

# Barriers to Competitive Tenders in Building Conservation Works

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**Abstract**—Conservation works in Malaysia that is procured by public organisation usually follow the traditional approach where the works are tendered based on Bills of Quantities (BQ). One of the purposes of tendering is to enable the selection of a competent contractor that offers a competitive price. While competency of the contractors are assessed by their technical knowledge, experience and track records, the assessment of pricing will be dependent on the tender amount. However, the issue currently faced by the conservation works sector is the difficulty in assessing the competitiveness and reasonableness of the tender amount due to the high variance between the tenders amount. Thus, this paper discusses the factors that cause difficulty to the tenderers in pricing competitively in a bidding exercise for conservation tenders. Data on tendering is collected from interviews with conservation works contractors to gain in-depth understanding of the barriers faced in pricing tenders of conservation works. Findings from the study lent support to the contention that the variance of tender amount is very high amongst tenderers. The factors identified in the survey are the format of BQ, hidden works, experience and labour and material costs.

**Keywords**—Building Conservation, Malaysia, Bill of Quantities, Tender.

## I. INTRODUCTION

EVERY client would want their building constructed at the lowest price possible and towards this end, tendering is used to obtain a competitive price from a group of contractors. However, when there is high variability among the tenders amount, there will be doubt on the reasonableness and competitiveness of the price. While the client would want to award to the lowest tender but if the variability is too high, there is the risk that the lowest tenderer bids below cost and thus may jeopardise his ability to finish the job later. Although tender variability happens all the time for new build project, it is usually within a consistently acceptable range. The same cannot be said for building conservation project. A document survey was conducted on building conservation tenders in the earlier part of this study to ascertain the variability level of building conservation tenders. Data on tender records for conservation project was obtained from the local authority and the National Heritage Department. In this study, the coefficient of variation (cv) was calculated to obtain the variability level of the 26 tenders that was collected. The

survey found that building conservation tenders recorded a mean cv of 20% as compared to 12% of new build project. The cv for new build project was also calculated from tender data collected for the purpose of this study. When such high variability occurs, it is difficult to determine which tender has the most competitive price. It is difficult for the client to assess the tenders and also would be concern that the lowest tender may be severely underpriced. If that is so then awarding the contract to the lowest tenderer would not be a wise move. However, awarding the contract to a higher tender would be difficult to justify. Therefore, there is a need to identify and understand the causes of such high variance in conservation works tenders.

Reference [17] explains that there are two major variables that may cause variability in the tender amount, one is the cost estimate and the other is the mark-up by the contractor. Although cost consultants in the building industry are able to estimate the cost of a proposed new building within a reasonable range, estimating the costs for building conservation works is not as easy. Conservation works estimate needs a more careful analysis of the scope of works and a different approach from that of conventional estimating [1]. This is because conservation works are conducted within a confined space in an existing building. Not only that, in order to protect the authenticity of the architecture, the works has to be conducted following strict conservation principles and guidelines. As such, conservation costs money, and it is usually believed that repair and maintenance work to old buildings are generally more costly than that of modern buildings, due mainly to the types of construction encountered, labour and material costs [4]. Reference [9] also found that competitive tendering is one of the most difficult management tasks to handle in refurbishment works.

Therefore, this paper discusses the findings of the study conducted to identify the problems faced by contractors in tendering for building conservation projects. It is hoped that with the understanding of the problems, improvements can be suggested which may help to reduce the current high variance in building conservation tenders.

## II. VARIANCE IN BUILDING CONSERVATION TENDERS

The tendering process requires multiple input of information from various sources for the calculation of the tender amount. Reference [3] summarises the tender activities into four main activities of 'decision to tender', 'collection of information', 'preparation of estimate' and 'the tender submission'. Under each main activities, there are further sub-activities, all in totalling 26 sub-activities to be performed

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before the tender is ready for submission. Due to the complicated process of pricing the tender, it is inevitable that there are both external and internal factors that will influence the pricing level of each tender. At the very fundamental, the tender amount consists of the cost estimate of the building plus a margin for overheads and profits [20]. The margin is usually a percentage mark-up to the cost estimate.

The percentage mark-up decided upon by each contractor will be dependent on the firm's mark-up policies. The decision on which mark-up policy to adopt depends on various factors such as bidding strategies [11], workmanship standards [21], profitability, market conditions as well as contract conditions [23].

Other factors influencing variability highlighted in the literature includes cost estimates [7], errors in pricing [18], differences in cost estimates [2], mark-up policies [21], serious and non-serious bids [19], contract type and size [8]. Reference [6] explains that variability in a tender may also be due to the following reasons.

1. Quantities
2. Material cost
3. Method of construction
4. Labour cost and productivity
5. Plant cost and productivity
6. Site conditions
7. Location
8. Escalation factors
9. Contract time
10. Overhead and profit
11. Contingency
12. Cash flow and financing
13. Errors

In the literature or research pertaining to the above, the authors did not differentiate between new build and conservation works. As such, it is assumed that these factors influence the variability of both new build and conservation tenders. Given that the level of variability differs rather substantially between new build and building conservation tenders, there may also be factors other than the above that attribute to the high variance in conservation tenders.

Thus far there is no study done to differentiate the causes of variability between new build and conservation tenders other than the research by [14] on refurbishment works. He found that complaints by contractors focused on the format and variability of tender documents especially on poor work descriptions, obscurity of specification clauses, amendments to Standard Forms of Contract and the Method of Measurement. The same study also found that inadequacies are covered by using "all embracing" risk clauses in the tender documents. This created higher risks and tenderers that perceive the level of risks differently will mark-up differently thus creating a big variance between tenders.

Thus poor document format, poor and incomplete description and insufficient information are problems encountered with the tender documents in refurbishment works. The problem lies in the different sequence of work, the need for specialist work and different specification required

for refurbishment works as compared to new building works. Other than the above, other problems encountered included lack of drawings to guide contractors as well as the extent and problems of the actual works are usually not discovered until site work commences [14]. These factors are limited only to refurbishment type of work due to the different nature of work between new build and refurbishment. Although not all refurbishment works are meant to conserve heritage buildings, the similarities between refurbishment and conservation works may mean that some of the factors identified by [14] could be applicable to conservation works.

While other researchers identified the factors by analyzing tenders only, [14] included a survey on contractors to obtain information regarding tendering of refurbishment works. He found that poor documentation is one of the main reasons leading to variability in refurbishment tenders. In comparison, there are fewer problems in the preparation of tender documents for new build works as the information available for tender are quite complete. On the contrary, [16] identified additional tender preparation process that is needed for conservation works which are essential in order to produce an accurate tender amount. The additional process includes additional reports such as Historical Architectural Building Survey report and dilapidation survey reports, site briefing, site visits, photographic record of the site measurement and observations.

### III. DIFFERENCES BETWEEN NEW BUILD AND CONSERVATION WORKS

Conserving a heritage building differs greatly from constructing a new building. Conservation works has different characteristic from new build but is similar to refurbishment works [14] as follows:

1. Small labour intensive operations
2. Works scattered throughout the existing building
3. Lack of as-built drawings to guide designer and builder
4. Extent of work not discovered until dismantling work.

The above characteristics create difficulty in planning and estimating works due to the unknowns and uncertainty [9] in the extent of repair works needed. Such uncertainty does not occur in new build works as the scope and extent of work is clearly demarcated. Similar to refurbishment works [15], conservation is usually carried out in scattered location of work within an existing confined site.

The sequence of work for conservation project is also different from new build, i.e. it is a top down approach for conservation works [16]. As the building is an existing structure, conservation works do not require structural construction like in new build. Restoration usually begins at the roof then proceeds to the internal areas, windows, doors and external façade. Due to the repair works on the roof, temporary roof covering is an important item for conservation works while there is no such need for new build works.

Similar to refurbishment projects which require the matching of new material components with that of the existing building [10], conservation works require not only matching but the use of the original materials where possible. This is

especially important for first grade heritage building restoration and thus the contractor will need to source for original materials or custom order for those out of production materials. This requirement has cost implication which is difficult for the contractors to estimate.

Not only is the sourcing of material difficult, the need for workmen is also very specialised and certain type of skilled workmen are needed to perform the work especially decorative work that is no longer used in modern construction. Frequently, local craftsmen are no longer available and the contractor will have to source such craftsmen from overseas. For example, many conservation works to Chinese temples in this country uses skilled craftsmen sourced from mainland China.

Due to the need to understand the condition of the existing building, many type of tests are needed to be performed in the early stages of work to provide a reference to the conservator and contractor on the selection of material and construction method. These also have cost implication especially if additional tests are requested due to newly discovered damages or hidden parts. Unlike new build, conservation also required additional historical studies and records to be conducted on the building for which the costs will vary according to the client's requirements.

Unlike new build where drawings are available for each part of the building, conservation works may not have such luxury especially if the building is very old and the as-built drawings are missing. As such, without drawings, it is difficult for the conservator or contractor to be able to visualise the restoration works needed during the tendering period. In the event there is a need to produce measured drawings; the additional requirement will incur extra cost to the entire works. As the full extent of work cannot be determined during the tender period, contractors will usually mark-up the tender according to their own assumption of the works that may be needed in addition to the items listed in the tender document.

As such, it can be seen that construction work for new build and conservation differs in terms of work approaches, works sequence, use of materials and labours and the availability of information and drawings. Considering the differences between new build and conservation works, conventional approaches in tendering used for new build may not be suitable for conservation works and so it is important to identify and understand the factors that affect the variability in estimating tender cost for conservation works.

#### IV. METHODOLOGY

This study focuses on the problems that contractors faced when they are pricing the tender for conservation projects. In order to understand the factors that cause difficulty to the contractors, an in-depth interview was conducted to solicit opinions from the contractor's viewpoint. The in-depth interview approach is adopted because in addition to identifying the factors influencing tender variability, this study also wanted to understand how these factors influence tender variability.

A semi-structured questionnaire is designed for the

interview based on literature of earlier research. Upon the completion of the questionnaire, a pilot study was conducted to test the suitability of the semi-structure questionnaire for the purpose of this study. The comments from the pilot study were used to improve the questionnaire before commencement of the survey. This survey targeted only contractors that have prior experience in tendering for conservation projects. The reason being conservation project has different needs and requirement from new build projects. Reference [1] found that conservation works has non-standard scope of works and require a different construction approach thus only contractors that have prior experience would be able to provide feedback that reflect the issues faced by the industry.

A sampling frame was compiled from the list of tenderers obtained from the public works department, local authorities and National Heritage Department. This list was then further reduced by the following criteria.

1. Firms no longer operating are removed.
2. Firms that cannot be contacted are removed.
3. If several firms belong to one owner, only the most active firm is included in the sampling frame.
4. Firms that refuse to participate in the survey are removed.
5. Firms that do not have experience in the conservation projects are removed.

The sample size is decided by data saturation method where data collection will cease when new cases no longer disclose new features [22]. In this study, the data collection terminated at the 10<sup>th</sup> respondent. The total interviews conducted exceeded the 'general rule of thumb' of a sample between 5 – 25 interviews recommended [12], [13]. All respondents have experience in conservation works and are willing to participate in the survey. A face to face interview session was conducted with each contractor. Their responses were transcribed and thematic analysis performed on the transcribed data.

The thematic analysis conducted is adapted from the steps proposed by [5]. Referring to Table I, the familiarizing phase is done during the transcribing process where all the interviews are transcribed by the author. For the second phase, the transcribed data is printed with a wide right margin to enable the author to write down the coding of interesting and relevant points derived from the transcript. During the third phase, similar codes are brought together to create emerging themes which is the step towards conceptualizing the data. The themes are now given a label and review in the fourth stage to further refine and define the themes. The themes identified are driven by the objective of the study which is to find the causes of high variability in conservation tender. This will form the findings of this study. It is new knowledge pertaining to tendering in building conservation from the perspective of the respondents.

TABLE I  
PHASES OF THEMATIC ANALYSIS [5]

Phases	Description of the process
1. Familiarizing the data:	Transcribing data, reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Defining, naming and reviewing themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
5. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

## V. FINDINGS AND DISCUSSIONS

At the start of the interviews, the respondents are asked if they find that conservation tenders has high variance and the respondents agreed unanimously. This set the tone for the interview on why this is so. The analysis of the transcripts provided four (4) major themes that capture the importance of the data in relation to the above question as shown in Table II. This is an important criterion in determining the themes [5]. The themes provide insight into the problems faced by contractors when pricing conservation tenders and how it affects pricing variance in the tenders. The analysis of the interviews found that Bills of Quantities, Hidden works, Experience and Labour and Material Cost contributed to the difficulty in pricing the tenders. The problems created a gap in the knowledge that is needed by the contractor to price competitively.

TABLE II  
THEMES EMERGING FROM INITIAL CODING

Final Coding/Themes	Initial Coding
1. Bills of Quantities	<ul style="list-style-type: none"> <li>• Incomplete BQ</li> <li>• BQ not clear</li> <li>• No standard format for BQ in conservation</li> <li>• Confusing arrangement of BQ</li> <li>• All encompassing BQ description</li> <li>• Quantity in lumpsum format</li> </ul>
2. Hidden Works	<ul style="list-style-type: none"> <li>• Covered works</li> <li>• Lack of information before work start</li> <li>• Required testing to verify condition at site</li> <li>• Unforeseen works</li> </ul>
3. Experience	<ul style="list-style-type: none"> <li>• Must be familiar with specification to price</li> <li>• Must be familiar with method of conservation</li> <li>• Must be familiar with materials used in conservation</li> </ul>
4. Labour and Material Cost	<ul style="list-style-type: none"> <li>• Change in material cause price difference</li> <li>• High labour cost</li> <li>• High material cost</li> </ul>

### A. Bills of Quantities

Bill of Quantities (BQ) is one of the major factors mentioned by the respondents. The issues mentioned includes BQ that are incomplete and not clear, lump sum quantities, confusing arrangement and all encompassing description.

Respondent 6: 'Because the BQ is not clear, that is why you have such discrepancies.'

Respondent 8: 'We don't get accurate BQ.'

BQ consists of both descriptions and quantities and both of these are equally at fault in hindering contractors from pricing accurately. Reference [14] has identified the same poor work descriptions as one of the major complaints in refurbishment tender. When descriptions are not clear, the contractor will have to make their own assumption and different contractors will be having different assumptions which will lead to different pricing.

Respondent 3: 'Some of the items they copy and paste and they didn't write it in detail.'

Respondent 7: 'We based on judgment to price. That is why conservation prices differ and there is big range (among tenders).'

Similarly if the BQ uses many all encompassing descriptions, the contractors are force to price higher because such description includes all necessary works in the given item. Therefore, some contractor will include more and some less. When this happens the difference will be high and the price is no longer comparable on an apple to apple basis.

Respondent 4: 'As I say most of them (QS) try to be very safe, they will put everything inside (the BQ description).'

Respondent 5: 'As I was saying just now, it's an umbrella one. It covers everything. Example of description is to replace whatever rotten timber in the roof trusses.'

The problem is not always the high unit rate but the total costs that each contractor allows for the required works that is different. This is due to the reason that no quantities are given to guide the contractors but are only asked to price as lump-sum. When this happen, the contractor will measure his own quantity and this will again cause differences between contractors.

Respondent 6: 'Second weakness is, it is all in lump-sum. Of course there are some they can't measure but they (descriptions) are not specific, e.g. just make good existing wall but there is no detail (on the method and quantity).'

Even when quantities are given, there are problem as the quantities given are only provisional which has a higher risks and therefore forces the contractor to allow for a higher mark-up in their pricing. Depending on the ability of each contractor to carry the risk, the mark-up will differ and this is also one of the causes of variability [21].

The problem of confusing arrangement highlighted by a respondent refers to the sequence of the BQ that does not correspond to the sequence of site work. For the less experienced contractor, they will just price according to the BQ and may miss out pricing certain work items which will cause the tender amount to be lower.

Respondent 6: 'If for conservation project, the sequence of work is from roof so we have to erect temporary cover which the QS don't allow for either in the preliminaries or whatever.'

Respondent 3: 'Arrangement of BQ quite confusing. Sometimes they separate the works to the same

elements so we might have missed it.'

Currently, BQ for building conservation tender is prepared based on the conventional sequence following new build work. However, as the sequence of work for building conservation work is different from new build work, the current arrangement makes it difficult for the contractor to ensure his pricing did not miss out any related works.

It is evident from the interviews data that the current bill of quantities for conservation work is poorly prepared. The effect of a poor bill of quantities is that it forces the contractor to make assumption when pricing which may inflate or deflate the price unrealistically. However, one respondent explains that if the BQ is well prepared it will be of help to inexperienced contractors.

Respondent 1: 'Not familiar with the type of work will be difficult to price but if the BQ is clear then it will help.'

Thus, bill of quantities that are well prepared with complete description, accurate quantities and proper sequencing will provide standard basis for the pricing of tenders.

#### *B. Hidden Works*

Due to the nature of conservation works which is repairing and restoring an existing and usually damaged building, there exist unknown conditions of the building which are covered by the layers of construction works throughout the years. This unknown work is one of the reasons contractors cited for the variance in tenders. Contractors with experience may include a higher mark-up to cover these hidden works while newer contractors may not have the foresight and therefore would submit a much lower price.

Respondent 1: 'You don't know what is inside. Once we pull it out then only we know what is inside (the walls of the building).'

Respondent 4: 'So those things we would not know will happen when we get the job so when we price we anticipate, sometimes we are right, sometimes we are wrong.'

The issue of hidden work is not new in conservation. This is one of the characteristics of conservation works which is similar to refurbishment works [14] where the full extent of work may not be fully realized until dismantling works are done.

Sometimes unforeseen work is not only due to it being covered up. One respondent explains that it can also be due to the method of conservation work as follows.

Respondent 3: 'When you install air-conditioning, you need to have the piping running around the wall. For conservation works you need to have a clear method statement on how you hack the wall, fix the piping, make good and return the condition of the wall to the original form. Some contractor can't foresee this part and they price like a new building air-conditioning installation.'

When inexperienced contractor price for conservation works, they might not foresee the meticulous steps needed to perform

the work to ensure that the authenticity of the building is protected. As such, the contractor will submit a lower price as compared to an experienced contractor that has included the cost of the additional work.

The requirement for testing in conservation works also contributed to this problem. The principle of conservation work is to restore the building to its original conditions and since the original conditions is not known by looking at it, tests are needed. However, the tests are usually done during the construction period and thus the information is not available during the tendering stage which will affect the contractor's ability to price competitively.

Respondent 2: 'One thing before you hack, you must prepare the method statement and when you hack, you must take a few samples of the plaster and send it to the lab for content analysis to see if it is cement, lime or red sand – you also don't know because the BQ sometimes never mention.'

The interviews data show that hidden work causes uncertainty and this uncertainty is reflected in the high variance of tenders. Those that foresee the hidden works will price high to cover the costs while those that do not will price low but the low tender does not mean it is competitively priced.

#### *C. Experience*

The interviews data also found that familiarity with specification, method of conservation and materials used is important to enable the contractor to price the tender competitively. Familiarity here translates into experience. When contractor is not familiar with the method of conservation, it will cause the tender price to be higher.

Respondent 4: 'When we are not sure how to do the work, we price higher.'

However once the contractor has prior experience, it will be easier for him to price.

Interviewer: 'If you are not familiar with the construction method in construction work, will that give you a problem in pricing?'

Respondent 2: 'For the first time is difficult.'

Interviewer: 'Once familiar, there will be no problem?'

Respondent 2: 'Yes.'

Interviewer: 'What about not being familiar with materials used for conservation works?'

Respondent 2: 'Same with the earlier. First time for everyone is also difficult.'

Contractor with experience in conservation works will be able to ensure a more complete pricing while a new contractor will miss out certain works and this will contribute to the variance among the tenders.

Respondent 4: 'Those that have done before, they will know what it takes, those that have never done before, definitely they will price it like a new building, this (conservation) is completely different you know.'

This shows that with experience, the contractor will be able to foresee and anticipate the works required and thus be able

to price competitively.

#### *D.Labour and Material Cost*

Labour and material cost has been identified by [6] as factors that influences variability in tenders. The interviews data also suggests the same as one of the reasons for high variability in conservation works tender. The labours for conservation works is usually highly specialized and are skilled craftsmen. In addition, the work is meticulous and time consuming. If the contractor did not take into consideration the need to engage skilled craftsmen or the need to source skilled craftsmen from overseas, he may have underpriced the tender.

Respondent 1: 'You must have a good labourer who knows how to refurbish back so the labour cost is quite high. Also because they do by hand and not by machine, so it is slow.'

Respondent 2: 'The big difference is the cost of using manpower and material because the scope of work is different from normal construction.'

Material poses a different set of problem for conservation works because of the difficulty in obtaining original materials for the conservation works. Many of these materials are obsolete and request the factory to reproduce the same materials, e.g. floor tiles would be very expensive. One respondent explains the problem with material.

Respondent 2: 'There are cost overruns because of the materials – we have to order from somewhere in Indonesia.'

The requirement to use original materials according to the age of the building has also caught new contractors off guard when they price with the unit rate of new material and later found that the price of original materials is much higher.

This data from the interviews conducted has identified four factors that cause differences in pricing by different contractors which are poor documentation of bill of quantities, hidden works, experience in conservation and high labour and material costs. Although all four factors explain different aspects of the tendering stage but the central idea emerging from all four factors is uncertainty. While hidden works is a direct cause of uncertainty, the other three factors may not be direct but still nevertheless contribute to the uncertainty in the actual scope of work or prices. Due to the lack of information provided by poorly prepared BQ, the contractor has to make certain guesses or assumptions to complete the pricing. Without experience in conservation works, contractor are uncertain on how to price special conservation work items. Lack of knowledge on skilled craftsmen and antique materials contribute to the under pricing of these items. These factors are found to be the barriers to the contractors trying to produce a competitive tender for conservation works.

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