

Estimating and pre
contracts quantity
surveying
construction essay



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The most important stage of any project is Estimating and Pre-Contracts Quantity Surveying. Care has to be taken at this stage, to produce a more accurate and realistic cost of the project so that the client is in knowledge of the financial requirement with no major surprises, for successful completion of project within the budget. Construction projects are always out of budget and delayed completion date. The two main reasons are either a wrong assessment of the cost and duration for the completion of the project or the client is being deliberately presented with a reduced budget and a tight schedule for completion of project. However the most common reason is the combination of the cost and time estimates and the latter being used by most consultants / architects to convince the clients to go ahead with the project. The reduced budget and the tight time schedule is sometimes way away from the actual, which is the main reason for the collapse of the client.

One of the bitter experience is with the Dubai Government Roads and Transport Authority being provided with a Cost Estimate of about 4. 25 billion dollars (15. 5 billion dirhams) for the Dubai Metro Rail Project, which went over budget and crossed time limit while crossing 7. 67 billion dollars (28 billion dirhams) expenditure with still part of the network stations being incomplete. As per RTA there were four reasons of the increase, first the project was extended by 4. 5 km, secondly adding a station with few more kilometres of the rail, thirdly adding two more stations on the Red Line and lastly the changing of the interior of the stations drastically and including footbridges.

Also to the fact that in my career of 10 years in Dubai, I have noticed only one project completed within the budget and within the allotted tight time

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period. The project was executed with good management and proper allocation of resources to achieve the completion within a short period of time. However it is not fair to put the blame on Pre-Contracts procedure deciding the major part of the fate of the construction project.

ABSTRACT

The PCQS has to submit various documents according to the various stages in Pre-Contracts.

The various areas to be considered in the Pre-Contracts Quantity Surveying stage are as following – 1) Selection of team. 2) Collection of historical data. 3) Identifying key personals specialised in particular field to co-ordinate. 4) Incorporating inputs from various departments heads. 5) Defining and implementing practically a clear quality check procedure. 6) Following the various steps according to the stage of the document submittal. 7) Team leader to identify and distribute the work to the responsible personnel. 8) Quality Management, especially during the end of the submission date. 9) Preparing a more realistic cost estimate. 10) Back-checking by comparing the Engineers Estimate and the realistic tender opened. 11) Client can make the consultant responsible by asking to provide backups for the quantities and rates. 12) Including feedback and data provided from ongoing projects by Post Contract Quantity Surveyor. 13) Preparing of BOQ for Remaining Works of a contract after the termination of the Main Contractor. 14) Making the Consultant responsible for cost estimates provided to clients, to avoid huge variation. 15) Quantity Surveyors to be fast and accurate in dealing with Notice to Tenderers.

To learn good lessons and avoid future loss to the members of the construction industry, some case studies are being provided.

ESTIMATION AND PRE-CONTRACTS QUANTITY SURVEYING

The Pre-Contracts stage needs a very good Quantity Surveyor having a wide range of experience with skills to manage the calculations with the available software and most importantly the historic data available in the organisation for using it as a base in Estimating.

The normal procedure in the pre-contracts estimating is preparing the estimate during the Preliminary Study, Preliminary Design, Final Design and Tender Design. For repetitive or similar projects, for which the organisation has good sound recent historic data, the difference between all the stage estimates shall be very less, provided there is no drastic change in the scope of the work. The Quantity Surveyor shall prepare and keep standard rates derived from historic data and keep as common. It is better that the person preparing the estimates, derives the standard rates himself, so that he is in knowledge of those items which are lumped into some unit rates or for those items whose cost to be separately calculated if possible, or just allow some percentage in the contingencies or any other line item. As the stage progresses the quantities and items becomes well defined and then only applying appropriate unit rates becomes a key factor.

But at each and every stage the Quantity Surveyor using any assumption shall keep records for any future justification of all the estimates even until the start of the project.

The various stages of Pre-Contracts document submittal with approximate time frame is mentioned below:

Stage 1 – Preliminary study

One page estimate prepared by PCQS to be included by the Project Manager in is study report.

Stage 2 – Preliminary Design (After approximately one month from stage 1)

Volume 1 – Tender and Contract Conditions – Sample copy from previous project

Volume 2 – Specifications – Sample copy relevant to the project

Volume 3 – BOQ – Sample copy with item description and without quantities, relevant to the project

Volume 4 – Drawings – Relevant to the project, including standard drawings relevant to the project

Preliminary Design Cost Estimate – One page estimate of the project

Stage 3 – Final Design Document (After approximately one month from stage 2)

Volume 1 – Tender and Contract Conditions – With all details relevant to the project

Volume 2 – Specifications – Only relevant to this project

Volume 3 – BOQ – Actual items and quantities from drawings of this project

Volume 4 – Drawings – Relevant to the project only

Stage 4 – Final Design Cost Estimate (On the 7th day from stage 3)

Final Design Cost Estimate – Detailed cost estimate with quantities from drawings and current market rates.

Stage 5 – Tender Design Document (After approximately one month from stage 3)

Volume 1, 2, 3 & 4 – Tender and Contract Conditions – Same as in stage 3 with incorporation of corrections and changes.

Stage 6 – Notice to Tenderers (After the floating of Tender documents to the bidders and not after 10 days before Tender opening date)

It consists of a report stating the changes in all or any of the Volumes and the new pages.

Stage 7 – Engineers Estimate (On the day of Tender opening date, after all Bid documents are opened and is submitted to the Client separately)

It consists of a detailed cost estimate with quantities from drawings and current market rates, after incorporating all NTT's.

Stage 8 – Tender Analysis (On the 14th day after stage 7)

The PCQS has to prepare an analysis report of the bid documents submitted and compare it with Engineers Estimate.

Stage 9 – Contract Documents (After stage 8 and finalization of the successful bidder to award the contract)

The PCQS has to compile all the documents of Volumes 1, 2, 3 & 4 submitted by the bidder and check if all the NTT's are incorporated and include if any missing. He has to also include any post tender correspondence and changes as agreed. This document is sent to the Contractor for him to check and sign. This signed document is then signed by the Client and thus the Contract is formed. One copy of this signed document goes to the Post Contracts section, with which the responsibility of the PCQS is completed.

Below are the various formats used in Pre-Contracts Documents:

The software required is very nominal such as MS Word and MS Excel for preparing documents. And for calculating quantities MS Excel is most powerful which can be used along with Autocad, Microstation and Geopak.

The Preliminary Study and Preliminary Design BOQ, consists of sample BOQ items with nil quantities as shown below:

Figure 1

The Final Design BOQ and Tender Design BOQ consists of actual work items with quantities calculated from drawings as shown below:

Figure 2

Preliminary Study and Preliminary Design Cost Estimate format is as given below:

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Figure 3

Final Design Estimate and Tender Design Estimate is a detailed estimate with work items, quantities and rates, as given below:

Figure 4

A sample page of the Tender Analysis is shown below, which compares the rates and amounts quoted by three contractors. It also calculates the minimum, average and maximum rates of all the contractors:

Figure 5

The index of the Volume 1 – Tender and Contract Conditions is shown below:

Figure 6

A sample of the unit rate calculation sheet is shown below:

Figure 7

PRACTICAL APPLICATION OF PRE-CONTRACTS QUANTITY SURVEYING

The study is fine tuned to Infrastructure projects like Roads and Bridges and using FIDIC contract conditions and CESMM3 method of measurement. The following are important areas to be considered in Pre-Contracts stage.

1) Selection of team depending on the project and client :

This is the job of the person in-charge of the QS team to select the particular QS's who shall be able to deliver the required project with accuracy and in

time. If the project is more specialised and unique then the key QS's shall have a better engineering background and innovative skills to deal with issues which comes up during the preparation of BOQ and estimate.

However some portion of the work shall be similar to routine work, which can be done by other QS's. Thus within the team roles and responsibilities shall be divided as per calibre and capacity of doing the job. The most important aspect is of communication, i. e. each and every person of the team shall be communicated of any changes and share new information received from other departments or client.

2) Collection of historical data from similar kind of projects :

The various stages of estimates are Preliminary Study, Preliminary Design, Final Design and Tender Design. The first two stages needs the estimate to be a one page estimate, having most of the items clubbed together to form a single line item like Roadwork, in which the items included are preparation of formation, laying sub-base, road-base, prime coat, asphalt base course, tack coat, asphalt wearing course, road markings, trial trenches, any demolition works, etc. The cost per meter square of roadwork can be calculated by adding the unit rates of all the above items, except for trial trenches and demolition works for which a percentage of around 5% of the unit rates can be applied. The per unit cost of bridges can be worked out by calculating the total cost of a concrete bridge from previous project and then dividing it by the plan area of the bridge giving us the unit rate of bridge per square meter. Thus in the preliminary study and preliminary design stage the major line items have to be identified and their most likely unit rate shall be

derived in terms of unit which can be calculated easily from the available <https://assignbuster.com/estimating-and-pre-contracts-quantity-surveying-construction-essay/>

drawing. Since the areas of roads and bridges are clear at these two stages, the quantities are defined in area unit. All the rates used in these line items, shall be taken from the recently opened tender and if required apply uplift for inflation on a quarterly basis.

3) Identifying key personals specialised in particular field to co-ordinate during the progress of Bill of Quantities preparation :

Depending on the type and nature of the project and the various departments involved like Highway design section, structural design section, traffic study section, steel structure section, landscape section, intelligent transportation section, various service departments, the QS team leader has to co-ordinate with respective section heads. The point of contact person shall be the same throughout the project. Any message or information passed on by sub-ordinates to sub-ordinates of QS section shall be communicated through the responsible section head. Frequent meetings shall be arranged between all the section heads, by the project manager so as to assure proper progress and to nullify any delay by any team being lagging behind which shall effect the project delivery.

4) Incorporating inputs from various departments heads including on-site and off-site :

The QS team can refer to the historic data available with their company for usage in the current project. In addition to this, the PCQS also shall co-ordinate with the post-contract QS to get some feedback from the ongoing projects so as to rectify those mistakes committed in previous documents and incorporate in their next submission. This procedure is normally not
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followed practically as the two sections behave as separate distinct entity. But there shall be a better communication between the pre and post-contract QS and it can be achieved very easily by the head of the QS section with very little effort, enhancing the overall quality of pre-contracts works.

5) Defining and implementing practically a clear quality check procedure before submitting the document to the client :

A very important procedure of quality check shall be included in the pre-contracts work, to provide quality documents for the clients. Any document after preparation and before sending it to the client shall undergo quality check by Senior QS or experienced QS in the section. This procedure shall eliminate minor mistakes definitely and also have a check on major items to avoid any blunder in quantity or description of items. It is sure that certainly the quality of the document shall be enhanced even if this procedure is implemented for atleast about 1 to 5 hours, depending on the time available for submission. This procedure of checking can be made effective by making the person sign the document after his checking of the document.

This procedure can be followed if the internal audit plan cannot be followed due to time restrictions. However the normal internal audit procedures available with Corporate are good enough for a quality product.

6) Following the various steps according to the stage of the document submittal :

Various steps has to be followed according to the stage of the submission, whether preliminary study, preliminary design, final design or tender design.

During the preliminary study the pre-contracts QS has to prepare only a one page estimate based on the key layout plan for e. g. Calculate the area of the road and bridges from the plan and then multiply it with the area of the road and bridges from the plan and then multiply it with the derived rates from previous standard projects. And consider percentages for services, landscape works, street lighting works, contingencies, etc. to arrive at the total project cost.

In the preliminary design stage the PCQS has to submit a one page cost estimate and a detailed sample BOQ with the quantities as nil. The BOQ items shall be standard items, from previous projects relevant to the current projects. Even the tender and contract conditions is provided same from the previous similar project.

In the final design stage, the Volume 1 – Tender and Contract Conditions, Volume 3 – Bill of Quantities and a detailed cost estimate is submitted. This stage is a more detailed stage and may be entirely different from the preliminary design, based on the changes being incorporated during this stage. The PCQS has to prepare volume 1 incorporating the description of the project, duration of the project, any milestone, any stage handover, the particular conditions of contract, penalties, liquidated damages, conditions for advance payment, performance bond guarantee form, tender bond form and the general conditions of contract. The volumes shall be a detailed BOQ, with no assumed quantities and all the items and quantities shall be derived from the available drawings. In addition to this there shall be a Bill No. 1 for General Items, containing the items for Method Related charges and Time Related charges for the contractor to price, so that he receives the initially

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invested money early as mentioned in this Bill. But sometimes contractor uses this Bill to front load these items to get initial profit earlier as he shall put all his profit in the Bill and price less profit in the actual work items.

The next submission is the Tender submission which is similar to Final Design submission, with the only difference that any changes in the drawings from Final Design to Tender Design has to be incorporated into the BOQ. Care has to be taken in this document as it shall be provided to the Tenderers for bidding and any mistake at this stage shall be borne by the client and in turn by the Consultant.

A real example of a very serious mistake happened by inserting the Quantity as ' One' in the BOQ for costly items, whereas in the drawings there were huge numbers. The contractor being aware of this fact priced high for these particular items and later during the project execution, when the client got aware of this he claimed the excess amount from the consultant as it was a pure mistake of the consultant, by putting the item in the BOQ, but not putting the exact quantity as per drawing. This could have been avoided by having a QC check before floating the document as Tender.

The cost estimate known as " Engineers Estimate" shall be provided on the date of the Tender Opening. In between the Tender submission and the Tender Opening, the consultant can issue a number of " Notice to Tenderers" to incorporate any changes in drawings or any tender documents. In this process, the PCQS can also rectify his mistakes which were not seen in the Tender Submission. The NTT is of standard form, consisting of serial numbers

and the front page summarising the pages to be replaced or added from any of the Tender documents.

7) Team leader to identify and distribute the work to the responsible personNEL of various departments and within Quantity Surveying department :

The team leader of the PCQS has to carefully allocate and distribute responsibility of preparing the Volume 1 and various parts of Volume 3 such as roadwork, bridges, landscape works, services, tunnel works, electromechanical works, etc. accordingly. Also he has to co-ordinate and be aware of instructions and details provided by different section heads for preparation of the BOQ. Any change in any of the service or other section, shall be communicated through the section heads to the team leader and the PCQS doing that part of BOQ. The project manager shall also be aware of all these communications.

8) Quality Management, especially during the end of the submission date, when major design changes occurs :

As discussed earlier there shall be a specific quality management plan for the PCQS works for a better quality product to the clients. This can be achieved by conducting a 1 to 5 hour QC check of all the documents prepared before sending it to the client. Criteria of checking each document is to be set out and the document used for quality check shall be stamped and signed duly by the Quality checker QS and the Team leader so as to be responsible for the document. This procedure shall atleast make 90% free of mistakes or blunder in any of the documents. This specially becomes difficult <https://assignbuster.com/estimating-and-pre-contracts-quantity-surveying-construction-essay/>

when huge changes in design are done when the submission date is very near and even getting 1 to 2 hours for checking is difficult. But it is suggested to have a quality check even in this tight schedule, when chances of mistakes are more.

9) Preparing a more realistic cost estimate for Tender Opening :

After the tender document submission, the cost estimate known as “Engineers Estimate” is submitted to the client at the tender opening time. Care has to be taken in preparing this estimate for the following reasons, a) there shall not be large variations from the final design estimate, other than the changes in design. b) the estimate shall be reflecting the current market rate, since it is derived from a previously opened tender and hence inflation rate has to be applied. c) The estimate shall be within the range of the offers submitted by the bidders at the tender opening time. d) Justification and hard copy proof shall be kept for those items, for which rates are not available from previous tenders and is derived from basic as there might be major differences when compared with the bidders. Since these proofs might be required to justify these rates at a later stage if the estimate is way out of the range of the lowest bidder. For the fact that certain clients fix the maximum limit of variation of engineer’s estimate as 15% and if it goes beyond it then the consultant is responsible for that variation.

10) Back-checking by comparing the Engineers Estimate and the realistic tender opened, for future incorporation of any shortcomings :

After the opening of all tenders the offers of all the bidders shall be compared with the engineer’s estimate. This is submitted to the client which <https://assignbuster.com/estimating-and-pre-contracts-quantity-surveying-construction-essay/>

is a part of tender analysis report. However the consultant shall also check for items where the engineer's rates have large variation from all the bidders and try to avoid this mistake in future estimates, to provide a more realistic estimate to the clients. Normally the bill amount for ' General Items' is considered as a percentage of the cost of work items and ranges from 15% to 30% depending on the class of the contractor and their overheads cost. But sometimes some of the contractor's price these bill items less than 10% or even more than 30%, however we have to consider the average percentage from a majority of normal class contractor's pricing.

11) CLIENT CAN MAKE THE CONSULTANT RESPONSIBLE BY ASKING TO PROVIDE BACKUPS FOR THE QUANTITIES AND RATES :

Another way of achieving quality and accuracy in the BOQ and estimates, is by asking the consultants to provide backup and calculation of each quantity and rate. By checking this client can ensure the reality of the BOQ and the estimates.

12) Including feedback and data provided from ongoing projects by Post Contract Quantity Surveyor to the Pre-Contracts Quantity Surveyor for future contracts in design stage :

One of the most important aspects of Quantity Surveying is the co-ordination and exchange of information between the pre-contracts and the post-contracts quantity surveyor. This is not done practically. However this can be done very easily by arranging monthly or bi-weekly meetings among them by their in-charge personnel. This will provide the PCQS the data about the new rates, missing BOQ items, quantity variation, claims due to BOQ, high <https://assignbuster.com/estimating-and-pre-contracts-quantity-surveying-construction-essay/>

rates for provisional items, high rates for mis-calculated BOQ quantities, to elaborate BOQ items description, insufficient BOQ description creating ambiguity of the scope of work. The comments and suggestions of the meetings can be used to incorporate in all the future tender documents to get a refined product for the client. This is a way by which the PCQS can assess the application of the documents prepared by them at site and measure the quantum of loss, occurred due to small or negligible mistake done during the pre-contracts period. This would also suggest the PCQS to include QC checks relevant to these mistakes in their checklist of quality control.

13) Preparing of BOQ for Remaining Works of a contract after the termination of the Main Contractor, to award the remaining works to a new contractor :

This is a very rare case that the main contractor is terminated and the remaining works is awarded to the new contractor. However, if this happens then the PCQS has to be very cautious in preparing the BOQ for the remaining works. The BOQ of the balance works to be prepared by taking the difference between the tender quantity and the actual work done quantity at site. However, care shall be taken to prepare some new items such as manholes and such other works which are partially completed by the main contractor and remaining has to be done by the new contractor. These item quantities shall be accurate if possible to be measured at site and no assumptions shall be made, as if the quantities are less than actual, then the new contractor shall price it more, the excess of which shall be paid by the main contractor, it is not good from an ethic point of view. Any item partially done and unsure of quantity shall not be included in the BOQ. Also to avoid <https://assignbuster.com/estimating-and-pre-contracts-quantity-surveying-construction-essay/>

major losses to the main contractor, items of this kind shall not be included in the BOQ, since the new contractor shall price it very high during tender stage, which we cannot control his pricing. However, if these items occur at site and if there is no BOQ item, then a better controlled new rate can be approved by the consultant, minimizing the loss to the main contractor. Items like testing of pipes, duct proving etc. shall not be included in the BOQ as the new contractor shall definitely price it very high than the actual incurred by them.

14) Making the Consultant responsible for cost estimates provided to clients, to avoid huge variation after the opening of the tender :

One important stage of the PCQS is to provide the cost estimates to the client. Sometimes the consultant might underestimate the cost of the project to make it look cheaper, so that the client goes ahead with the project and the consultant is free from the responsibility of providing the most economical design for the client. This can be nullified by making the consultant responsible for the cost estimate and impose a fine, if the cost estimate varies more than +15% to -15% of the lowest bidder. Also the fees for the consultant design fees shall be based on the lowest of all bidders including the consultant's cost estimate. In this case the client shall also take particular interest and ask justification for the rates being priced for the BOQ items by the consultant.

15) Quantity Surveyors to be fast and accurate in dealing WITH Notice to Tenderers within A short period of time :

Notice to Tenderers provides a sort of cover to the mistakes or late design changes for the consultant and the client. Always these are issued within a short span of time in hurry and most probably having a risk of containing mistakes and errors being sent to the tenderers. Since the time is short and a lot of parts such as drawings, specifications or BOQ has to be re-issued there is chances of error. However this shall be avoided by having a rapid and thorough QC check. If it is not possible to do even this check, then the consultant shall request from the client to provide an extension of time, for the tender opening. This would avoid and nullify any future major loss of money or ambiguity during the post-contracts period. Also this is good opportunity for the consultant to rectify any mistakes done by any of their department during the pre-contracts stage in the tender documents. In this notice even the consultant has to send in the answers to the queries raised by the bidders. Later on during the formation of the contract document, each page and every answer of the query forms an integral part of the contract document in Volume 1 and other Volumes as applicable. Notice to Tenderers, before issuing to the client who in turn issues it to the bidders, shall be authenticated by the responsible heads of department, who is related to the contents of the Notices.

The PCQS responsibility is the preparation of Volume 1 and Volume 3 and cost estimates at any stage. After the tender opening, even the preparation of the contract documents has to be done and thoroughly checked by the PCQS. A very systematic procedure shall be followed in preparation of the contract documents. Because, even if in the pre-contracts stage a mistake of the consultant is rectified in the subsequent NTT and that page is not

incorporated in the Contract document, then the purpose of NTT is lost and the contract after signing has to be executed with that mistake, giving rise to disputes and claims. Initially the original Tender document has to be taken and then one by one the succeeding Notices shall be applied by the PCQS. He should take responsibility for all the Volumes, because the other department personnel might not remember or not have any documentation to replace the pages as mentioned in the NTT. A important point to be noted is that each and every page issued in each NTT shall become a part of respective Volume. Sometimes or more often there are certain discussions negotiation being held after the Tender opening known as the Post Tender stage.

Each correspondence and documents submitted during this post tender stage shall become a part of Volume 1, as it shall be the deciding factor of the contract during a later part of the construction stage. Once the contract document is signed by both parties, ie. The client and the contractor then the contract is formed. At this point of time the responsibility is transferred from Pre-Contracts Quantity Surveyor to Post Contracts Quantity Surveyor.

TO LEARN GOOD LESSONS FROM CASE STUDY TO AVOID MISTAKES AND AVOID HUGE LOSSES :

Case Study 1 – The items for Drainage Manholes were included in the bill, but the quantity take-off from the drawings was not included in the Tender BOQ. The contractor knowing this fact priced it four times high, since the quantity in BOQ was ‘ unit’ and it did not effect the overall tender price. The client became aware of this fact that the actual Manhole quantity is more

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and the client shall have to pay around 5.48 million dollars (20 million dirhams) more. The client wrote a letter claiming this excess amount from consultant.

This mistake happened at the pre-contracts stage, due to non-inclusion of the working of the Drainage bill quantity done by team member into the main BOQ excel file.

Conclusion: Teamwork is important and each team member shall ensure that his part of work is included in the main work.

Case study 2 - Due to lack of time the area of concrete retaining wall was calculated as length multiplied by average height of 3.5m. During the execution of the work, the actual quantity seemed to be three times more than the quantity mentioned in the BOQ. This excess amount was out of the client's budget and he asked a justification from the consultant.

This mistake happened since the QS preparing the quantities did not refer the road profile drawings in which, the starting and end point stating the heights of retaining wall were clearly mentioned.

Conclusion: To check each and every drawing while calculating quantities, referring to partial drawings shall definitely mislead and create error.

Case study 3 - Due to non-availability of time between Tender document issuing date and Tender Opening date and also the pressure created from the project manager, major electro-mechanical items were missed from the Tender BOQ. Later on during construction period, lot of variations cropped up and the consultant was responsible for this loss to the client, as the <https://assignbuster.com/estimating-and-pre-contracts-quantity-surveying-construction-essay/>

contractor would have priced these with a competitive rate during the tender stage as compared to the present new rate.

Conclusion: This mistake happened due to the pressure created by project manager to complete the work in short time. However this could have been avoided by extending the tender period and giving sufficient time to issue a proper well developed NTT.

Case study 4 – The client asked to submit all the four stage documents of the pre-contracts stages urgently one by one, by