

Case Studies in Awarding the Lowest Bid Price in Construction Projects

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Abstract: The basic criterion for selecting a tender for construction projects is usually the price. Public construction procurement, the process by which contractors are chosen for public construction projects, has traditionally been based on selecting the lowest bidder. This process, although designed with good intentions, has several shortcomings. The aim of this paper is to investigate the consequences of selecting the lowest bidder through studying three case studies. These case studies include a rehabilitation project which is funded by the Italian government, construction a sewage pump station and pressure sewage line, and construction a new pump station which are funded by the Danish government. The investigations include bidding, evaluation, awarding, and implementation stages; in addition to highlight the encountered problems during these stages. The findings indicated that all three projects faced a number of problems; among them are delays, cost overruns and disputes. It is recommended that: Project cost estimate should be checked and agreed upon between all project parties before starting tendering stage. Bid evaluation process should be a joint effort task between related project parties and including various engineering specialization of expertise in order to be able to control and evaluate all the project items in early stage before starting the implementation stage. Bid evaluation should focus on the balance of items' prices and correctness of items unites prices. Awarding project should be to the lowest evaluated responsive bidder, who has the financial and technical capabilities and present the most logical and practical offer. Factors other than financial offer should be considered in the awarding decision.

Keywords: construction, award decision, lowest bid, contractors

حالات دراسية في ترسية العطاءات بأقل الأسعار في مشاريع التشييد

ملخص: المعيار الأساسي لاختيار عطاء مشروع التشييد يعتمد غالباً على السعر. ويتم اختيار المقاولين للمشاريع الحكومية غالباً بناءً على أقل الأسعار. وبرغم أن هذه الطريقة يتم العمل بها بنية حسنة إلا أن لها العديد من جوانب القصور. وتهدف هذه الدراسة إلى التحقق من تبعات ترسية العطاءات بأقل الأسعار من خلال التطرق إلى ثلاث حالات دراسية. وهذه الحالات هي: مشروع تأهيل ممول من الحكومة الإيطالية ومضخة صرف صحي ومحطة ضغط للصرف الصحي ومحطة صرف جديدة ممولة من الحكومة الدنمركية. التحقق يشمل الإجراءات التالية: تقييم العطاء، ترسية العطاء وكذلك خطوات التنفيذ، بالإضافة إلى تسليط الضوء على المشاكل التي تحدث خلال هذه الإجراءات. وتوضح النتائج أن الحالات الدراسية الثلاث مرت بمشاكل عديدة منها التأخير وارتفاع الأسعار والخلافات بين أطراف التعاقد. ويوصي البحث بما يلي: يجب التحقق من تقييم أسعار

المشروع قبل البدء في مرحلة طرح العطاء، تقييم العطاء يجب أن يركز على تحقيق التوازن بين سعر عناصر المشروع، ويجب ترسية العطاء على أكثر العروض تجاوباً مع الشروط المالية والفنية، والعرض الأكثر منطقيةً مع إمكانيات التنفيذ. ويجب الأخذ بعين الاعتبار عناصر أخرى في عملية ترسية العطاء بالإضافة إلى السعر.
الكلمات المفتاحية: مشاريع التشييد، المقاولون، قرارات الترسية، أقل الأسعار.

Introduction

The construction industry and awarding authorities (those who commission and award projects), have begun to explore ways to improve the process of selecting general contractors

[1]. Awarding a contract is the approach an owner follows to choose a contractor that provide works under specific criteria. A project can be procured using different procurement methods ranging from single source: direct hiring, negotiation, restrictive bid, to open competition procurement [2]. An owner may select a contractor through competitive bidding, such as the lowest-bidder system and the non-lowest-bidder system. Procurement type is a critical decision because it defines the method to select the key player in the project, which is the construction firm that is expected to deliver the project. This decision greatly impacts the performance because if the construction firm is not qualified to achieve the project goals, serious problems may arise during and after construction [1].

The lowest bidder method has created a number of problems. Rules designed to protect the public from corruption have made it difficult for innovation in selecting construction delivery systems. The low bid process makes selection based exclusively on price, not on qualitative factors such as past performance or construction schedule [1]. A 'good' contractor is expected to complete a project on time, within budgeted cost, and to the client's desired level of quality. Unfortunately, this is not always the case. A number of earlier research and case studies have highlighted that clients' total satisfaction (comprising time, cost and quality performance measures) is difficult to achieve [3, 4, 5, 6]. The most dominant way of awarding contracts in Gaza strip is the lowest bid method. The aim of this paper is to investigate the impact of choosing contractors, based solely on the lowest bid price, on the local construction industry in Gaza Strip by studying a number of case studies.

Literature review

The review of the existing literature indicates that numerous studies have developed selection methods to help in procuring the appropriate contractor [3, 7, 8, 9, 10, 11, 12, 13, 14, 2, 1]. Different systems with evaluation criteria have been developed to assist owners during the contractor selection

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process. The main advantages of these methods and evaluation systems is that they provide a systematic and objective procurement approach that takes into consideration numerous factors other than the price of the bid. There are three main concepts are generated for selection of contractor "cost, time, and quality". The selection of contractor is the most difficult decision taken by the client, because the inappropriateness of the selected contractor leads to substandard work, delays, disputes, or even bankruptcy. Using a multi-criteria approach for evaluating contractors with respect to their economic and technological aspects, quality standards, past performance, and other tangible and intangible characteristics may help solving this problem [15].

Hatush and Skitmore [16] found that all clients use a 'similar' set of criteria for contractor selection, but that the way clients quantify these criteria can be very different in practice. In these previous works, a contractor's bid amount appears to be the most dominant and important criterion [17, 15, 18]. The following four weaknesses were found in contractor selection practice: (i) lack of a universal approach, (ii) long-term confidence attributed to results of prequalification, (iii) reliance on tender sum in decision making and (iv) inherent subjectivity of the process [17, 19]. Holt et al. [19] provided example application of Multiattribute Analysis to the evaluation of construction bidders. Hatush and Skitmore [16] applied Program Evaluation and Review Technique (PERT) to assess and evaluate contractor data against client goals (time, cost and quality). Hatush and Skitmore [20] used Multi Attribute Utilities Techniques (MAUT) to select the best contractor based on a mixture of qualitative and quantitative criteria.

However, choosing a contractor based solely on the lowest bid price is one of the major causes of project delivery problems. One of disadvantages of using the lowest bid as a principal discriminating criterion is that some contractors (e.g. facing a shortage of work) may enter unrealistically low bid prices, simply to try and maintain cash flow. Therefore, as Hatush and Skitmore [16] indicated, financial and technical criteria must be considered in order to assess the potential of contractors finishing projects on time; and to assess whether contractors have the necessary resources to complete any contract awarded to them. A number of innovative approaches have been put forward designed to achieve the selection of "good" contractors [18]. Some of these methods have aimed to provide a quantitative indication of contractors' potential cost or quality performance using univariate or multivariate statistical methods. Others have used multivariate statistical methods i.e. one or more dependent variables and several independent

variables [21, 5]. In a universal selection method, emphasis is placed on the investigation of a contractor's particular ability; such as the prediction of cost, time or quality performance. Almost every previous study in this field has cited different performance assessment methods as being the "most effective" for selection of a "good" contractor [22, 23].

Standardization of the selection systems should take place based on previous projects experience, while taking into consideration priorities that are specific to future projects. If implemented, standardization processes will enable construction organizations to be more flexible and coping with change, a characteristic especially for local contractors considering moving to the international level [24]. Some researchers have recommended that the selection should be composed of a two-step approach: prequalification and tenders evaluation. The first stage should emphasize more on the contractor's organization capabilities such as past experience and financial health, while the second stage should evaluate more those contractor's competencies that enable him to qualify for project-specific criteria such proposed construction method or previous expertise [18, 25].

Tarawneh [26] conducted a study on contractor prequalification for public and private project through qualitative interviews with owners, directors and senior managers of major client organizations in Jordan. The findings of his work indicated that public and private clients have different views about the importance and priorities of the prequalification criteria.

Russel and Jaselskis [27] analyzed contractor failure in the US and recommended that an owner should have two means of avoiding or minimize the impact of contractor failure: analyzing the contractor qualification prior to contract award; and, and monitoring the contractor's performance after contract award. El-Sawalhi et al. [28] considered that the pre-qualification criterion is an indirect measure of likely performance of contractors in meeting project objectives. For the pre-qualification process to be logically complete, the effect of the criteria on the predominant project objectives needs to be known.

Case Study (1): Rehabilitation of Al Welada Hospital

Introduction

This case study presents the consequence of selecting lowest bidder to implement a rehabilitation project. The contract price was less than the project budget by an 18%. The case study demonstrates the process starting from bidding, awarding, construction, contract termination and project re-tendering. The project organization structure consisted of funding agency (Government of Italy), operating agency (PECDAR), beneficiary (Ministry

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of Health), supervisor (Municipality of Gaza), technical and financial auditor (consultant) and main contractor as mentioned in the figure 1.

Project Scope

The project scope was to rehabilitate a two-story health care building related to health sector in Gaza City (labor-delivery). Rehabilitation works included internal and external finishing works and electro-mechanical works. The main project outcomes can be summarized as follows:

- Fixing and painting wooden ceiling (Qarmeid cover), an area of 160 m².
- Masonry works, an area of 170 m²
- Plastering works, an area of 170 m²
- Painting works for walls, an area of 480 m²
- Laying of marble for windows ceiling, 45 m length
- Demolishing of old ceramic tiles in the WC units, an area of 65 m²
- Installation of new electrical main distribution boards (MDB).
- Fixing of marble steps, 20 steps in No.
- False ceiling works
- Fixing of new aluminum windows
- Rehabilitation of existing wooden doors

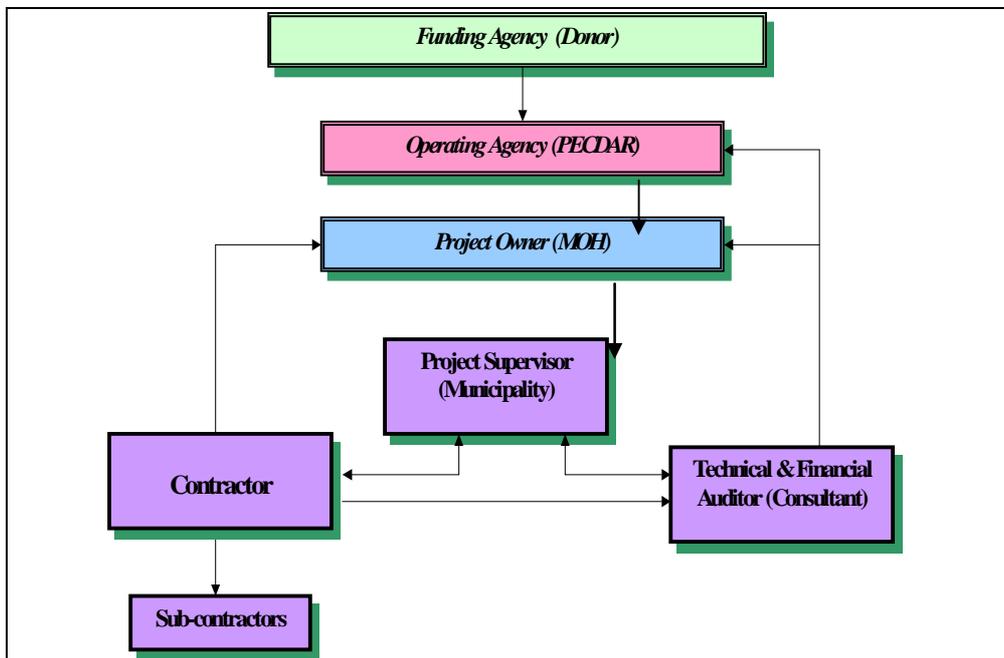


Figure 1: Project Organization Chart

Project Data

| | |
|------------------------|--|
| Project Name | Rehabilitation of Al Welada Hospital - Gaza |
| Donor Name | Italian Government |
| Owner Name | Ministry of Health (MOH) |
| Supervisor | Municipality of Gaza (MoG) |
| Sector | Building – Health care facilities |
| Location | Gaza City |
| Located Budget / \$ | 75,000 |
| Planned Duration /Days | 75 |
| Estimated Cost / \$ | 113,681 |
| Actual Cost / \$ | 93,069.6 |
| Actual Duration / Days | 240 |

Bidding process

Bidding stage

The bidding process was performed by the supervisor agency and administrated by the *operating agency* adopting the World Bank related guidelines. The bid was opened for all building classified contractors by the Palestinian Contractors Union (PCU) from class 2 to 4. The used awarding method was Competitive Bidding. By this method, the winner contractor is selected based to his financial offer after passing the preliminary examination process to check and verifies the completion of tender requirements. These necessities are: registration certificates, bank's guarantees, filling of the bid form and documents).

In this case study, no prequalification process was taken place. Five local contractors were involved in the bidding process. Three of them were classified as class 2, while the remaining was class 4. Complete bidding documents were provided including: general and private conditions, specifications, bill of quantities and drawings. Bidding process continued for 14 days, passing though all steps: advertising, bid sell, site visit, pre-bid meeting, tender submitting and tender opening meeting. The tenders were opened and financial offers were announced through an open meeting attended by concerned parties' representative including the contractors. The bidding process was completed according to World Bank Guidelines.

Evaluation stage

The evaluation stage started immediately after the bid opening date. The evaluation process conducted in the following steps:

- Preliminary examination process. This step included checking, by yes or No, the legibility, submitting bid security, bid completeness and substantial responsiveness of the contractor.

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- Prices corrections.
 - Price review (check of summation for BOQ items).
 - Technical advisor have followed up the correction of evaluation process and results according to job creation program guidelines and conditions.
- Based to the prepared bid evaluation report by project supervisor agency, revised by the program technical auditor and approved by the operating agency, Table 1 summarized the final contractor corrected bid prices.

Table 1: Final corrected contractors' bid prices

| S.N | Contractor Name | Class | Preliminary examination | Tender Amount \$ |
|-----|-----------------|-------|-------------------------|------------------|
| 1 | A | 2 | Pass | 133,218.5 |
| 2 | B | 4 | Pass | 109,731 |
| 3 | C | 4 | Pass | 93,069.6 |
| 4 | D | 2 | Pass | 155,762 |
| 5 | E | 2 | Pass | 128,060.2 |

Awarding stage

According to the bid evaluation report, the tender was awarded to the lowest price contractor (Contractor C as shown in the table 1). The supervisor agency considered this contractor as the lowest evaluated responsive bidder. This was approved by the operating agency in parallel with the technical advisor. It should be noted that the awarded price is lower than the estimated budget by 18%. The evaluation and awarding process duration was 21 days after the bid opening date.

Implementation Stage

The Planned project duration was 75 days. However, project was implemented within 240 days, which mean 165 days delay. Many factors contributed to this encountered delay which can be summarized as follows:

- Boarders closure and shortage of raw material in local markets
- The delay from the beneficiary side to hand over the project site to the contractor according to the planned schedule. The site hand over was scheduled in stages due to the nature of building under rehabilitation (continuous medical services to the public during 24 hours per day).
- The contractor was not able to continue project activities due to his unreasonable price in main project items. Based on that, the operating

agency decided to terminate the contract after 200 days from starting works.

- Re-tendering, evaluation and awarding processes took place and new contractor was selected to complete the project remaining activities.

Encountered problems

Based on abovementioned circumstances, the main encountered problem was that the project was delayed 165 days, during construction phase. Moreover, the project was terminated by the supervisor without completion by the contractor which was considered as a “lowest evaluated responsive bidder”. Through detailed investigations and revision of related documents and reports, face to face interviews with project parties (operating agency, supervisor, beneficiary and contractor), the followings were the main response behind this lengthy delay:

Bidding stage

The Bidding process as general steps followed the World Bank guidelines. Accordingly, all data were available to the competitors to prepare their offers accurately, site visits and pre-bid meeting were conducted by all project parties. However, the following problems were noted:

- By revision of tender documents, it was found that the level of documents prepared for this project was satisfactory to execute the project on time with acceptable level of quality. But, there was no coordination between the project parties, mainly the supervisor and owner. This was reflected on the negligence of accurate cost estimate which was prepared by the beneficiary (MOH). It should be noted that this estimate was not revised or discussed by the project parties before or during the bidding process.
- The opening invitation of the bid to all contractors' classes had contributed to this problem. The scope of the works needed relatively higher class contractor (not lower than Class 3) with considerable past experience in maintenance and rehabilitation works.
- The beneficiary agency that will be responsible for project operation was not involved in bidding stage.

Evaluation stage

- The evaluation process was carried out by bid evaluation and awarding committee that was formed from the supervising agency. Neither the project technical auditor nor the project beneficiary was involved in any evaluation or awarding steps. It should be noted that this was due to the internal regulation of the supervising agency (Municipality of Gaza) which limited the evaluation of bids to its internal staff. This resulted in

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awarding the contract without detailed analysis (Breakdown) of the contractor's bidding prices and specially the electrical items.

- As a result, a contractor was awarded with a price lower than the beneficiary's cost estimated by 18%. It should be noted that the awarding decision ignored this estimate and built his decision without considering the beneficiary cost estimate.
- The un-analyzed BOQ priced items of the awarded contractor resulted in un-balanced contract. Items were priced correctly while other was not. Among the most illogical priced items was the rehabilitation of Main Electrical Distribution Boards (MDB). This was not noted by the evaluation committee as no specialized electrical engineer was involved in this committee.
- The responsibility of technical auditor or operating agency was minor in this stage. The whole evaluation activities were completed by the supervisor agency which had all documents to do this assignment.

Implementation stage

- As mentioned above, MDB works were not profitable items in the contract of the selected contractor. Therefore, the contractor tried to postpone this item to the end of project by various means.
- From the supervisor side, the illogic price of MDB items was not discovered early. It was founded that the contractor loose if he implemented these works about 15,000\$ (about 17% of contract price). Accordingly, the contractor refused to perform these activities considering that the existing MDBs were in good condition. This was not agreed by the supervisor and beneficiary.
- Accordingly, the operating agency decided to terminate the project, liquidate the contractor performance guarantee and suspended the eligible contractors' payments and retention. Total amount reserved by the supervisor was about \$33,244. This amount was used later to cover the new contract budget.
- Re-tendering process was performed by the supervisor agency to complete the unfinished works in the first tender. This new bidding process was started 200 days after the initial project start date. This led to award the project to new contractor with a price of \$23,858 to perform the remaining MDB activities. It should be noted that the original contractor price for these activities was only 8,197 \$.
- The operating agency (PECDAR) finalized the project without any increase over the project budget. At the end of the project the first

contractor lost about \$15,700 to pay the new contractor the total amount of his contract from the reserved amount mentioned above in item 3.

Assessment

Owner opinion

The problem of project termination without finishing all the project items, and the project delay about 200 days was due to the selection of lowest price contractor by the supervisor's evaluation committees without taking into consideration the reasonability of contractor price and the detailed cost estimate prepared by experienced staff from the owner (MOH).

Supervisor opinion

The supervisor staff involved in project implementation stage agreed with the beneficiary opinion that lowest price contractor was not eligible to perform the works especially in the MDB items. They believed that if the bid was awarded to the second lowest price (about 5% lower that estimate), then the project could be implemented within time schedule and with satisfactory level of quality.

Contractor opinion

The contractor stated that it was his fault not to check the breakdown and offer of his electrical subcontractor related to MDB works. This was due to his short experience in the prices of electrical works.

Comments and lessons learned

- Implementing of the above project within 240 days (planned duration =75 days) was a problem to all project parties and not only to the contractor.
- Project cost estimate should be checked and agreed upon between all project parties before starting tendering stage.
- Bid evaluation process should be a joint effort task between related project parties and including various engineering specialization of expertise in order to be able to control and evaluate all the project items in early stage before starting the implementation stage.
- Bid evaluation should focus on the balance of items' prices and correctness of items unites prices.
- Awarding project should be to the *lowest evaluated responsive bidder*, who has the financial and technical capabilities and present the most logical and practical offer. Factors other than financial offer should be considered in the awarding decision.

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Case Study (2): Construction a sewage Pump station and pressure sewage line

Introduction

This case presents the consequence of selecting lowest responsive bidder to conduct an infrastructure project with a price lower than the estimated budget by 15%. The case study demonstrates the steps from starting bidding process, awarding, construction and handing over. The project organization structure consists of funding agency, operating agency, beneficiary (Municipality), Supervisor (Consultant) and main contractor as mentioned in the figure 2.

The project main activities were to construct a main sewage pumping station and its main pressure line. The project site was in the Middle Area Governorate. The project area extended from the proposed location where the pumping station should be installed to the location where the pressure line should end.

Project Scope

The main components of the project were:

- One sewage pumping station which pumps the collected sewage from the study area through a pressurized line to a gravity interceptor line located in the served Municipality.
- The gravity sewer which collects the sewer of target area by gravity to the sewage pumping station.
- A Steel pressure line which lifts the sewage from the pumping station to a location that would make it possible for the sewage to flow through a gravity line.

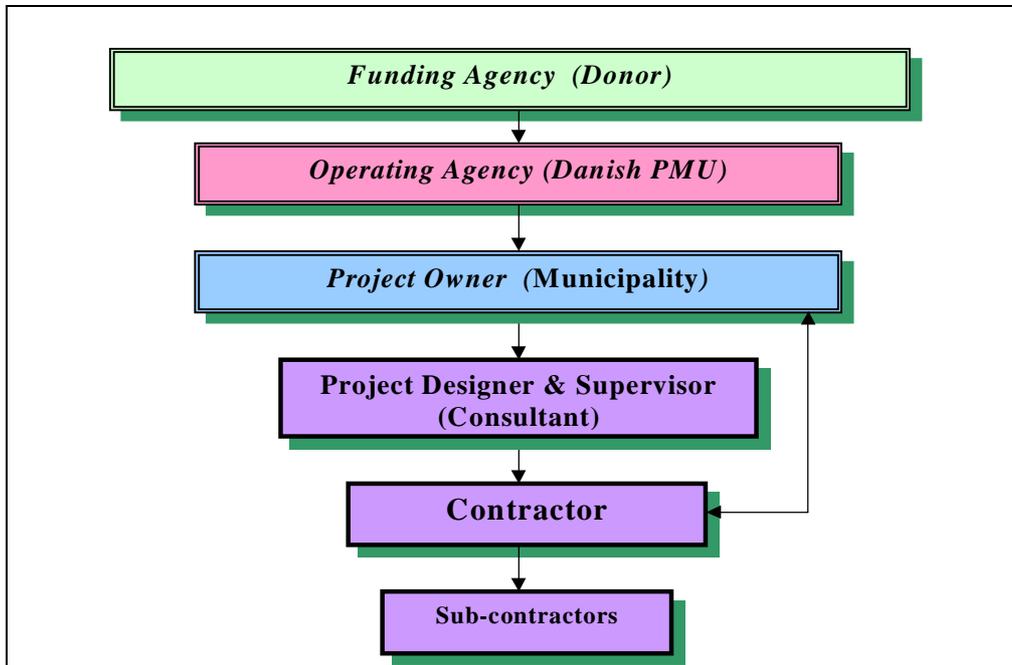


Figure 2: Project Organization Chart

Project Data

| Project Name | Construction a sewage pump station and pressure sewage line |
|------------------------|--|
| Donor Name | Danish Government - SMDM Program - |
| Owner | Zawaida Municipality – Gaza Strip |
| Operating Agency | Danish Project Management Unit (PMU) |
| Designer & Supervisor | Local consulting firm |
| Sector | Infrastructure |
| Location | Middle Area- Gaza strip |
| Located Budget / \$ | 340, 000 |
| Planned Duration /Days | 120 |
| Estimated Cost / \$ | 430,521 |
| Actual Cost / \$ | 368,143 + 63,000 as claim (Tot = 431,143) |
| Actual Duration / Days | 230 |

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Bidding process

Bidding stage

The bidding process was performed by the beneficiary and administrated by the operating agency adopting the FEDIC guidelines. The Bid was opened for all building classified contractors by the Palestinian Contractors Union (PCU) from class 1A to class 2. The used tendering method was Competitive Bidding. In this case study, no prequalification process was taken place. Seven local contractors were involved in the bidding process of this project. Three of them were classified as class 1A; three were 1B, while the remaining was class 2. Complete bidding documents were provided including: general and private conditions, specifications, bill of quantities and drawings. Bidding process continued for 21 days, passing though all its normal steps: advertising, bid sell, site visit, pre-bid meeting, tender submitting and tender opening meeting. The tenders were opened and financial offers were announced through open meeting attended by concerned parties' representative including the contractors.

Evaluation stage

The evaluation stage started immediately after tenders opening date. Similar process steps are followed in this case study to that implemented in Case study No. 1. Based on the prepared bid evaluation report by project owner, table 2 summarizes the final contractor corrected bids' prices. What is new in this case study was the negotiation meeting with all bidders after announcing their financial offer in order to get a discount due to exceeding project budget. The owner asked all bidders to attend a negotiation meeting in which only three bidders (A, B & E) agreed to give price discount varied from 3% to 7%. The prices mentioned in table 2 were after discount.

Table 2: Final corrected contractors' bid prices after discount

| Contractor Name | Class | Preliminary examination | Amount \$ |
|-----------------|-------|-------------------------|-----------|
| A | 1A | Pass | 381,441 |
| B | 2 | Pass | 368,143 |
| C | 1A | Pass | 388,179 |
| D | 1B | Pass | 390,674 |
| E | 1B | Pass | 375,947 |
| F | 1B | Pass | 410,228 |
| G | 1A | Pass | 445,165 |

Awarding stage

According to the bid evaluation report (including the negotiation meeting outputs) that was prepared by the owner and approved by the operating agency, the contract was awarded to the lowest price contractor (Contractor B as shown in table 2) with total amount of 368,143 \$. It should be noted that the awarded price is lower than the estimated budget. The evaluation and awarding process was completed within 10 days from tenders opening date.

Implementation Stage

The planned project duration was 120 calendar days. However, this project was performed within 230 days, which mean 110 days delay. Many factors contributed to this encountered delay which can be summarized as follows:

- Boarders' closure and shortage of raw material in local markets in some project stages.
- Unseen conditions due to the rise of groundwater level in winter season. This condition was not clearly specified in tender document or site visit. This condition delayed all earthworks, excavation and concrete works. It led to necessitate of additional time, cost and effort from the contractor
- The unreasonable price in some project items specially the electromechanical items, mainly imported pumps and related accessories.

Encountered problems

Based on abovementioned circumstances, the project was delayed 110 days. Through detailed investigations and revision of related documents and reports, site documents and related files, face to face interviews with project parities (operating agency, supervisor, owner and contractor), the followings were the main reasons behind this delay:

Bidding stage

- The operating agency, which was the fund agency representative, started the tendering stage knowing that the located budget is not sufficient to cover all the project activities as designed. The operating agency did not take into consideration the cost estimate prepared by the project designer consultant. This led to looking only for the lowest price bidder without considering its qualifications or previous experiences in similar projects.
- The opening of bid to all contractors without prequalification for this specific project type contributed to this result. The scope of the works needed contractor with similar experiences and significant financial resources which were not the case with the selected contractor.

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- By revision of tender documents, it was found that the level of documents prepared for this project was satisfactory to execute the project on time. The only main missing item to be clearly identified was the nature of the project site, soil strata classification and water table location. The soil tests prepared by the designer consultant were not included as a part of the tender documents. Moreover, the level of water table in the site when starting execution was above the indicated level in the tender documents.

Evaluation stage

- The evaluation process was performed by tenders evaluation and awarding committee which was formed from the owner and operating agencies. Neither the project designer consultant nor the supervisor consultant was involved in any steps of the tenders' evaluation. It should be noted that this was due to the internal regulation of the operating agency which limited the members of the evaluation committee to the agency/owner staff members only. This resulted in awarding the contract without details analysis of the contractor's bidding prices.
- As a result, a contractor was awarded with a price lower than the designer's cost estimated by 15%. It should be noted that the awarding decision ignored this estimate.

Implementation stage

- As mentioned above, the excavation works in existing of high groundwater level was not considered realistically in the awarded contractor price. Therefore, the contractor faced many problems that required extra time and cost from project starting day.
- From the supervisor side, a mistake in auditing contractor price was found in a later stage during construction. The tenders evaluation and awarding committee neglected to account main bill in the offer of tender of the selected contractor. The forgotten bill price included many items necessaries to complete the project and can't be canceled, the total offered price of this items were about \$65,000.
- Accordingly, the contractor asked for extra cost beyond the contact price. When the owner refused, the contractor stopped the works. Negotiations were taken between the whole project parties and all agreed to compensate the contractor in the earthworks prices and the consideration of the forgotten items which led to extra cost to the project budget equal to about \$63,000.

Assessment

Owner opinion

The problem of project delay and extra cost resulted from none securing the availability of project budget as estimated by the project designer.

Supervisor opinion

The supervising staff involved in project implementation stage stated that the lowest price contractor was not eligible to perform the works due to his lack in experiences with similar projects. They believed that such type of project needed to be conserved only to pre-qualified contractor. In addition, the mistakes in checking contractor offered prices in evaluation stage added additional problem in this case.

Contractor opinion

No input was received from the contractor. His only comment was that he is not responsible on the incompleteness of tender documents (mainly the issue of groundwater table) and also the evaluation committee mistakes.

Comments and lessons learned

- Implementing of the project within 230 days is a failure to all project parties not only the contractor considering that the planned duration was 120 days.
- For such specific project, it is recommended to prepare a pre-qualification process to guarantee the experiences and capabilities of bidders.
- For local circumstances regarding project funding, it is not recommended to start any tendering process without securing the whole project budget.
- Bid evaluation process should be attended by project consultant (Designer and supervisor) to provide more technical support.
- The awarding project should be to the lowest evaluated responsive bidder, who has the financial and technical capabilities and present most logical and practical offer. Factors other than financial offer should be considered in the awarding decision.

Case Study (3): Construction of new sewage pump station

Introduction

This case presents the consequence of selecting lowest responsive bidder to conduct an infrastructure project with a price lower than the estimated budget by 2.5%. *But*, the estimation is lower than the average of the bidders' prices by about 12%. Only the lowest bidder had a price lower than the cost estimate. The case study demonstrates the steps from starting bidding process, awarding, construction and handing over. The project organization structure consists of funding agency, operating agency, beneficiary

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(Municipality), Designer (Consultant 1), Supervisor (Consultant 2) and main contractor as mentioned in the figure3.

The project main activities were to construct a main sewage pumping station and its main pressure line. The project site was in the Middle Area Governorate. The project area extended from the proposed location where the pumping station should be installed to the location where the pressure line should end.

Project Scope

The pumping station consists of:

- Inlet chamber
- Bar screen system
- Pump wet pit (with capacity of three vertical submersible pumps) & valves chamber
- Standby generator
- Transformer, LVSC and HVSC, and switchgear rooms
- Overflow control system
- Water hammer controlling system
- Administration, guard and WC.
- Parking and landscaping

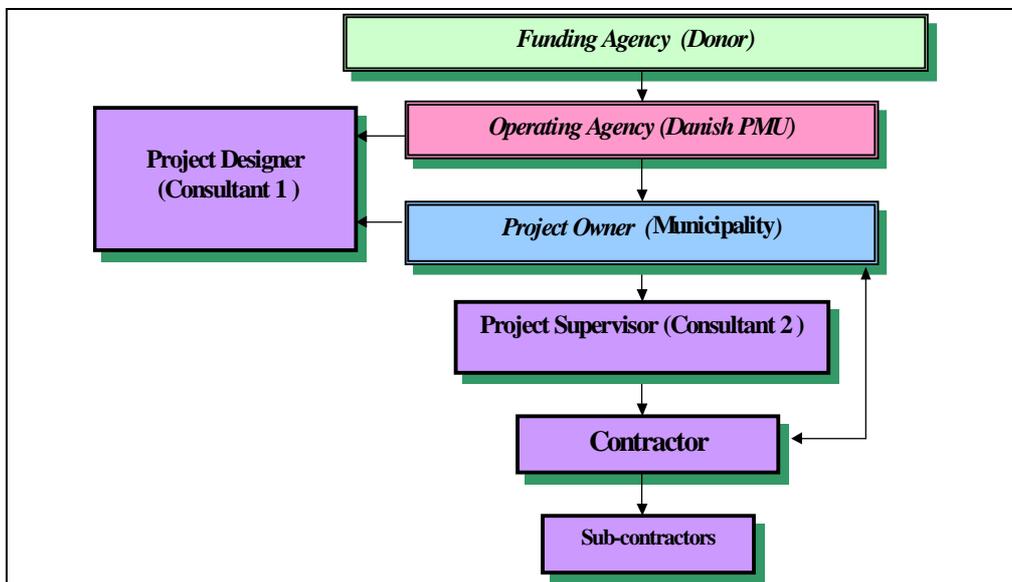


Figure 3: Project Organization Chart

Project Data

| Project Name | Construction of new sewage pump station |
|------------------------|--|
| Donor Name | Danish Government - SMDM Program - |
| Owner | Nusirat Municipality – Gaza Strip |
| Operating Agency | Danish Project Management Unit (PMU) |
| Designer | Local consulting firm 1 |
| Supervisor | Local consulting firm 2 |
| Sector | Infrastructure |
| Location | Middle Area- Gaza strip |
| Located Budget / \$ | 400,000 |
| Planned Duration /Days | 210 |
| Estimated Cost / \$ | 443,198 (prepared by the designer-consultant1-) |
| Actual Cost / \$ | 433,333 |
| Actual Duration / Days | 397 |

Bidding process

Bidding stage

The bidding process was performed by the owner and administrated by the operating agency adopting the FEDIC guidelines. The Bid was opened for all building classified contractors by the Palestinian Contractors Union (PCU) from class 1A to class 1B. The used tender method was Local Competitive Bidding (LCB).In this case study, no prequalification process toke place. Five local contractors were involved in the bidding process of this project. Three of them were classified as class 1A, while the remaining was class 1B. Complete bidding documents were provided including: general and special conditions, technical specifications, bill of quantities and drawings. Bidding process duration was 29 days, passing though all its normal steps: advertising, bid sell, site visit, pre-bid meeting, tender submitting and tenders opening meeting. The tenders were opened and financial offers were announced through open meeting attending by concerned parties' representative including the contractors. It can be said that the bidding process was completed usually according to FIDIC Guidelines.

Evaluation stage

The evaluation stage started immediately after tenders opening date. Similar process steps were followed in this case study to that implemented in Case study No. 1. Based to the bid evaluation report by project owner, table 3 summarized the final contractor corrected bid prices.

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Table 3: final corrected contractors' bid prices

| Contractor Name | Class | Preliminary examination | Amount \$ |
|-----------------|-------|-------------------------|-----------|
| A | 1B | Pass | 433,333 |
| B | 1A | Pass | 539,102 |
| C | 1A | Pass | 499,622 |
| D | 1B | Pass | 457,840 |
| E | 1A | Pass | 487,778 |

Awarding stage

According to the bid evaluation report which was prepared by the owner and approved by the operating agency, the tender was awarded to the lowest price contractor (Contractor "A" as shown in the above table). It should be noted that the awarded price is the only lower price than the estimated budget, as it is lower than the average of the bidders' prices by about 12%. The evaluation and awarding process duration was no more than 7 days from bid opening date.

Implementation Stage

Planned project duration was 210 calendar days. However, the project was performed within 397 days (Hand over on 30 November, 2005), which means 187 days delay. Many factors contributed to this encountered delay which can be summarized as follows:

- Boarders closure for many periods during project implementation and shortage of raw material in local markets
- The estimated construction period proposed by the project designer as stated in tender documents was unreasonable. The time frame did not considered the unique site conditions to excavate for 10m below natural ground level where dewatering process is needed starting from 7.0m depth. Moreover, the designer was not aware of the method statement for implementing project in such complicated conditions.
- The contradiction between design data provided in the tender documents regarding the soil profile and existing water table levels in the project site and what was found during the implementation.
- The technologies used for dewatering and protection of excavation sides in the project site resulted in a differential settlement for on going structure in the project site. This badly affected the progress of works.
 - The cost estimate provided by the project designer (Consultant 1) was to someway under-estimation for such project conditions.

Encountered problems

Based on above mentioned circumstances, the main encountered problem is that the project was delayed 187 days. Through detailed investigations and revision of related documents and reports, site documents and related files, face to face interviews with project parties (operating agency, owner, designer, supervisor and contractor), the followings were the main reasons behind this delay:

Bidding stage

- The project designer, prepared under-estimated project cost. This created many variation orders and claims from the contractor side which affected the progress of the works
- No prequalification process was carried out for this project. In this type of project the prequalification of contractors was required.
- By revision of tender documents, it was found that the level of documents prepared for this project was not satisfactory to execute the project on time. Many missing items should be clearly identified to the bidders before the submission of their tenders.
- In addition, the project designer was not involved in the tendering stage due to the policy of the operating agency.

Evaluation stage

- The evaluation process was performed by bid evaluation and awarding committee formed from the owner and operating agencies. Neither the project designer nor the supervisor was involved in any steps. It should be noted that this was due to the internal regulation of the operating agency. This resulted in awarding the contract without analysis of the contractor's price and just comparing it with the cost estimate.
- As a result, a contractor was awarded with a price lower than the designer's cost estimate by 2.5%. The designer's cost is lower than the average of the bidders' prices by about 12%, which should be a reason for the evaluation committee to reconsider the second or third price and also to ask for justifications from the project designer.

Implementation stage:

- As mentioned above, the soil conditions during excavation works (groundwater level) was not clearly identified in the design documents. Therefore, the contractor faced many problems since the project starting day.
- Despite the above point, the contractor did his best to commit with project technical requirements in such unique site conditions above.

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- Additionally, over design for the main structural elements were presented by the designer in the tender documents. Based on that, the contractor provided a “re-design package “for main structural works during the project implementation. This also influenced an ordinary progress of works.

Assessment

Owner opinion

The owner stated that he provided hiring consultancy services (design and supervision) as he recognized the nature of the site conditions and complicated implementation requirements. He stated that the delay is due to the unique natural of soil conditions and no availability of high technology in Gaza to overcome such soil conditions. For that no liquated damages were applied on the contractor.

Designer Opinion

The designer stated that the tender documents were completed and all site conditions were clearly identified to the bidders and the estimation was reasonable at the time of preparation. He reflected the problem to the method statement used in the project implementation by the contractor.

Supervisor opinion

The supervisor staff involved in project implementation stage stated that the contractor was doing his best to overcome all site obstacles. However, they stated that the unique site condition, unreasonable project duration and primary technology available in Gaza to execute the work all contribute to the project delay. In addition, the supervisor staff stated that the final project amount is approximately the same as the price of second bidder; this amount was 12% above the designer cost estimate.

Contractor opinion

The contractor stated that he provided all available technical and financial resources to resolve implementation problems. However, the change of soil type from that in tender documents and the re-design of many structural elements which was approved by project designer/supervisor were behind the delay of the project.

Comments and lessons learned

- The project period and estimation should be correctly estimated by project designer and owner based on method statement prepared in design stage.
- For such specific project, project designer and supervisor consultants should be involved strongly in tendering, evaluation and awarding stages.

- This case study showed that project delay or failure is related to select lowest price tender, and also related to lack of experience of project parties during design, tendering and construction stages.

Conclusion

The finding obtained from the three case studies exposed in this study is the existence of a proportional relation between awarding bids to lowest price and the problems encountered during implementation. The three cases of the study were awarded to lowest price contractors; the results show the existence of the following problems:

- Considerable delay in the project handover.
- Disputes between the project partners.
- Contractor's claims against the client which lead to disputes issues
- Low level of quality in some items.
- Increase of the final project cost.

There is a need to change the traditional system for contractor selection and awarding contracts from the "lowest price" to "multi-criteria selection" practices. This can be implemented by establishing alternative methods to select contractors based on technical and financial criteria. The local official authorities ought to make legislative changes on related statutes law, so that the awarding committees can lawfully consider not only cost but also other technical factors that are useful to predict the quality of the construction. The evaluation of contractors requires information related to the past performance of contractors during the past years, such information is generally obtained from contractors only, which represent imprecise source of information. It is recommended to establish a specialized public institute responsible of recording and archiving data related to the implemented projects in Gaza Strip. The role of this institute will be helpful to all clients related to the local construction sectors, in addition, such institute will offer a firm and accurate information to the evaluation and awarding committees and all others interested organizations. It is necessary to structure this issue through an official public organization like the 'Central Bidding Committee'.

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