Study on Quality Problems and Countermeasures in Compilation of Bills of Quantities

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Abstract. This paper used the method of documentary research to put forward main problems in compilation of Bills of Quantities (BQ) through three stages, including preparation before compiling, compilation and review. And then, classified and rearranged these problems, analyzed the reason. At last, this paper put forward countermeasures and suggestions, including promoting design quality, collecting sufficient data before compiling, improving professional levels of the compilers to ensure complete, accurate and rigorous of the BQ, implementing the "three-tier review" system and post-quality assessment system to guarantee quality control effect of the BQ etc. The research results offer thoughts and methods for BQ quality controlling.

Introduction

BQ is the detailed list of names and their corresponding quantities of the sub-part construction projects, measure projects, other projects, fees and taxes. It is the basis of preparing the base price of bidding, the tender offer, project settlement and project claim [1]. Complete and accurate BQ is the guarantee and foundation for quantity pricing, but many problems appear in the compilation process made the BQ not so reasonable which not only cannot control the project costeffectively, but also does not reflect the advantage of BQ. In this paper, through three stages of preparation, compilation and review, main questions in compiling BQ are studied, controlling countermeasures is brought up to improve the quality of compiling BQ. Compiling flowchart of BQ is shown in Figure 1.

Figure 1. Compiling flowchart of BQ.
Main Problems in Compilation of Bills of Quantities

BQ should be compiled by the employer, which is the responsibility entrusted by the “Code of bills of quantities and valuation for construction works”. If the employer fails to compile the BQ for their own sake, they can entrust the BQ compiling to engineering cost consulting units with corresponding qualifications. Due to various reasons, quality of BQ compiled by employer or the consulting unit is always not very high. Using the method of documentary research, this paper found out main quality problems, classified and analyzed the problems. See Table 1 for Statistical Table of BQ Compiling Problems.

### Table 1. Statistical Table of BQ Compiling Problems.

<table>
<thead>
<tr>
<th>No</th>
<th>Quality Problem</th>
<th>Frequency</th>
<th>Compiling Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>quality of design drawing</td>
<td>19</td>
<td>Preparing stage</td>
</tr>
<tr>
<td>2</td>
<td>inadequate depth of design drawing</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>inadequate design depth of construction organization</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>inadequate site survey</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>wrong and missing items of BQ</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>inaccurate item characterization description</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>inaccuracy of project quantity calculation</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>incomplete BQ compiling content</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>low level of BQ compiler</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>inconsistency of calculation rules</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>BQ compiling methods</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>governing system absence of the compiling unit</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>implemented review system</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>technical level and responsibility of BQ compiling units</td>
<td>9</td>
<td>Revising stage</td>
</tr>
<tr>
<td>15</td>
<td>influence lacking of supervisory authorities</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

### Preparing Stage

Before compiling BQ, preparations such as familiar with design drawings and related information, knowing about the construction site situation, mastering construction organization design, knowing clearly the source of main materials and equipments and collecting corresponding supplementary documents and information should be carried out.

### The depth and quality of design drawings

Design drawings are important basis for compiling BQ, correctness and completeness of design drawings directly affects the quality of the compiling of BQ. If inadequate depth and accuracy or many flaws exist in designs, item listing will not be comprehensively and standard, and describing project characteristics and calculating quantities accurately become impossible, which will then make the quality control of the compiling very difficult, controversies and disputes then appear [2]. The capability difference of designers which results in the difference of the design drawings is the main reason; another is the lacking of communication between the owner and the design unit which affects the accuracy and depth of design drawings.

### Inadequate design depth of construction organization

Construction design documents are technical and economic documents which can guide the proposed project during construction preparation and construction. Content of construction design includes: construction project programming, construction sequence and construction methods, which makes the compiling and accurate calculation of BQ easy, especially for measure projects. The main reasons result in insufficient depth of construction design are concluded as:(1) inadequate site survey
and limited understanding of site situation, (2) one-sided knowledge structure of construction designer.

**Common problems during the compilation of BQ**

Compiling content of BQ includes: defining items of BQ, describing features of the items, calculating quantities, fees and taxes.

**Wrong items and missing items of BQ**

Wrong items and missing items of BQ refers to items that cannot reflect the content of work well and disconnected from design drawings, which may lead to an increasing project alteration, even claim event and delaying of the construction period.

**Incomplete and inaccurate item characterization description**

The extent of completion and accuracy of item characterization description plays an important role in the BQ compiling, which meanwhile reflects the ability and the level of BQ compiler [3]. If the project BQ’s item characterization description is not accurate, the bidder will not be able to accurately understand the constituent elements of BQ, which may lead to:

1. Unreasonable integrated unit price;
2. Difficulty in evaluating bid price-marks reasonably when evaluating bids;
3. Controversy between contracting parties when settlement is carried out.

**Inaccuracy of project quantity calculation**

If BQ calculation is not accurate, the bidder can win the bid with a false low price through unbalanced bid and other means, and then they can profit from the project, even construction claims were proposed. For example, the bidder didn’t question the extra calculated part of BQ strategically, they offered a low price for this part and a high price for the short-counted part, when the quantity was adjusted to the right lever, and items with low price decreased and high price rose, the tender then get more money which may be saved for the tendered.

**Problems in the review process of BQ**

BQ review job is a comprehensive review of the project document number, the project name, unit of measure, description of project characterization, engineering calculation formula for the project quantity, calculation result, accuracy of figures and dates.

**Implemented review system**

When BQ was finished, review system will work, yet the system didn’t always run well, because of formalistic review which cannot find out the real errors or the errors that wasn’t corrected in time. Generally speaking, it was caused by two aspects as: one is the limit of levels and experiences of the reviewer, and the lacking of responsibility, another is no distinct division among the reviewers of different level, and the lacking of communication among them.

**Governing system absence of the compiling unit**

Compiling of BQ is usually commissioned to consulting firm with appropriate qualifications. Unsound, unreasonable or ineffective governing system of compiling unit, no effective incentive and restraint mechanisms for assessment and evaluation of employees, meanwhile, employees of consulting firms always worked in the vicinity of their saturation point, no enough time left to the reviewer, all these contributed to the inefficiency of the review system.
Measures to Control the Quality of the BQ Compiling

Strict quality control of design, ample data collection before compiling

Choose excellent designers through a competitive mechanism and define their rights, obligations and responsibilities in the form of contract. Communication for improving the design quality should be in time when the design drawing is not so detailed as required. Compilers shall go to the site to conduct field surveys and grasp the situation and the characteristics of the project; otherwise underground pipelines, structures etc will be neglected easily, which was called item omission and will affect the project during construction. Item omission usually happened in the measure project of BQ [4].

Meanwhile, with the appearance of new materials, new processes, new technologies in the field of construction, newly-added items for appendix of "code of bills of quantities and valuation for construction works" (GB50500-2013) should be found out, and corresponding consumption quota should be modified, supplemented and adjusted.

In addition, basic data such as consumption quota, design of construction organization, construction technical measures, material price, Engineering cost documents issued by government departments should be collected.

Strengthen staffing quality training to ensure the BQ complete, accurate and rigorous

Compiling of BQ required more and higher about the knowledge structure and professional and technical levels of compilers. It covers many aspects and links, only those who are familiar with engineering techniques, and who can understand economic management system, grasp policies and regulations, “Master Code of Bills of Quantities and Valuation for Construction Works” (GB50500-2013), and based on "norms" of the contract and the terms of integration, carefully analyze the composition and influencing factors of the proposed project based on the Code and compromised contract terms, practice deeply in engineering can compile high quality BQ. In actual work, we can do from the following aspects:

Firstly, members of BOP compiling unit should be employees with relevant specialty or cost engineers with vocational qualification, which can promise accuracy and scientificness of BQ.

Secondly, engineering cost consulting agency and engineering cost personnel should transform their ideas, participate in training of code studying and BQ compiling, familiar with and grasp the quintessence and operation tips of codes for BQ as soon as possible, fully familiar with factors that affect the cost such as the construct conditions of the bidding project [5].

To be sure integrity, accuracy and rigorous of the BQ, attention should be paid as followed when compiling:

(1) Design drawing should be studied thoroughly when listing items, meanwhile, "Code of bills of quantities and valuation for construction works" (GB50500-2013) should be considered, so that no omissions, wrong items, no recount appeared;

(2) Combined with the construction drawings and requirements of related cost pricing, characteristic of the project should reflect its' physical characteristics and engineering practices, taking full advantage of industry rules and common practices, reasonably avoiding and sharing project risk to protect the legitimate interests of the tendered should also be considered.

(3) Understand and grasp calculation rules of the Code, calculated the quantity precisely combined with construction drawings [6].

Implementation of the "three-tier review", post-quality assessment system and guaranteeing quality control effect of the BQ

When BQ is finished, in addition to self-inspection and repeated checking carried out by the compiler referred to design drawings, a "three-tier" review system of “project manager –team leader of the compilers-reviewer” is proposed to be implemented under permitted conditions, the BQ
compiling unit should develop detailed and feasible quality control system or rules for themselves to avoid errors to the maximum limit, so that quality of BQ is ensured.

Summary

BQ of high quality can play a significant role in project bidding, project payment and audit process of settlement. Therefore, either the owner or the compiling unit must put a high value on the BQ compiling, fully aware of the close relation between BQ compiling quality and the project cost, and constantly improve the quality of the compiling of BQ, avoid disputes in the final settlement or claims, lay the foundation for the pricing of BQ and provide protection for the project cost management and control.

References

[4] WU Yi; Tender BOQ preparation of quality projects to explore the relationship between costs [J]; Value Engineering; 2014.