

# Preparation of Tender for Building Conservation Work: Current Practices in Malaysia

Q.Y. Lee, Y.M. Lim

**Abstract**—Building conservation work generally involves complex and non-standard work different from new building construction processes. In preparing tenders for building conservation projects, therefore, the quantity surveyor must carefully consider the specificity of non-standard items and demarcate the scope of unique conservation work. While the quantity surveyor must appreciate the full range of works to prepare a good tender document, he typically manages many unfamiliar elements, including practical construction methods, restoration techniques and work sequences. Only by fulfilling the demanding requirements of building conservation work can the quantity surveyor enhance his professionalism an area of growing cultural value and economic importance. By discussing several issues crucial to tender preparations for building conservation projects in Malaysia, this paper seeks a deeper understanding of how quantity surveying can better standardize tender preparation work and more successfully manage building conservation processes.

**Keywords**—Conservation Works, Quantity Surveying Practice, Tender Preparation, Malaysia

## I. INTRODUCTION

NOWADAYS, the professional quantity surveyor (QS) is involved in many sub-fields other than construction, such as oil and gas, manufacturing, petro-chemical, aeronautical, mining, transportation, shipping, and civil works. This diversification arose as the profession adapted to changes in industry requirements. Even in the field of construction, the QS often finds sub-sectors such as building conservation works to be new areas of work due to the different methods and processes involved in the processes of conservation and restoration. As such, more research is needed in this area to explore the ways in which QSs may increase their knowledge, skill and professionalism in administering conservation projects. This need has become urgent in Malaysia where the value of conserving heritage buildings has been enhanced since Malacca and George Town were listed on 7 July 2008 as historical cities under UNESCO's World Heritage Sites.

Conservation work is socially beneficial for various reasons. Conservation strengthens a sense of identity and association with aspects of national history and development [2], [12]. Besides, it prolongs the life of cultural property and extends the duration of its utilisation [9], making it possible for a city to stay in touch with its past and in tune with the future. In short, conservation work is readily justified by its resulting wide range of social, architectural, cultural and economic benefits.

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Within the construction industry, however, conservation projects are perceived to be significantly riskier than new building construction [20] mostly because a building conservation project typically demands a non-standard scope of works and a different approach [16] as well as special project management experience. Hence, it is insufficient for the QS to prepare tender documents for conservation work by merely using standard documents for new building works that cannot reflect actual needs and special processes in conservation work. Anecdotal evidence indicates that this is currently happening in the industry in Malaysia with the result that ill-prepared documents have caused cost overruns and contractual disputes during post-contract stages. By evaluating the merits of the methods that Malaysian QSs have used in conservation work, this study seeks to establish various pertinent criteria and aspects of the special knowledge that QSs require to improve their skills in tender preparation for such work.

## II. LITERATURE REVIEW

### A. Specialisation in Conservation Work

To a large extent, the scope of construction work will be the same for both new building and conservation work. However, the QS, no less than other professionals involved, should develop an in-depth knowledge of heritage buildings, special restoration techniques and requirements, and technical specifications. For example, special preliminary tests may have to be conducted to obtain information on the usage and details of original materials prior to the commencement of construction. Such tests are not required in new building works so that even an experienced QS may not know when and how to include these tests in the conservation work tender documents.

In fact, the process of conservation should ideally be preceded by multidisciplinary studies, including archaeology, which address relevant factors such as the need for excavation, or the potential disturbance of the building fabric, and aspects of history, architecture, building and engineering techniques, sociology and economics [11]. However, the ideal can only be realized if a project employs conservation consultants as part of the construction team. In Malaysia, many private owners carry out improper conservation practices because of the absence of standard specifications for repairing historical buildings [6]. Indeed, identifying problems from appraisal reports and building survey inspection in reconnaissance survey is the first of various special works required for building conservation. The process should continue with the identification of building defects from a dilapidation survey, the documentation of all works using the Historical Architectural Building Survey (HABS) and further scientific

studies and laboratory tests [7], [10].

### *i. Reconnaissance Survey*

A reconnaissance survey, to be conducted before a dilapidation survey, involves a general investigation of the building interior and exterior to gauge the nature and extent of building problems [10]. It would save much time and field work to study significant historical resources, extant building plans and photographs as part of a reconnaissance survey.

### *ii. Dilapidation Survey*

A dilapidation survey consists of an inspection of the existing structural conditions of Buildings [13] to develop an in-depth analysis of building defects, their probable causes, and the proposed methods and techniques of building conservation [7], [9]. In a dilapidation survey, building floor plans are divided into several zones (in alphabetical order) for cross-referencing and a systematic

TABLE I  
 COMMON HERITAGE BUILDING DEFECTS IN MALAYSIA

Item	Types of Building Defects
1	Leaking roof
2	Termite attack
3	Water or dampness penetration through walls
4	Fungal stains and harmful growths
5	Unstable foundations
6	Rising damp and salt contamination
7	Broken floorboards
8	Crumbing plasters
9	Erosion of mortar joints
10	Peeling paint
11	Poor drainage system and defective rainwater goods
12	Structural and wall cracks
13	Cracks in walls and leaning walls
14	Poor installation of air-conditioning units
15	Broken ornamental elements and balustrade

Sources: [3], [4], [6], [8], [9]

pictorial documentation of building conditions and defects [8].

Table I lists building defects that are commonly found in historical buildings in Malaysia. All such building defects may be recorded systematically in pictorial documentation, plans and elevations [7] which the QS may use to perform the quantity take-off for a bill of quantities (BQ).



Termite infestation of ceiling Joist



Dampness problem

[Courtesy of Ghafar: <http://www.hbp.usm.my/conservation/>]

### *iii. System of Recording and Documentation*

The Historical Architectural Building Survey (HABS) is a systematic method of recording and documentation introduced by the Museum and Antiquity Department of Malaysia. The HABS, which has three major stages, is

conducted throughout the project duration to record, photograph and document the conditions of the heritage building before, during and after conservation [7]. It is necessary to record all information on building conditions, conservation techniques, grid locations and photographs in a standardized and systematic format before storing it in a database for future reference and final documentation. A database of such information will be of great help in tender preparation [10] as the QS would be able to determine the types of work involved and incorporate clearer, detailed specifications and descriptions in the tender documents.

### *iv. Scientific Studies and Laboratory Tests*

A series of scientific studies and laboratory tests may be necessary to identify building defects and discover the best ways and the most appropriate techniques, methods and materials to rectify the defects. The results from the scientific studies should serve as inputs in decision-making, particularly to clarify the causes of deterioration, propose ways to control them, select building materials, and determine appropriate methods and techniques of repair [8], [10], [17].

Laboratory tests may also be performed on building materials to determine the levels of salt content, the components of building materials, the compressive strength of new wall plaster etc. [8], [10]. Using reports of scientific studies and laboratory tests, the QS will know the types of materials to be used and accordingly prepare relevant specifications and obtain (tender pricing) quotations from suppliers.

Building conservation practices which incorporate the specific works mentioned above lie outside the scope of work for new building construction. Yet, those practices are needed to preserve the authentic structure and fabric of the building, thus safeguarding its historical and architectural significance and preparing it for future cyclical maintenance programmes. These special practices of building conservation, as noted by Ahmad and Rahman [10], offer major guidelines and basic references to QSs in the preparation of project briefs, building specifications, BQ and tender documents.

In any case, an inadequate grasp of the extent and nature of conservation building works would not only lead to an inappropriate approach and inaccurate scope of repair work but also result in substantial cost implications when the QS performs pricing work. To prepare an accurate project budget, therefore, the QS should understand and allow for a special scope of conservation works.

### *B. The QS's Responsibilities at the Tender Stage*

As with new building projects, the QS has roles and responsibilities from the early stage of conservation works until the end of construction. To prepare an initial budget at the preliminary stage, the QS must be alert to possibilities or uncertainties in a project and use his or her experience to assess the full scope of conservation. The QS should clearly explain to and advise the building owner on the build-up of estimates, a proposed cash-flow and contract procedures. In the next stage, the QS will prepare tender documents which consist of BQ. During the construction phase, the QS should maintain a strict control of costs against the budget and

verify work performance at monthly intervals. During the whole process, the QS should focus on cost-related matters, including maintaining cost budgets and cost control.

Although the QS plays an important role in all stages of work, this paper focuses on the process of preparing tender documents and BQ. At this critical stage, the QS's level of input is highest and the documents he or she produces will have an impact on the awarded contract sum. The QS's job scope in tender preparation stage can be summarised thus:

1. Take into account all relevant factors and information.
2. Prepare BQ which measure the amounts of works to be done and specify their quality (usually by reference to Standards and Codes of Practices applicable to new construction).
3. Recommend the most suitable form of contract.
4. Provide tender documents based on design drawings and specifications.
5. Check, evaluate and recommend award of tenders.

The construction industry has expressed concerns over the non-standardization of tender documents for conservation projects. For example, non-standardization of preliminaries bills and BQ can cause considerable confusion during contract administration. Standardizing such documents will ensure higher degrees of compatibility, interoperability, safety, replicability, and quality. It will reduce confusion by making it easier for the different construction team members to understand the document contents.

### C. Tender Preparation Processes

Tender documents, including general drawings, construction drawings, construction specifications, BQ, contract format, etc., must provide a contractor with clear and accurate information of the project requirements. Hence, tender preparation for building conservation work should contain all up-to-date information on materials, labor and equipment. In addition, the documents should make known the conditions of buildings, reports of site investigations and specific documents such as reports from the dilapidation survey, and other scientific and technical surveys [10], [18] – all this being information that has been purposely obtained for preparing project briefs, building specifications and BQ.

Adequate and accurate drawings and specifications that build up a full picture of the project are indispensable to the QS for performing quantity take-off to determine the types and amounts of work required [18], [22], [23], and, ultimately, to manage costs well. After considering the units of measure and work items, the QS will conduct quantity takeoffs that require knowledge and expertise based on drawings and a complete set of project documents [16]. The quantity take-off being a detailed, itemised list of required materials, its accuracy requires a strong understanding of the intricacies of work related to different disciplines important to a project. Moreover, the accuracy and various methods of take-off will rely on the QS's previous estimating and field experience [24] especially for complex conservation work that comprises elements of removal, repair and replacement. The total quantities of measured works are usually arranged or billed against each work item

in the order they are to be used in the construction of the building [15], [24].

Uncertainties associated with conservation work make it unsuitable, even ill-advised, to undertake such work on the traditional basis of lump sum competitive tenders for the whole of the work. Yet the use of standard (new construction) form of contracts is still prevalent in Malaysia for building conservation work. Indeed, contract documentation for building conservation should convey critical information as clearly as possible and should be so structured as to preclude amendments to standard forms [14].

The choice of an appropriate form of contract should mainly be guided by project complexity, sufficiency of detail, uncertainty of items, etc. In principle, a contract with firm BQ can be applied with sufficient information and detail. In fact, Davey [21] recommended that BQ should only be dispensed with for smaller and less complex conservation projects. Even for the smaller projects, there is often considerable advantage in preparing bills because of the greater financial control available to the client.

If a project faces a high level of uncertainty, however, a contract without BQ would be used. In the absence of BQ, full and comprehensive specifications will constitute much more important documents that supply the descriptions of all materials to be used, the standards of workmanship and preliminaries bills [21]. In addition, a schedule of rates for principal items should be provided after the acceptance of tender [26]. The QS should consider these key points when preparing the tender document for conservation works.

### D. Differences Between Building Conservation and New Construction Practices

The method and sequence of conservation work are totally different from new construction work [25]. Table II compares construction elements between conservation work and new construction derived from the study of five contract documents. For the new buildings, the construction

TABLE II  
 DIFFERENT CONSTRUCTION ELEMENTS BETWEEN BUILDING CONSERVATION  
 WORK AND NEW CONSTRUCTION

Building Conservation Work		New Construction	
1	Demolition	1	Work Below Lowest Floor Finishes
2	Roof	2	Frame and Upper Floor
3	Wall/Column and Partition	3	Roof Structure
4	Doors and Windows	4	Staircase Structure
5	Flooring	5	Roof Covering and Finishes
6	Wall Finishes	6	Staircase Finishes and Balustrade
7	Floor Finishes	7	External Wall
8	Ceiling Finishes	8	Internal Wall and Partitions
9	Staircase	9	Doors, Ironmongeries and Windows
10	Sanitary and Plumbing	10	Internal Wall, Floor and Ceiling finishes
11	Sanitary Wares and Fittings	11	External Finishes
		12	Internal Plumbing and Sanitary
		13	Sanitary Wares and Fittings
		14	Sundries

elements are standardised, and construction proceeds from the base or foundation of the site to the top of buildings.

However, there is no standardized process for building conservation elements. Demolition and roof-related work are almost always found at the beginning of the BQ. Unlike in new construction, too, preliminary works for building conservation typically need the cleaning of building sites, and the removal of dirt, and fungal and harmful growth on walls and columns. Moreover, it is essential to provide adequate if temporary roof covering that protects the exterior and interior architectural elements and the timber structural elements from inclement weather. Building conservation practices thus begin at the roof top, continue with wall rebuilding or repairing, and subsequently proceed to the structure. This progression allows the lower elements to be repaired and removed without affecting the stability of existing structure.

Construction techniques in conservation work are likewise very different; they consist of removing, restoring or replacing decayed items, reconstructing damaged items, laying and fixing new elements, and finally re-plastering and repainting the surface [5], [25]. As such, problems may arise if the QS neither understands the construction process nor foresees the hidden work in conservation project. Thus, the QS must make every attempt to identify and determine hidden costs in order to provide a comprehensive and accurate estimate of the entire cost of a conservation project. Only then can the QS truly prepare tender documents that provide potential contractors with clear, accurate and full information of project requirements.

### III. METHODOLOGY

This study focuses mainly on the method the QS uses to prepare tender documents and pricing for conservation work. In conducting this study, the authors collected data through a combination of questionnaire survey and semi-structured interviews. At the beginning of the research, preliminary informal discussions were conducted to gain a general view of conservation work. These discussions were needed due to insufficient information on the QS's practices in this area. The interviewees in the informal, relatively free ranging discussions were an experienced QS and a building conservationist.

Subsequently, and upon the completion of the survey questionnaire, the authors conducted a pilot study to test the suitability of the questionnaire according to feedback from industry participants. After some amendments were made to the questionnaire, copies of the latter were posted to consultant QS firms and contracting firms. Both QS firms and contracting firms was targeted because of their participation in tendering practices. A total of 338 sets of questionnaires were sent out all over Malaysia. From those, 70 sets were returned, giving a 21 per cent response rate which lay within the 20–30 per cent range deemed to be the norm for postal questionnaires in the construction industry (Akintoye, 2000).

Of the 70 respondents, 24 affirmed that they were involved in conservation work. Of these 24 respondents, 13 (or 54 per cent) were consultant QS firms and 11 (46 per cent) were contracting firms.

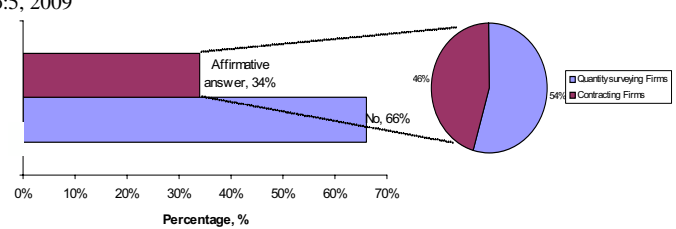


Fig. 1: Postal Survey Response Rates

To obtain an in-depth understanding of current practices, the authors held semi-structured interviews with five consultant QS and five contractors, all of whom had participated in the postal questionnaire phase of this study. And to obtain information on the skills needed by QS in conservation work, separate semi-structured interviews were carried out with five conservation experts (made up of conservation architects and conservationists).

### IV. ANALYSIS AND RESULTS

In current practice, a QS normally transfers his expertise in new building to conservation works. This method, although acceptable, tends to overlook the highly specialised works that are not found in new construction but are critical to conservation works. The risk is clear: tender documents that lack critical information on highly specialised works can create confusion and even cost overruns. To improve the tendering process for conservation works, therefore, it is essential to review the current industry practices during this stage of work.

#### A. Additional Tender Preparation Processes

The survey findings indicate that it would be advisable to add some processes during tender preparation for building conservation works. The additional processes are:

1. Obtaining a full understanding of the HABS and dilapidation survey reports
2. Attending site briefing
3. Conducting site visits
4. Taking photographs to record measurement details
5. Making site measurements and observations.

These additional processes should be included to ensure the completeness and adequacy of tender documents for conservation works especially in providing accurate quantities. From the viewpoint of the industry, site briefings and site visits are very important to obtain information on the special requirements of the conservation projects for which tenders are made. In addition, site visits enable the QS to witness first hand the required works, measure quantities and write descriptions accurately. Actual building conditions can be closely noted and compared to drawings in case of discrepancies. The above work processes, relevant to tender preparation, are essential during tender pricing in order to produce an accurate tender amount.

### B. Application of Specific Information to Conservation Work

For new building works, architectural, civil and structural (C&S), mechanical and engineering (M&E) drawings are essential to making a quantity take-off. The survey shows that architectural, C&S and M&E drawings are likewise essential to quantity take-off for conservation projects. In addition, however, the HABS, dilapidation survey and reconnaissance survey documents are unique to conservation works. Yet, the survey results showed that these special conservation documents are not commonly used to measure quantities for tender preparation. There is also a difference in viewpoint between the consultant QS and contractors regarding the use of HABS in quantity take-off. Among the contractor respondents, 64 per cent considered the HABS to be necessary but only 39 per cent of the consultant QS respondents believed so. But both QS and contractors felt that the reconnaissance survey was unnecessary for quantity take-off.

### C. Agreement between Client and Contractor

Since there is no specific contract form for conservation contract, the practice in the industry is to use either the Persatuan Akitik Malaysia (PAM, or Malaysian Institute of Architects) Standard Form of Building Contract or the Public Works Department (PWD) Form of Contract. As in new building works, PAM Form of Contract is used for private projects while the PWD Form of Contract is used for government projects. However, the survey found one additional form of contract that is used for conservation projects, namely, an *ad hoc* contract prepared by the client's lawyer specifically for the proposed conservation project only.

To the question, "Is there a need to draft a new standard form of contract specifically for building conservation works?", the responses recommended that a new standard form of contract should be drafted specifically for conservation works because certain clauses in the standard forms of contract are unsuitable and do not take into account the special nature and characteristics of conservation works.

The survey also revealed additional considerations in choosing the type of contract – sufficiency of details, uncertainty of items and time limit. The survey shows that a firm BQ is the most common type of contract. This may be due to the considerable advantage that the client derives from this type of contract for financial control [21]. But this type of contract will only be used if the project information and details are sufficient.

If the project has a high level of uncertainty and many items are pending confirmation, a contract without BQ is preferred. In that case, comprehensive specification becomes a much more important document which will apply to the description of all materials, standards of workmanship and preliminaries [21]. Finally, the schedule of rates for principal items will be provided after the acceptance of a tender offer [26].

### D. Format of BQ

The relative suitability of six BQ formats for conservation works was tested in the survey. The results show that all BQ formats used in new building projects are applicable to

conservation works. The locational and elemental formats are the two most popular BQ formats used in a firm BQ contract. Other BQ formats such as operational, annotated and trade bills are less commonly used by the industry for conservation works.

In new building projects, items in the BQ are rarely arranged by location but mostly by element. The elements start from works below ground floor to the roof. Reviewing five conservation BQ, the study found that a combination of locational and elemental BQ is often used for conservation projects. For a big conservation project, the work items are usually arranged according to location whether by room, zone, block or grid. Following that, the items are arranged according to building elements starting from the roof downwards. Most interviewees felt that the conventional BQ format might not be suitable for conservation projects. They suggested that some modification is needed because of the different nature of works compared to new building works.

### E. Items in Preliminaries Bills

In general, preliminaries bills contain adequate particulars of the project parties, location, general descriptions of works, nominated sub-contractors for major contracts, form of contract and amendments and insertions, contract period, approximate date for dispatch of tender documents, tender period, liquidated damages, bond and any special conditions [19]. Comments from the pilot study suggested that "different preliminaries items for conservation work" should be indicated. The survey showed that nine important items (Table III) had to be included as the preliminaries items in the BQ for conservation works.

In practice, most QS prepare the preliminaries for conservation work by adapting bills from new building works. This practice is unacceptable due to the different types of construction methods and processes in conservation work. Presently, only a few QS will add some special items into preliminaries bills upon the advice of conservationists and architects.

Several practices are commonly applied in preparing preliminary bills. The QS who is not aware of these special items will incorporate some of them in bills of provisional sums; otherwise these special items would be missing from the preparation of tender document. In such a situation, the contractors will spread the costs either in BQ or price similar work items into the preliminaries bills.

TABLE III  
 ADDITIONAL PRELIMINARIES ITEMS NEEDED TO BE INCLUDED IN BUILDING CONSERVATION WORKS

Preliminaries Items	
1	Keeping as built records with slides, videos, pictures etc
2	Detailed investigation of building/site and its setting
3	Dilapidation and reconnaissance survey
4	Care and maintenance costs
5	Historical Architectural Building Surveys (HABS)
6	Diagnosis of defects reports
7	Laboratory test and scientific studies
8	Employment of conservation architect in the contractor's team
9	Application of recognized charters, standards and guidelines

## V. CONCLUSIONS

This study reviews QS practices in tender preparation in Malaysian building conservation work. Its aim is to investigate and evaluate how the QS prepares such tender documents despite the lack of experience and data sources. It concludes that current QS practices need to be improved.

Site visits, site measurements, site briefings and site observations are necessary especially under present conditions of conservation work that lack information, expertise, training and practice. On-site activities are important to produce an accurate quantities take-off and to clarify discrepancies between drawings and actual site information. The study survey shows a low application of specific documents for conservation work, namely, the HABS, dilapidation survey and reconnaissance survey reports. Hence, the QS in Malaysia may be said to occupy a preliminary stage in understanding and managing conservation work.

Finally, detailed investigations are needed to propose new BQ formats, forms of contract and preliminaries bills that are specifically to be used for in building conservation work. For the moment, modifications of new building practices show a need for standardization of methods and guidelines in building conservation work. This is an issue that deserves the careful attention of industry actors and educationists as the conservation of heritage buildings grows in importance and attraction throughout the world. Hence, there is a need for QS to learn and acquire additional knowledge if he/she wants to be involved in this area.

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