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Management of Dispute Factors in Engineering Contracts and the Proposed Remedies

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***Abstract*: *Generally, most projects are not completed within time, cost, scope for various reasons, and this is accompanied by the emergence of disputes among the contracting parties. Disputes occurred as a result of failure to define the scope of work accurately by the employer which will be followed by the inaccuracy of the time and the estimated cost of the project, the imbalance of prices submitted by the contractors and the unrealistic data of the project activities schedule and the material supply schedule, the selection of contractors without suitable criteria, non-availability of the required financial allocations within the specified times, lack of integration between technical and legal departments in preparing the draft contract to reach a common opinion, lack of experience of executive or supervisory employees in dealing with disputes that occur during the course of work, which leads to their escalation. Four case studies related to dispute in construction contracts which have been resolved by the court were investigated. Triggers for these disputes were discrepancies in change order evaluation as a result of undefined or an accurate project scope, unsuitable site conditions, double meaning of specifications, design mistakes and excessive contract quantities fluctuation, unavailable financial allocations and the subcontractor's lack of experience on similar projects, as well as the main contractor's lack of expertise and capability are the reasons with importance weighting in these case studies. Therefore, taking proactive steps for the purpose of minimizing these disputes and their negative effects through preparing realistic feasibility studies for projects and allocating sufficient time for these studies, in addition to activate the role of surveying engineers and qualifying them to play their effective role in determining quantities and prices accurately and using specialized engineering programs in addition to modern methods of calculating Project completion rates using Earned Value*.

Keywords: Change order, Dispute, Earned value, Feasibility studies.

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1. INTRODUCTION

Construction sector is greatly differed than other sectors and it encompasses a wide range of activities, climatic conditions, various skill sets and work environments, making it one of a kind. (1,2).

Construction industry is considered one among the most attractive industries for investments within the nation economy, as it constitutes a percentage ranging between (40% - 50%) of the total annual investment in most countries of the world.

As infrastructure projects and the environments in which they are found get more complicated, the necessity for construction managers to complete projects on schedule, within budget, and conformance with the required quality has become a key concern. (3, 4). There is a different type of projects, including complex and huge, infrastructure projects, buildings, factories, etc., and accordingly there are many forms of contracts used in these projects. Some of them are related to design, consultancy, design and implementation contracts (turnkey contracts), implementation projects only, construction management contracts, and maintenance and operation contracts...etc.

Insufficient contractor experience, Interference by the owner, labor poor productivity, funding and payments shortage, inappropriate planning, delayed decision making, and subcontractor issues were among the top ten elements that cause time delays in the Jordanian construction sector. (5,6,7).

According to research undertaken in the UAE, improper leadership, inadequate planning at earlier phases, shortage and failure of equipment, delay of drawing approval and decision making, shortages of trained workers, poor management, and inadequate site oversight were among the primary reason for time delay in the construction sector (8, 9,10).

Signing contracts without the involvement of the legal departments may lead to many issues in the different stages of the project. it is required that the contract language and wording be specific and well drafted due to the critical importance of them, don't cause misinterpreting, aligned with law and rules, and the contract type should be suitable to the type of contracted work.

The contract terms should clarify the role and responsibility of each party to the contract to avoid any contractual disputes that could lead to a conflict that occur in the absence of a thorough and good study of the project, insufficient detailed drawings before signing the contract, or failure to provide the necessary financial funds for additional works. There are many types of contracts that can be chosen according to the desire of the contract parties to share the accountability and responsibilities contained in the contract to ensure its smooth implementation. However, due to the multiplicity of types, nature and parties of project contracts, there are also many methods and strategies for settling claims and resolving disputes in the construction sector. (11)

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Dispute Concept

The dispute is a disagreement between the two contracting parties regarding the project contract items, or one of its documents and this dispute turns into a claim unless it is resolved on the site and occurs when one of the contracting parties documents the issue of the dispute in written form.

The General and Direct Reasons for the Emergence of Disputes in the Contracts of Construction Projects

Claims for additional financial and requests to extend the implementation duration are the most common reasons for the occurrence of construction projects disputes between the contracting parties, as the discrepancy in views between the contracting parties towards these claims for financial compensation and extensions for the project implementation period will be based primarily on verifying whether the claims were for items that were intended making changes within or outside the approved scope of the project, what is the additional cost, and finally what are the effects of these changes on the approved schedule.

One of the direct reasons for the emergence of disputes in construction project contracts is the ambiguity in the aspects of the project due to the lack of clarity of objectives, and the continuous request for modifications and changes in order to be able to overcome this ambiguity. It is also noted that the inability to define the scope of the project accurately and correctly or the emergence of unreality expectations of project stakeholders or poor performance during the work stages are one of the main reasons for the emergence of contractual problems and disputes, and represents unsuitable skills of the employees working in the project and the insufficient communication between those involved in the project.

Construction Projects Dispute Resolution Strategy

The resolution and settlement of construction contract disputes depends largely on the desire of the contract disputing parties to resolve the dispute, in addition to the clauses of the contract itself. Resolving disputes mechanism in projects must be included in the contract clauses or items, and the description of the solution and its mechanism should be clear and specific as well that specifically shows the methods of settling disputes and the judicial references for that. In government contracts, a clause is included demonstrating that the methods of settling disputes are first through negotiation and then by arbitration or the courts.

The Strategies That Used To Settle Engineering Disputes Can Be Divided Into:

- The first strategy: The aggrieved party is returned to the state it was in before the other party broke the contract's provisions.
- The second strategy: The aggrieved party given the least compensation that it can be accepted in its claim for the damage and loss that happened.

Preparing the Required Documents for Claims in Disputes

The claim must be well prepared to determine whether it is legal or not before proceeding to resolve the conflict that request by the party who believes that he has the right to claim and must prepare a large number of documents like bill of quantities, approved drawing, records,

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work progress schedules, authentication, detailed plans and cost estimates change orders, etc. All these documents are required to prove his right, as good preparation of the claim, especially the supporting documents, are one of the most important requirements for his claims. Also, the legal procedures for making the claim must be taken into account in terms of time and objectivity.

Various Case Studies of Conflicts That Seen in Court

1. The First Case: Stopping Work As A Result of the Security and Safety Condition

The contractor claimed that he had previously contracted with the employer under Contract No. (10) for the year 2010 for an amount of (5,000,000,000) ID and the variation order No. (1) was issued on 12/24/2012 for the purpose of reducing the quantity and reducing the contract amount to (4,100,000,000) ID. The contractor company has completed (73%) of the contract amount and the completion percentage has been approved by the resident engineer, and due to problems at work and the company's employees being threatened with death by armed gangs, the company was forced to withdraw from the work site and accordingly the employer issued a decision to withdraw the work and assign the project to a government company to complete the remainder of the work and charge the contractor the difference in the implementation prices for the remaining items amounting to (2,500,000,000) ID.

In this case, the contractor requests the agreement on calculating the percentage of completion to estimate the value of the completed work and then calculate the difference in the implementation prices for the remaining items. As for the employer, he demands that the contractor should pay the difference in price for the implementation of the remaining items, in addition to the damages that occurred in the project, which it was not caused by the contractor.

Generally, the value and cost of the work performed should be calculated based on the actual items implemented quantities with regard to the bill of quantities. As for the amount of the difference in the implementation prices for the remaining items, it is calculated, taking into account any increase or decrease that occurred on the executed quantities, and any items that were not mentioned in the bills of quantities should be excluded with note if there is any change in the designs, as if this is proven, the contractor will not be charged the amount of the difference in the implementation prices for the remaining items and the compensation request will be rejected by the court.

2. The Second Case: Unskilled Client Employees and Poor Communication

The contractor claimed that his company had previously contracted with the employer for the purpose of supplying the employer's company with gravel to an asphalt site of the Traffic Highway project located in Muthanna Governorate, and he claimed that he fulfilled all the contract obligations and the completion date on 19/1/2015 according to the report issued by the client company and the amount of (100,000,000ID) remains withhold by the client company.
By reviewing the laboratory tests of the gravel, it becomes clear that more than half of the contractual quantity has been provided and examined within the contractual period, and therefore it is not covered by the delay penalty. Therefore, the sums deducted from the delay penalty for this quantity were returned.

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3. The Third Case: Ambiguine and Unclear Contract Clauses and Poor Documentation

The contractor claimed that he had previously contracted with the employer under a joint venture work agreement as a second partner to jointly participate in the completion of a project for the development of the cities of Basra and Al-Amarah and update the basic design for them and in accordance with the specific obligations of each party to this agreement. And that the employer received the financial dues from the beneficiary by three checks without paying the agreed percentages according to the terms of the contract.

By examining the case documents, it was found that the contractor had one of his employees signed the checks that are the subject of the case, and this alone is considered an acknowledgment of his receipt of his contractual percentage, and accordingly the case is rejected.

In this case, the contractor lost his rights due to several reasons, the most important of which are:

- Delayed claiming for several years, which resulted in the move out or retirement of the employee and the inability to reach him.
- Not to open a joint account between the parties to the case in which the received instruments are deposited, which guarantees the rights of both parties.
- Failure to expressly and clearly define the obligations of each party to the contract, which has resulted in the emergence of many disputes.

4. The Fourth Case Study: Well Defined Procedure for Disputes Settlements

The employer claimed that he had previously contracted with the contractor to implement a project (implementation of an 18-classes secondary school) under the contract condition, and due to the contractor's reluctance to implement its contractual obligations, an initial warning letter was issued urging him to increase his efforts because the work is proceeding very slowly. Due to the contractor's failure to respond to the initial warning letter, the final warning was sent, but the contractor also did not comply with the contractual terms. And as the contractual period ended with all the extensions on May 31, 2013 and the project works were not completed, the work was withdrawn from the contractor and the rest of the works items carried out on his account. Therefore, he requests to obligate the contractor to pay an amount of (300,000,000 ID) in favor of the employer.

By reviewing the case documents, it was found that the employer had taken all the procedures adopted when the work was withdrawn in the presence of the representatives of the second party to the contract to measure the actual work that sone by the contractor before work was withdraw, as well as the approval of the representatives of the second party on the implementation prices for the items from which the work was withdrawn and implemented at the expense of the contractor.

In this case, the available data is sufficient to determine the entitlement of each of the contracting parties, taking into account that the contractor will not bear the price difference for the costs incurred in implementing the new items or the contractual items that exceed 20% of the contracted bill of quantities.

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From The Previous Case Studies the Frequent Conflicts in Projects and Ways to Deal with Them Can Be As Follow:

1. The Contractor's Reluctance and Inability to Complete the Implementation of the Contract Items Due To Financial Problems or Security Conditions

Many projects face the problem of stopping due to the lack of financial allocations or security conditions, which is followed by the need to measure the work that have been done and the exist situation to indicate the right of each party, as well as to be able to refer the work later to another implementation company. When making the measurement for the exist situation (which is in the presence of the contractor or his official representative and in the event of his refusal, a judicial permission is obtained) it must be carried out according to the actual measurement of the executed works and compared to the quantities mentioned in the bill of quantities and the approved change orders, and then calculating the amounts due. However, it is noted that some contracting parties calculate the percentages of completion as a measure of the contractor's financial entitlements, despite the fact that the contract is based on price founded in the bill of quantities, and this represents a waste of one contract parties money because calculating the value of the work performed must be according to the measurement of the executed quantities contained in the bill of quantities and according to the prices established against each of them. Also, many committees neglect to read the contract items and clause carefully to ensure the rest of the contractual obligations of the contractor, for example, deduction of sums for failure to complete (as built drawing) or the expenses of training on certain devices or for the processing of laboratory equipment and other items contained in the contract.

2. Changing the Project Site Due To Problems in the Soil of the Site

The dispute in this case occurs when the contractor prepares the work requirements and begins part of the work, and then a case of changing the project site and replacing it with a new site occurs, and this requires determining the costs resulting from the implemented items and compensating for them with the additional periods necessary to complete the work in the new site.

This problem can be avoided by not starting to make any design or announcing a tender unless the ownership of the land is confirmed, and then conducting soil investigations to be able to start the subsequent steps and avoid a cause of conflict in the projects.

3. Cancel And Or Create Items in the Bill of Quantities

In construction projects, situation that led to variation orders have been identified by researchers. As every project is unique than other projects, unanticipated situations, and resources limitation of available time and money for planning, execution, and a project delivery, it was suggested in a study of public school building those changes are unavoidable in construction projects (12). Furthermore, there are a variety of reasons for construction change, including each project uniqueness and the difficulties in future forecasting (13,14). Change occurs as a result of omissions and errors, scope of work variations, and unexpected circumstances (15). Changes are usually the consequence of underlying reasons such as design flaws, unanticipated site and weather conditions (16). Trying to reduce as much as possible

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the change in the specifications of the items, except for the utmost necessity, since any change must be followed by an additional cost and time, and the resulting extension of the project completion date. In addition to the necessity of describing the items in an accurate manner that does not accept more than an interpretation and specifying the required specifications and the acceptable origin.

1. Items Price Imbalance

It is noted in most contracts that the prices of the items that are implemented at the beginning of the work have been charged a high percentage of profits by the contractor and that the items that are implemented in the last stages of the project are less than their real cost.

This problem shows its effects when withdrawing the work from the contractor and referring it to another contractor, charging the contractor and resorting to the courts for the purpose of charging the contractor the amount of the difference in the implementation prices for the remaining items.

2. Performance Measurement and the Weights of the Items in the Work Progress Schedule

This section covers the basics of measurement and assessment of performance. performance measurement includes a practical technique for assessing managerial performance, human resources management, and establishing company strategy (17). Policy and strategy implementation as well as collecting feedback are conducted through Performance measurement systems (18). A set of metrics must be defined in order to adequately evaluate performance. Most work progress tables have unrealistic weights fixed for the items that are implemented at the beginning of the work for the purpose of showing the project ahead of the planned completion rate, which gives an unrealistic picture of the stages of progress of work in the project. The presence of an accurate estimated cost of the project items, calculated before it is announced, contributes to reducing this problem by adopting the weights of the work items in comparison with the estimated price of the item to the total estimated cost of work.

3. Additional Costs and Periods for Infrastructure Items Due to Design Errors

Design errors occur due to a shortage of understanding of fundamental engineering principles, insufficient detail of requirement, or last-minute adjustments with the absent of proper evaluation of the consequences of this variation (19,20). Design errors include things like insufficient experience and training, client/end-user issues, insufficient quality assurance, competitive professional fees, time limitations, ineffective coordination and integration, and inadequate consideration for constructability. (21,22). A number of requests arise to add quantities and periods to the implementation of items under the foundations due to an accurate calculation during the study phase by the beneficiary, or the absence of soil investigations. Also, the contractor may face many problems due to his failure to visit the site and ensure the elevation of the project compared to the surrounding buildings before submitting his bid. For the purpose of reducing this problem, it requires giving sufficient time to the specialist with calculating quantities through conducting a field survey for the purpose of providing the estimation engineers with accurate data, in addition to the soil investigations that are required to be conducted by accredited bodies (23). There are also many advanced engineering programs

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that can be used to calculate quantities such as (CIVIL 3D AUTOCAD, REVIT, PLANSWEFT…….) to reduce human error as much as possible. also training and choosing the sufficient designers is very important for reducing conflict in these items (24).
Aluminum production projects are among the projects in which the importance of industrial management is clarified, due to the importance of this product [25] [26] [27] , as it contains many alloys with different physical and mechanical properties. Therefore, the process of including manufacturing costs is considered compared to the properties of the final product in terms of price and the percentage of sustainability[28] [29] [30]. The actual half-life of the product compared to the properties mechanics of the final product and the intervention of efficient project management to obtain high-performance aluminum alloy products with the price acceptability of new alloys. [31] [32] [33] [34] [35]

2. CONCLUSION AND RECOMMENDATIONS

By studying the different dispute cases, it becomes clear that most of the conflicts arise for financial, technical or administrative reasons, which require the remedies of each case in relation to it, as follows:

1. Disputes Due To Financial Reasons, Such As the Lack of Financial Allocation:
In this case, an accurate schedule must be prepared that includes the actual weights of the item according to the estimated costs, while calculating the necessary cash flows accordingly.
Attracting financially efficient companies for the purpose of participating in tenders, and this is done by canceling the advance payment clause.

2. Disputes As A Result of Not Defining the Scope of Work Accurately and the Subsequent Changes during the Course of Work:

- It requires giving a sufficient time to surveying engineers to conduct detailed surveys and then handing over accurate data to the estimation engineers for the purpose of determining the quantities accurately, taking into consideration the necessity of using advanced engineering programs in calculating quantities to reduce the error as much as possible
- Update the information related to the prices of materials and prices of implementation of the work items, as well as the methods of implementation to ensure that the estimated costs are accurate.

3. Disputes As A Result of the Percentages of Planned, Financial and Technical Achievement:

- The best solution is to adopt the weights of the items relative to their estimated cost determined by the client beneficiary, given that this percentage will represent the acquired value (EARNED VALUE).
- Adopting an accurate estimation of the periods needed to implement the items before announcing them in order to determine the necessary and sufficient period for the implementation of the project
- Emphasis on the submission of an accurate timetable by the contractor, accompanied by a timetable for supplying resources, and it is approved after making sure of its reality and the

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possibility of implementation according to it being an essential document when considering disputes.

4. Documentation

- Documentation of lessons learned from previous projects: It is an important database that is referenced in new projects, as well as benefited from by project managers who are assigned to similar projects.
- Documentation of the best applications and methods of implementation: which saves a lot of effort and time for new projects.

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