

# Analysis on the preparation of construction cost business

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**Abstract:** *The construction cost business mainly includes the preparation of bill of quantities, the preparation of the tender control price, settlement auditing, and the whole-process cost management. Specifically, bill of quantities is the basic document of the bidder's unified quotation provided by the tenderer. The tender control price is the maximum construction cost limited by the bidder on the proposed construction project, which is also called block bid price, bid control price or the highest quotation. The settlement auditing refers to the process of the construction enterprises handling the project price settlement with the construction unit (owner) in accordance with the contract and the completed project quantities. Generally, the construction unit entrusts a consulting agency with appropriate qualifications to calculate and review the submitted settlement until all parties perform links such as confirming the amount. The whole-process cost management is the process of investment management for all or part of the construction project from decision-making to completion.*

**Keywords:** *bill of quantities, tender control price, settlement*

## 1. Introduction

The author has been engaged in the preparation and review of cost consultation business for many years in a cost consultation agency. In recent years, the author has been responsible for the overall control of the cost consultation results of the company. Based on the accumulated experience in the previous few years, the author has summarized basic principles of preparing cost business, problems occurred and precautions. This paper mainly analyzes the bill of quantity, tender control price preparation and settlement auditing projects.

## 2. Basic principles of preparing bill of quantities, tender control price and settlement auditing

### 2.1 Basic principles of preparing bill of quantities

The bill of quantities should accurately describe the characteristics of the project: project characteristics are the essential characteristics of the value of the divisional and sub-divisional bill of quantities items and measure item list. It is the information sent by the developer to the bidder for a certain project, and it is also an important basis for the bidder's bidding and quotation for a certain project. Hence, the accurate description of project characteristics is very important for the bill of quantity and the later tender control price and bidding quotation.

The unit of measurement should be accurately described in the bill of quantities: the original vague unit of measurement have been specially adjusted in the "Pricing Specifications for Bill of Quantity in Construction Project" (GB50500-2013), and can be chosen according to the actual situation. For instance, the units of doors and windows "set" and "m<sup>2</sup>" are available for selection; the "m" and "m<sup>3</sup>" are listed for earthwork of the pipe trench; "m", "m<sup>3</sup>" and "piece" are listed for the precast reinforced concrete pipe piles; "m<sup>3</sup>" and "set" are listed for septic-tank and inspection well; "unit", "set", and "piece" are listed for small electrical appliances; and "pair" and "piece" are listed for flanges. The various situations of drawings and practical applications are taken into consideration, and it is necessary to choose the most suitable one unit according to the actual situation of the project when preparing the bill of quantities.

The list code shall be accurately selected when preparing the bill of quantities: "Pricing Specifications for Bill of Quantity in Construction Project" (GB50500-2013) is divided into 9 volumes

according to professions with the purpose of clarifying the division of majors and matching the quotas of each volume. The list code is first prepared according to corresponding professions. The list for other professions can be borrowed for use if the list for this profession cannot meet the requirements, but the same name or similar sub-items shall be chosen.

### ***2.2 Basic principles of tender control price***

The quota shall choose the appropriate profession when preparing the tender control price. The list code corresponds to the quota major. When the major is not satisfied, the quota can be borrowed. However, it is not suggested to borrow a quota based on subjective opinion or the similar name. When using the borrowed quota, similar sub-items with similar construction technology, construction content, and construction process shall be preferred. Only in this way can the consumption of labor, machinery, and materials of the quota sub-items borrowed be similar, so that the deviation of the applied quota sub-items is small, which is of significance for reference.

The expenditures shall be set correctly when preparing the tender control price. Taking the Hebei project as an example, the project category, taxation area, project location, labor fee adjustment area, number of adjacent roads, and construction area shall be set according to actual conditions. In the stage of preparing tender control prices, the location of the company cannot be determined (not bidding yet), therefore, the location of the company is always set to the urban area. Many cost business personnel sometimes use other project templates temporarily, and sometimes forget to adjust some content, resulting in deviations in pricing. Therefore, expenditures setting is also a very important step.

When preparing the tender control price, the unit prices of labor, materials, and machinery must be implemented at any time in accordance with the price adjustment documents issued by the provinces and cities. The prices of other main materials should be adjusted according to the current cost information or market prices. Generally, the prices of the city and the counties and districts under its jurisdiction should be taken with the priority. If not, the corresponding district and city prices can be used. If not available in provinces, it is necessary to visit inquiry websites such as [www.bmlink.com](http://www.bmlink.com), [www.gldjc.com](http://www.gldjc.com) and [www.iccchina.com](http://www.iccchina.com) to compare the prices of non-standard equipment or infrequently used materials, or refer to similar prices of previous projects, and choose the price closest to the actual price according to the grade and brand required by the construction unit.

When preparing the tender control price, the measure fee shall be calculated accurately. For instance, construction fees in winter and rainy seasons should be adjusted according to the actual conditions of the project. If the construction period is less than 50% of the specified days in winter (rainy) season, the fees will be calculated as 50%; if it exceeds 50%, it will be calculated as all. Other expenses are set according to amortization and charged according to the actual situation of the project.

When preparing the tender control price, pay attention to the calculation of fees, safety production, and civilized construction fees. Take Hebei Province as an example. Now the fees are no longer measured and charged, and can be charged at a fixed rate. Safe production and civilized construction fees are now calculated at a fixed rate instead of the basic fee and additional fee. The base figure recorded is the pre-tax construction cost (excluding safe production and civilized construction costs).

### ***2.3 Basic principles of settlement auditing***

Strictly review the reported settlement data: for any construction project, the relevant data must be used as the basis when preparing the settlement. Therefore, the relevant information must be reviewed first, from construction drawings, project contract to the dynamic data of the whole-process construction, and the data shall be complete to lay a foundation for the review work. The construction period, quality, construction material price, rewards and punishments of the project should be based on the contract or other agreed terms, and the dynamic progress in the specific construction, partial changes and concealed projects must be supported by relevant documents before entering the settlement. It can be said that if there is no complete settlement information, the settlement done is not completely accurate, and it will not meet the expected settlement requirements or objectives.

Accurately calculate engineering quantity: engineering quantity is the main component of construction cost with great flexibility and concealment. Auditing the quantity is a key and difficult step. During the audit, it is often found that there is a discrepancy between the quantity settled and the actual completed quantity. The reasons are listed in several categories.

- (1) The construction enterprises intend to increase the engineering quantity so as to obtain more

value in order to increase the cost;

(2) Some items changed and deducted will still enter the settlement as originally scheduled without deduction;

(3) For engineering projects involving multiple subcontracts, the boundaries are not clear. Each subcontract is included in its own settlement as much as possible, resulting in double calculation and repeated declaration of the engineering quantity.

The above situations often occur in settlement audits. The over-reported quantity shall be deducted during reviewing. At the same time, the under-reported quantity after repeated verification will be calculated into the settlement based on the principle of seeking truth from facts, so that the quantity can accurately reflect the actual engineering quantity of the completed project.

Reasonably determine the comprehensive unit price: under normal circumstances, the comprehensive unit price of the project bidding with the bill of quantities generally adopts the fixed unit price contract. When preparing the project settlement, only the comprehensive unit price can be calculated for the project quantity. The difficulty lies in the items not in the list. The contract agreed to regroup the price with reference to the current fixed quota and withdrawal of fees. However, in actual operation, errors often occur in the application of fixed unit prices. There are mainly the following reasons.

(1) The specifications of materials or equipment are artificially changed, and the price is too high;

(2) Incorrectly split the work content contained in the quota, causing repeated application, and excessive expenses;

(3) Fail to apply the quota or collect fees as stipulated in the contract when reporting for settlement;

(4) The supplementary quota unit price lacks basis and the confirmation materials of the construction unit, supervision unit and other relevant departments that comply with the procedures or rules and regulations, which are subjectively included.

The above conditions will directly affect the construction cost. Therefore, it is necessary to distinguish clearly whether it is the unit price within the contract or outside the contract, and study the contract to confirm the method of pricing and the principle of fee collection.

Appropriate pricing for visa changes and claims fees:

Firstly, costs for visa changes during construction; in terms of visa changes during construction, the approval items must be signed and stamped in full, and the description of the visa changes should be detailed and clear. The actual situation of the project should be verified during the review, if necessary through on-site survey and measurement. Besides, check the basis used in the calculation, and seek truth from facts to avoid errors as much as possible.

Secondly, policy-related fees (taxes, fees, etc.); for policy-related fees, the appropriate documents shall prevail when reviewing. Some projects have a long construction period, spanning two or more cycles to implement policy adjustment document. Therefore, it must be calculated in phases according to the time boundary determined by the document. Hence, the process documents in the settlement materials are important at this time. In the calculation process, it is necessary to distinguish the date node of the implementation of the policy adjustment document, the calculation base, etc. Generally, this cost still has a large impact on the cost of medium and large projects, so the adjustment should be based on sufficient and clear principles.

Thirdly, material price difference adjustment: for material price fluctuations caused by market fluctuations, it is necessary to adjust the price of materials. The focus of the review is to determine whether the difference adjustment principle meets the contract requirements. Generally, in practice, the following three adjustment methods are adopted: (1) Adjust the difference according to the unit price signed and confirmed by both parties;

(2) Adjust the difference based on the cost information released by local government;

(3) The method for material adjustment for which both parties have not confirmed and is not listed in the cost information is: Party A and Party B respectively inquire about the price and adjust the difference after the negotiation and confirmation by two parties.

No matter which adjustment method is adopted, try to be fair so that it is accepted by both parties, and the procedures for both parties to determine the price must be complete.

Settlement of water and electricity costs: it is part of the project settlement, easy to be ignored sometimes. If the developer's water and electricity are used on the construction site, the costs need to be deducted according to the agreement between the two parties or the fixed amount. If the employer agrees to deduct it, it shall be stated in the audit report.

### **3. Quality problems in preparing bill of quantities, tender control price and settlement auditing**

When reviewing the results of the cost business, the author found some problems in the results documents, including severe ones and insignificant ones. However, they affect the rigor and accuracy of the cost results, which have been classified and summarized into the following four types.

Firstly, text errors: mainly appearing in the preparation of instructions or audit reports.

- (1) Errors in the description of the construction scale in the preparation instructions;
- (2) The cost amount filled in the preparation result in the preparation description does not match the attached software version;
- (3) The text description in the preparation instructions or audit report contains repeated words, missing words, wrongly written characters, and sentences that are not smooth;
- (4) The project name is filled in incorrectly or the project name in different positions in the file is inconsistent;
- (5) The date on the cover and other positions of the file are inconsistent or incorrect;
- (6) The case and amount of the audit results in the audit report do not match with each other;
- (7) The wrong document number used in the audit basis in audit report;
- (8) The wrong serial number of the content in the audit report or the preparation instructions, and the wrong serial number of the excel sheet of the settlement statement;
- (9) The amount on the settlement cover of the audit report does not match the final settlement sheet, or the amount in the final settlement sheet does not match the amount in the attached settlement statement;

Secondly, errors in fee collection, mainly in setting categories of the results.

- (1) Errors in the fee setting conditions (for example, the first type of project is wrongly set as the second type of project);
- (2) Errors in the policy document setting (such as labor fee adjustment document, security fee adjustment document, and regulation fee adjustment document);
- (3) Errors in implementing the tax rate file.

Thirdly, errors in the calculation of measure fees, mainly caused by inaccurate understanding of the calculation of measure fees.

- (1) The construction increase fee in winter and rainy season is not calculated according to regulations;
- (2) Errors in the calculation of the unit price measure fee base;
- (3) The settlement audit project did not calculate the measure fee in accordance with the contract.

Fourthly, errors in the entity project, mainly in the calculation of the quantity, pricing and other problems.

- (1) The list quantity does not correspond to the quota quantity;
- (2) The list or quota unit is incorrect;
- (3) The list code is wrong (for example, the number of digits in the list code is incorrect) or the borrowed list item is wrong;
- (4) Missing items in the list;
- (5) The incomplete or incorrect project feature description;
- (6) Errors in the construction quantity;

- (7) In the unit project, the projects between the civil engineering and the mechanical and electrical, or the mechanical and electrical unit project are repeatedly counted or the count does not correspond;
- (8) Errors in mechanical application of quota (such as repeated and missing application, inconsistent specifications, errors in borrowing);
- (9) Errors in calculating price of materials and equipment (such as unit and the price);
- (10) The specifications described in the list do not match the specifications of the main materials of the quota;
- (11) The provisional amount or provisional estimated value in the settlement item not deducted;
- (12) In a single project, the inconsistent prices of the same materials, equipment, and labor of each unit project (except for settlement projects based on different periods of settlement);
- (13) The unreasonable cost of the visa change claim, and the cost of settlement not fully understood.

In addition to the above problems, there are other types of problems, requiring us to strengthen the sense of responsibility in the process of undertaking business. It is necessary to verify and review the materials and data we deal with, and try our best to reduce our own errors, and reduce losses for the entrusting party.

#### **4. Precautions in issuing results**

If the description is not clear in preparing the list, when the bidder quotes and bid according to the bill of quantities, if the bidder finds errors in the description, an unbalanced quotation will be generated when pricing, or submitting visas or changes purposefully for certain list items in the future implementation process, causing the owner to suffer unnecessary losses. When preparing the settlement, if the basis for the results of the audit is not clear, the description of the audit report is incomplete, and the pricing does not meet the contract requirements, the content of the results document will be not rigorous. Errors in the third-party review will affect the trustee's reputation. In view of the above reasons, the author has summarized a few points for attention:

First, carefully review and make clear of the drawings in the first time: carefully study the drawing design instructions before preparing the bill of quantities and tender control price. The civil engineering department shall have a basic understanding of the practices of each part and the selected atlas, and the installation project department shall learn the general situation of each system and the materials and practices of each system, so as to understand the comprehensive description of project characteristics when preparing the bill of quantities.

Second, when the characteristics of list items are not clear: the characteristics of the list items, the calculation rules of the construction quantity, and the content of the project in the list pricing specifications must be clearly mastered, especially the item characteristics shall be detailed and complete. If the drawing is not clear, but the project characteristics must be described clearly, the solution is that first ask the client to answer the question, the description shall be performed in accordance with the answer to the question. If not answered, choose a common practice by yourself, and then describe in the preparation instructions. When borrowing lists, it is best not to manually modify the project name, the real name shall be added in the project characteristics.

Third, carefully prepare the bill of quantities and the description of tendering control price: the preparation of the description is important as an integral part of the results, especially the final summary and illustration by project leader should not be a formality. It is a supplement and improvement for the result. The preparation description is generally divided into project overview, preparation basis, and other descriptions. In particular, the content of other descriptions should be filled in according to the actual situation of the project, such as the calculation basis of labor costs and material costs when preparing the tendering control price. The material price collected according to the cost information or the market inquiry (if there is market inquiry, it is better to keep the inquiry record), which document shall be implemented for labor costs, and which document shall be implemented for safety and civilized measures shall be stated clearly. For the unclear drawing, the method of calculating should be stated if calculated on their own. If there is a provisional amount, the provisional estimate should be clearly stated in the description. The audit report of the settlement audit project should describe the relevant content based on the content of the "Settlement Preparation and Review Regulations in Construction Project" (CECA/GC 3-2010).

Fourth, process documents shall be recorded: in the process of preparing the construction quantity and tendering control price, the entrusting party or the designer's Q&A documents, correspondence, meeting minutes, etc. are best included in the issued tendering control price results for future reference and at the same time a record of the process file.

Fifth, strongly review and strengthen self-inspection: after preparing the bill of quantities and tendering control price, the completed work will be first checked. The next step is to check the corresponding checklists and quotas of the physical projects one by one (especially check whether the list quantity does not correspond to the quota amount, the quota is applied incorrectly or there are repeated items), the total price measure item is verified (especially whether the construction increase fee in the winter rainy season should be fully calculated), and then the unit price measure item, safety and civilized measures and fees, and taxes are verified. Then handle these over to the project manager and higher-level departments for quality review, so that errors are minimized in each level of control.

Sixth, review first and start after obtaining the settlement documents: first review the completeness of the settlement documents, and conduct settlement in strict accordance with the adjustment clauses in the construction contract. For meeting minutes, price approvals, and visa changes that affect the cost, pay attention to the completeness and validity of signature and stamping, and the next step can be performed after the information is complete.

Seventh, the scope of settlement shall be clearly defined: the scope of settlement should be clear when reviewing settlement. Communicate with the client to confirm in the early stage, and it is best to form a written document to explain the entrusted content in detail, and to sort out the settlement content of the entire project, so as to realize a overall control over the scope and time of settlement.

Precautions for settlement of fixed total price contracts: people generally encounter three types of settlement contracts: adjustable-price contract, fixed unit price contract, and fixed total price contracts. These three categories are often encountered, and the types of contracts for other special circumstances are not explained. The issues for fixed total price contracts that need to be paid attention to will be discussed in this paper, in stead of adjustable price contracts and fixed unit price contract settlement. For fixed total price contracts, the review focuses on the actual construction scope, project negotiation visas, and design changes. First, check the budget content against the contract price, whether all the projects have been implemented (go to the site to investigate, or there is an explanation or report that the project has been implemented in accordance with the scope of the contract), and then verify the content of the visa change item by item to perform calculation in volume and price. For the quantity, if the quantity is directly described on the visa, it is best to have the relevant personnel of the engineering department sign words like "the quantity is true, or the quantity is confirmed". If the quantity is not specially confirmed, it is recommended to check the scope and content to verify the quantity. The relevant engineer of the engineering department of the owner or professional supervision engineer should confirm the content and scope of the visa change. The responsibility as the auditor should be to calculate the quantity and price of the confirmed scope and content.

Finally, the settlement result shall be complete: a complete settlement result generally includes the settlement audit report, the cover of the settlement statement, the details of the settlement statement, and other necessary settlement-related materials. For individual service types or those that cannot be expressed in the content of the project (such as nursing fees, compensation fees, loss fees and interface fees), the settlement may not be attached to the settlement statement, however, the settlement of other projects generally covers the above settlement content before it can be called a complete settlement result.

## 5. Conclusion

In addition to the items listed above, there are many other issues that we need to pay attention to. It is necessary to strengthen the learning, improve technology, understand and memorize commonly used pricing norms and rules, and master in time the issued documents by government and related cost management departments, and learn the construction methods and installation techniques of new materials and new equipment to avoid subjective errors.

Part of the content is described because of the limited space, and the inadequacies are inevitable, so any correction is welcomed. To sum up, whether it is to prepare a bill of quantities, tendering control prices or project settlement audits, as long as we have principles and a bottom line, and strictly implement the list pricing specifications, pricing rules, and laws, regulations and rules issued by

relevant departments, we will definitely be able to make a qualified cost result.

### **References**

[1] Hu Yong, Guo Jianmiao, Liu Zhiwei (Editor-in-chief), Chen Zhipeng, Chen Guojiang, Zhang Fengrong (deputy editor-in-chief). *Engineering Consulting Theory and Practice Research Series: The Theory and Operation Guide of Whole Process Construction Consulting*. China Electric Power Press, 2019.

[2] Song Rui (Editor-in-chief), Guo Jianmiao, Pang Hongjie, Chen Guojiang (deputy editor-in-chief). *Engineering Consulting Theory and Practice Research Series: The Theory and Operation Guide of Construction Project Investment Control*. China Electric Power Press, 2019.