unified administration
2. Not good education and training system
  - In university there is no special field of construction management and project budget, directly leading to lack of specialized project manager and cost engineer who have a good knowledge about the construction process and an ability to administrate.
3. Insufficient realization on the importance of management in brief stage and design stage. (to the client and project manager)
  - Many clients don't like to put the financial resources and manpower into the administration during these two stages, they usually depend on their own organisation just like the DCC. which usually lack of experienced administrator. They seldom go outside to find the right competence for management. (one of the reasons is being no more the experienced construction management firm in China.)
  - Vague project plan expressed by words
  - Insufficient in-depth economic analysis
  - No tendering in design of civil building
4. Designers lack sense of duty and experience of construction. Insufficient co-operation among the different specialities.
  - No selected plan of economic analysis in comparing the cost
  - Lack of detail drawing in the working drawing leading to difficult in construction
  - Some contradiction of different specialities in working drawing usually found in construction stage
  - Not to deliver the bills of quantities
  - Too conservative structural design being no definite binding on cost control
5. The sluggishness of the norm for project estimates as a basis of budget
6. The weak basement of IT

- The lack of computer support for project management especially for budget and construction management
- The lack of specialized software in common use between design and budget

Our suggestions:

1. To deepen reform of organisation system, simplify the administrative structure, raise efficiency
2. To strengthen the higher education, replenish the course of construction management learning from developed country's experience
3. Must be full of realisation on the importance of the brief and design stage
  - By using the Bar Charts or CPM to make the project plan
  - To use the experience of ICM course for reference on economic analysis in early stage, such as "SYRE system" which is a computerised estimating system and instrument for economical analysis of buildings with actual cost data and references objects
  - To enlarge the design tendering area to civil building
4. The architect should practically be responsible for leader of the design group, co-operating every specialist. And designer should often practice on construction site to get more experience of production.
5. The requirement of delivering the bills of quantities and multi-plan of economic analysis should be mention in contract between the construction and the client.
6. To develop the IT in construction management, tap the specialized software of budget and design in common use as fast as possible.

## Production stage

As we known from above contents that the construction markets consist of three main parts: the clients, the contractor and the supervisor. So during the production these three parts are the leading roles.

## Tendering and contract

In China the new tendering law was carried out from January 1, 2000. Moreover in Beijing, the Committee of Construction stipulates that the project whose cost above 500,000 yuan (about 60,459 USD) must tender and be supervised in construction. Now in Chinese construction market, there are three tender forms: 1.open bidding; 2.invitation to bid; 3.negotiation to bid. For insurance of fair play in construction, the negotiation to bid has been forbidden. Therefore we used open tender in our project. The process are shown followed:

1. The project manager registered the project at the Tender Administrative Office (TAO.) which belongs to the Committee of Construction in Beijing. (every local project must be administed by local TAO.) The TAO.gave the schedule of the tender.
2. Preparing the tender documents. The management group filled the tender documents, which are the standard forms made by the TAO. Then the quantity surveyor handed them in the TAO. The administrator of TAO checked them and served as a record.
3. In accordance with the schedule given by the TAO, the project manager entrusted the legal consultancy with pre-tender estimate. In Beijing there are only four ledge consultancies which are qualified to do the pre-tender estimate. We selected one of them, which is the People's Construction Bank of Beijingxisi China. The project manager should present the tender document and the working drawing to the consultancy. (no the bills of quantities)
4. Making the information about project tender public. At the hall of the TAO, using the computer the information of bid including general situation of project, the requirement of the bidder's qualifications etc. were shown on the projection screen for 3 days.
5. Getting the information of tenderer. At the hall of the TAO, the quantity surveyor of the project management group received the whole application of bidder and presented them to administrator who inspected the course. The administrator in the TAO.served as a record by computer and gave the

- prequalification of prospective bidders. Deleting the tenderers who can not accord with the client's requirement of construction qualification.
6. Selecting the tenderers among the list of candidates. To this project we selected 4 tenderers among the 12 candidates. It's the main job that the project management group should analysed and compared the different tenderers' condition. Then they gave the result as an important reference to company board to decide. We gave the decision to the TAO, and informed the selected tenderers to prepare bid. At the same time the project manager should deliver the tenderers the tender documents and the working drawing.
  7. Within the fixed time, the TAO collected every tenderers' bid price and the book of tender, then sealed up for safekeeping together. Next the administrator in TAO also sealed up the effective pre-tender estimate, which should be verified by one of the other three legal consultancies. In other words when the project manager got the pre-tender estimate from the entrusted consultancy, he must present it to the TAO. The TAO stipulates that the pre-tender estimate from the client must be verified by one of the other three legal consultancies. The clients can select one of them. Only the pre-tender estimate examined by second legal consultancies is effective to bid. It's very important that the time sealing up the bid price and book of tender must be first than sealing up the pre-tender estimate.
  8. Tender opening and evaluating. We opened the public bid chaired by administrator of the TAO. A group of evaluating the tender consisting of 5 specialists who were invited by the client are in charge of evaluating the tender. (According to tendering law, only two of these five people are permitted from the client. And their qualifications should be affirmed by the TAO). There are two kinds of regulations of evaluating the tender: public building and dwelling. The evaluating was divided into two parts. The first one is economic tender and the second is technical tender. Using the computer and the specialized software, the result of economic tender was directly shown in public. The tendering law stipulates that the bid whose public offer is in the limit of  $\pm 5\%$  pre-tender estimate is effective. Then the group of evaluating continued the evaluating of the technical tender at the other place. The main contents evaluated are about production plan, outstanding achievement of construction, qualification etc. At last the group gave the final marks based on result combining the economic and technical tender evaluation. The tenderer of highest marks won the bid.
  9. Letter of acceptance to tenderer who gets the bid. Within the fixed time, the client should contract with winner of bid.

In this project the Hebei No.4 Construction and Decoration Company got the bid. But our problem is how to deal better with the stipulation that the public offer is effective if it is in limit of  $\pm 5\%$  pre-tender estimate. So both to client and contractor how to use these 10% space is very important for profits each of them.

To contract in China usually we have three different forms of contraction. The first form is "divided contracts" used in large project. The second form is "general contract" which is used mostly in China, just like our project showed by **chart 2**. The third form is "design and construct" also called "turnkey". In China this form gradually develop at present. The three forms contract have their shortages and advantages. So the clients should reasonably select them according to condition of the project for their project. In addition another important point is that some contract terms such as how to deal with the change in the work, requirement for quality level with bonus-and-penalty clause, liquidated damages etc., should be made definite. Sometimes we met trouble in contract dispute being lack of in detail contract terms. Even it directly affected the time, cost and quality of the project.

## Production planning

The production plan is the main part evaluated in tender stage. So every contractor usually attaches importance to it. Generally the main contents of production plan just like our project include:

1. general situation of the project ( in accordance with the tender documents)
2. detailed construction schedule
  - dividing of construction flow process
  - the phase of construction period control

- construction schedule network ( CPM)
- 3. preparation for construction
  - preparation for personnel ( the project of staff organisation and the project of labour)
  - the list of construction machinery
  - electricity and water used in construction
  - preparation for construction site (attaching overall site plan)
  - explaining the obstacle underground and ground
  - handing over the construction stake
  - preparation for construction technique
- 4. the main construction method
  - the earthwork ( excavation and backfilling)
  - reinforcement work
  - formwork ( the form of the foundation, the form of the main structure including beam, slab and column)
  - concrete works ( including regulation of winter construction )
  - water proofing work
  - finish work
  - masonry work
  - electrical installation
  - heating and plumbing work
- 5. the system of quality guarantee
- 6. the measures of safety management
  - the chart of organisation on safety management
  - regulation of safety management
  - technical measures of safety management
- 7. the civilized construction measures of environment protection
- 8. the construction site plan in different stage ( the phase of foundation work, structure work, finish work)

## Quality management

In production stage, the quality controlling was managed by the contractor and the supervisor. The construction firm of this project got the certification of ISO 9000 system in 1998. So this firm established its quality guarantee system according to ISO-9002 (GB/T19002). Under the controlling of this system, for this job, they set up a project department, which the manager is a key man in the subsystem of quality. For the goal of high quality in contract of the project, they carried out the construction manager responsible system and specialized foreman system. To external the construction manager as the delegate of company performs the contract and to internal he contracts with his company. In this contracts a series of bonus-and- penalty clauses about quality are arranged. Moreover the construction manager resolved the quality goal into the divisional work and subdivisional work. (It was shown as **table 2**). At the same time he must drawn up the inspection plan and organize its carrying out according to the evaluation regulation of high-quality project in Beijing. To analyse the result and data of quality inspection, draw up the higher goal; ensure the effective operation of quality guarantee system. In addition they fixed the critical working procedure and separately drew up the construction plan of subdivisional work, by conscientious analysing the working drawing for ensuring the quality. About the specialized foreman system, every specialized foreman only is responsible for his own specialized work. Formerly a civil foreman usually was in charge of many different specialized works. In fact he had not enough energy to do it. Now in specialized foreman system, the foreman had more time and energy to inspect the every process in his specialized area. Therefore their sense of duty was strengthened. Generally there are some main means on quality control:

- the specialized operator can not go to work unless he gets the relevant certification
- machinery must be tested before operated
- first the qualified expeditor must inspect the outward appearance of materials on the site, then he must take the sampling of the materials and have it qualification tested by legal laboratory. Only the qualified material can be used in project.

- Carrying out the prototype system , trade self-inspecting system and inspection on handing over process system
- Drawing up the preventive measures on controlling quality
- Strictly administrating the records of quality inspection

Table 2:the Divided Quality Aim in Divisional Work

Aim of quality	Qualification rate of subdivisional work	High quality rate of subdivisional work	Divisional work quality level
Division work			
Foundation work	100%	40%	Qualification
Structure work	100%	60%	High quality
Roof work	100%	80%	High quality
Door and window work	100%	50%	High quality
Floor work	100%	40%	Qualification
Finish work	100%	60%	High quality
Heating and plumbing work	100%	40%	Qualification
Electrical installation work	100%	70%	High quality

On the other hand the supervisor is the other important part on quality controlling during the construction. Almost every process must be inspected by supervisor. It can not be continued into next process unless the chief supervisor signs the sheet of the acceptance. Generally their main management contents for quality control are followed:

1. Fixing the requirements and standards of quality ( including construction, materials, equipment and technology)
2. Making definite about the quality clauses in tender documents and contract conditions
3. Inspecting the quality of materials including end products , semi-finished products and equipments
4. Attending inspection of concealed work on the critical process and quality of subdivisional work. Pre-inspecting the main structure and completion
5. Checking the technical measures on construction safety
6. Assisting the client to deal with the accident of quality and safety
7. Assisting the client to affirm the subcontractor selected by the main contractor, checking its qualification and quality guarantee system

The supervisors control the quality based on the followed contents:

1. The documents and the working drawing of the project
2. The supervision contracts ( the client VS. supervisor) and the construction contracts ( the client VS. the contractor)
3. “ Regulation on construction supervision” issued by the Ministry of Construction and “ measures of construction supervision management in Beijing”.
4. The policy, law, code about construction issued by government and local government such as technical code for work and acceptance, the standards for quality evaluation...

In addition the government department for construction quality at unfixed time inspect construction on site using mainly administrative means. They usually attend the inspection and acceptance of the main process and completion.

So we may find that in China the construction quality guarantee system was pledged to fulfil by the supervisor’s inspection in whole stage, government department’s administrative means and the construction contractor’s self-inspection. Moreover the experienced project manager or group just like the DCC.also cooperate with supervisor for quality control.

### Economic control – budget review and reconciliation

To economic control in production stage, it is most important that constructing must be strictly in accordance with the working drawing and control the change in the work. We should make every part of the working drawing even to detail drawing

clear and as far as possible reduce the change in the work, which will add the cost of project due to unclear facts about working drawing. Sometimes the contractors make the extra profit by additional work being the change in the work. Especially in the cost reimbursement contract, the contractor even likes more changes in the work than he make more profit naturally. Therefore in these kind of contract, the project management group should cooperate with supervisor to control the change in the work. The cost engineer should go to the site regularly and know well the actual quantities for settling accounts. The project manager and supervisor should study the working drawing deeply, deal with the construction plan reasonably and control strictly the additional cost.

Sometimes in China the settle accounts is not a simple course. Usually it takes the client and the contractor not a short time to negotiate. The supervisor in charge of budget co-operating with the cost engineer from client is responsible for budget review and reconciliation. They adjust the budget in accordance with the regulation of adjusting price issued by the Construction Cost Administration Agency in Beijing and the actual quantities. So if the client want to gain the initiative in the closing phase, he must have the definite requirement to management group and supervisors to know well the all facts of construction. On the other hand back to the procurement phase, we may easily understand why we should analyse the contract clauses carefully. Indeed it's very helpful to settle accounts. From above we can draw a conclusion that really the economic control is a continuous course.

## Conclusions

From the three goals control (quality, cost, time), we completed the project with higher quality on schedule. But the final cost overstepped the budget a little being some changes in the work.

Generally at present we should have some less good parts in construction stage as followed to improve.

- Although the tendering law was issued, some detailed rules and regulations should be perfected. Because sometimes it's not more fair to every tenderer being the loophole of the tendering law.
- Often the construction planning in the tendering book is formal only for winning the bid, not actual. Therefore it needs to be reconsidered before the commencement of work.
- Lack of pre-control. Most of measures for control were used after the problems were found. So we should use more pre-control way which is more effective.
- Often bonus-and-penalty clauses about quality in construction contract are not performed. We must get the quality in touch with the contractor's profit for quality guarantee.
- Lack of computer support. There is most information in construction stage compared the other stages. So we should develop the computer to manage the construction.
- Insufficient the research on construction method. At present some construction methods are still backward. We should change it.

## Property management

### Present situation of property management in China

In China the property management as a trade sprang up in recent years. In the early days of the economic reform, we made strenuous efforts to develop the real estate because we realized that the real property are one of the most important productive factors in Chinese economy. But our main direction is development and selling at that time. Always the property management was not taken seriously. In fact the total value of the whole Chinese properties is amazingly large. For example, in my company the total value of the real estate property can be estimated to more than 1 milliard yuan ( about 121,000,000 USD). The maintenance costs are about 5,000,000 yuan per year (about 604,600 USD). Thus there are very big real values to

need be managed. How to administrate them appropriately? It is an increasingly urgent task that we should attach great importance to the property management.

Publicly owned houses in China are owned either by public enterprise just like my company, or by local governments. Generally in the first case we have a housing administrative department in enterprise and in the second a local housing management bureau, both in charge of maintenance. But this system is not working well because of lack of funds. At present the rental housing market is not established. One side the rent of government owned buildings is so low. On the other hand the private housing rent is not regulated. Formerly the maintenance fund was paid by government. Being too low rent, it can not be accumulated to maintain buildings. In addition government finances are limited. So it is the universal phenomenon that more and more public housings are out of repair. Some housing can not dwell normally. In China the housing policy was reformed in 1998. The old housing system of welfare distribution changed into new housing system of currency distribution. All the housing including the old public housing are sold to inhabitants as a kind of commodity. In fact the change of the housing property right does good to property management. At least the maintenance funds are solved by collecting the property management fees from inhabitants. Therefore co-operating with the reform on housing policy some enterprises which are engaged in property management appear. Recently both of the housing administrative departments in enterprise and the local housing management bureau are changing their system from the administrative department to profit-making department. Moreover in 2000, the government put forward that the speed of developing the property management should be picked up. The Ministry of Construction first set a good example that they will entrust the property management firm with administrating their whole compound this year. Undoubtedly it is a signal that our government attaches more importance to property management.

Concretely for example, now in my company, the two departments are responsible for the all properties management. The DCC is in charge of industrial building and the department of property set up at the beginning of this year is in charge of housing. (In my opinion it is a transitional stage. At last we will realize the unified control). Generally every year in December, the DCC gather the requirements of maintenance from the subcompanies. The facts of public parts belonging to the general company such as the road, the square, the main office building etc. should be investigated by the DCC. After this the DCC work out the maintenance planning including the quantities, time and the budgets, and give it to company board. Approved by board the maintenance plan can be carried out next year. Usually our properties go through the life cycle of the objective. Because we seldom rent our properties to other. But now with more and more cooperation with the foreign enterprises, the properties in our company such as some factory buildings are rented out to them. So we should consider the different cycles of life. Actually we are insufficient of analysis on life cycle economy. Often the financial department prepares the maintenance funds only according to the regulation of depreciation. Except this, we have no other analysis in detail. On the other hand from the every maintenance project the DCC got some important information about not good function being not well design and served them as a record that would be fed back to design to prevent the same problem in the future.

## Our problems and suggestions on property management

Being its young, surely the Chinese property management has many shortages. How can we do?

- Too insufficient of professional personnel in property management firm. Although the old administrative systems has changed, but many property management firms even have no specialized civil engineers and budgetary engineers. It is only a formal property management firm. Therefore it is an urgent requirement that the Chinese property management firms should strengthen the professional personnel.
- Being lack of professional personnel, we have no integrated management system including all specialized measures on life cycle economy analysis, planning and IT.ect. But we could detour less by learning the advanced and mature experiences from developed country, such as ICM course about

property management. We should use them for reference based on our national conditions.

- The laws and regulations of real estate are not perfect. Due to insufficient of effective management there are many vacancies in property market. So we should perfect the property management laws system and regulate the total amounts of property.
- The real estate developers lack the realisation on the importance of property management. They are only interested in selling not in management. To them as long as sold out the building, it is ok. But from ICM course we know that a new construction only is the beginning of their life cycle. If a developer lack the analysis of the whole life cycle economy, he would not make better profit in the property market.
- We have not established our rental housing market. It restricts the development of property management. So we should as far as possible set up the rental market. Also it is a main direction on our rental market reform.

## Conclusions

Although the property management appears in recent years, it develops rapidly. It is necessary that we should attach great importance to property management: strengthening the training system of property management; learning the advanced international experience; perfecting the law system of property management; setting up the rental market. Then the real estate will truly become the supporting industry in the national economy.

## Experiences to be used in the future

During the ICM course, we were trained systematically on construction management. Although the time is limited, the lecture with the abundant contents was very brilliant. Among them there are many advanced experiences that we can use directly, some ways that can be used for reference. I think they will become to our measures if they are made changes according to our national conditions. It can increasing improve our management to a higher level. Followed we present those experiences from the course which could be used in China in the future.

- The theory of “the determination of final cost in the building project” can be directly used to guide our construction management.
- Developing the large construction management firms to manage the project.
- The software “Microplan” and the measures of “bars chart” and “CPM” can be directly used in project manager’s plan.
- “How to make the cost analysis and project plan in detail during the design stage” we can use them for reference.
- In commissioning stage presenting the maintenance manuals is a good way that we should use.
- Drawing up the unified consulting service rules just like ABK96, can direct dealing with the dispute in consulting.
- Using the modern information technology in construction management. We can use their principle to develop our IT.
- The systematic theory on property management including a series of calculating formulas and management process etc. can be used by us.
- The theory of Swedish rental housing market can be used for reference. Because to welfare policy, we have some similar aspects.
- In addition from visiting the site I knew some construction methods about waterproofing works, system building work and so on.

On the other hand in China there are also some effective measures and experiences in construction management, which could be used for reference to other countries.

- Carrying out the supervision system widely in construction. Their main goal is “three controls and two management”. (including quality, time and cost control; management of contract and information)
- Construction management responsible system and specialized foreman system



- The system that the legal person of the project be responsible for construction quality lifelong tenure. Whenever or wherever the legal person of the project goes, he must be held accountable as long as collapse for construction quality.
- This year the Ministry of Construction issued “ the function and property evaluation measures on commodity housing”. It stipulates that from now every new commodity housing will be evaluated to three levels: 1A, 2A, and 3A according its five aspects (suitability, safety, durability, environment, and economy). Then they are issued relevant certificate. This level will directly affect its price in market. So the quality of construction establish contact with the market.
- Developing the housing industrialization system  
The housing industry is the important part of the national economy. Generally the investment of housing construction account for 3%--8% of GDP, 15%--30% of the total investment of fixed assets. Moreover its development can affect and promote the development of relative industries. According to statistic, if we invest 100 yuan (RMB) to housing construction, we will increase the requirement on relative products about 170—220 yuan (RMB). Therefore in China, developing the housing industry is a main goal in national economy.

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