

A Proposed Approach for a Balanced Construction Contract for Mega Industrial Projects in Egypt

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Abstract: Nowadays, strong organizations make efforts to ensure that successful relationships are kept up through terms that encourage collaboration and support manage risk. Despite the importance of the existence of several forms of construction contracts for standardization contractual clauses in Mega industrial projects, standardization inevitably reduces the flexibility of these documents and their ability to adapt to all possible circumstances and parties' interests and needs. Contracts can function as an administrative tool for effective dispute control and project management by allocating each significant risk factor to the party who is capable to bear, manage, or mitigate it. The Conditions of Contract for Plant and Design Build {FIDIC form 2017 Yellow Book} were studied and examined to address the risky clauses. Some amendments were made to mitigate the project's significant risk factors and change the contract into a risk-balanced contract that could be used as a project management tool. These amendments focused on the specific requirements of Mega industrial projects, strive hard to address some problems such as the responsibility matrix between the Employer and the Contractor, limitation of liability, resolving procurements problems, Design errors, and contradiction in documents, the need for coordination between contractors and subcontractors, the importance of adhering to the project program, and linking delay damages with the project milestones. The outcomes of this study will be highly valuable to contract parties in terms of good managing projects, reallocating, reducing, and managing risk, and dispute avoidance.

Keywords: Risk allocation, project management, FIDIC 2017 Yellow Book, Delay Damage, Milestones.

1. INTRODUCTION

Contracts are core business assets, however, the inherent complexity, scope & scale, and long-term duration, make construction projects susceptible to future uncertainties. The research on forms of disputes in the construction industry conducted by Ramonu, JA, et al., 2018 revealed that contractual dispute was the most important and main form of dispute in construction projects. While The administrative and economic problems were the last to be addressed. As a result, establishing dispute types has provided a foundation for preventing conflicts in construction projects. Contracts are an important tool for managing construction risk, as conditions of contract usually play a critical regulatory role in all project interactions between the various project partners. According to several studies, if contract terms are not properly considered, it may become one of the most significant sources of risks in construction projects. As risk is a permanently present feature in the construction industry, good risk management can contribute to an increasing revenue and an improving competitive advantage, (Suprpto, M., 2016).

Due to the boom in construction projects in Egypt in the years ahead, it is critical to shed light on current risk allocation procedures and study the obstacles to optimum risk allocation in Mega industrial projects. Thus, creating contract

drafting is very important for successful contract management, where balanced risk allocation defines and distributes risk-related responsibility in order to share the future loss of opportunities or project benefits proportionately. Consequently, the balance of risk allocation has become an important issue for project management success which helps to ensure the balance of liabilities and gains among project parties.

Construction risk allocation among the project players (owner, designer, contractor; etc.) has a large impact on the total goal of the project. Risk allocation has thus been a hot topic of research in recent years, as a key issue of contractual governance for construction projects. The project's key players (owners, engineers, contractors, and material suppliers) are bound through both direct and indirect contractual relationships, yet they may not have the same interest in the project and they may characterize the risks along with their allocations in different perspectives. Furthermore, there is no consensus among construction project participants on the optimal risk allocation strategy. Project owners often allocate more risks to contractors when designing contracts by using the pre-contract bargaining power. Some scholars suggest that such an unbalanced allocation of risks will lead to defensive strategies on the part of the contractor by reducing the quality of work or by claiming overcharges (Nasirzadeh, F., et al., (2014). Risk allocation can also significantly affect the project participants' behavior, so improper risk allocation has led to aggressive relationships between contract participants. However, there is commonly little parity in risk allocation in construction projects. Nowadays, strong organizations are taking the effort to guarantee that they sustain successful relationships through terms that encourage collaboration and help risk management. However, the benefits of good contracting are frequently lost because there is a tendency by those who craft and negotiate them to focus on avoidance not on proper risks' allocation. This emphasizes the importance of evaluating the provisions of standard construction contracts, especially clauses concerning the improper risk allocation that culminate in adversarial relationships among the contracting parties, Mellewigt, T., et al., 2012.

Despite the importance of the having various construction contracts' forms, aiming at unifying contractual clauses in relation to mega industrial projects, it is sometimes useful to introduce some modifications that make the contract more balanced in terms of risks. The purpose of contract modifications is to make it easier for the parties to achieve project goals, respect contracting partners, and avoid disputes, rather than to win a legal battle. Referring to several studies, if contract terms are not properly considered, they may become significant sources of risks in construction projects. Rameezdeen, R. et al, 2014. The use of design-build contracts as a project delivery system has significantly risen in both the Egyptian public and private sectors. Nonetheless, this project delivery turns out to be a risky process for all the contracting parties unless the risks are adequately defined, assessed and managed throughout the bidding and project execution phases. Banik, G.C. 2008. and Osipova, E., 2007 examined the impact of the chosen contract type and risk management collaboration in construction projects. They found that The design-build project demonstrated very good project performance and effective risk management collaboration. From the perspective of the contractor, risk management in design-build projects is more effective as it gives the contractor the possibility to control the project during the early phases.

2. LITERATURE REVIEW

The contract agreement is mandatory for all construction projects, as it sets out obligations among the parties and specifies how costs are shared or divided in the project (Kumar, R.K., 2019). A construction contract agreement allocates the rights, duties, responsibilities and risks among the parties, as contractual clauses have a significant role in reducing the complexity inherent in industrial projects. However, good contracting benefits are frequently lost because contractual parties tend to focus on avoidance not proper risks' allocation. These parties are bound by both direct and indirect contractual relationships, yet they may not have the same interest in the project and may characterize the relevant risks along with their allocation from different perspective. Despite the widespread availability of standard forms of construction contracts (SFCs) and the documented benefits of using these types of contracts, current practice and recent evidence suggest that owners remain dependent on ad hoc (bespoke) or substantially revised SFCs, (Youssef, A., et al., 2018). Nowadays, strong organizations are exerting efforts to guarantee sustainable successful relationships through the contract terms to encourage collaboration and enhance risk management. The construction research community is no novice to the risks' allocation problems and management. Risk allocation and sharing in contracts were investigated in particular contract forms and have been examined by researchers in various sectors of the construction industry, (Osman, H., et al., 2018.). When asked about contract terms that deal with or are critical in controlling risks, people seem to think about liabilities' limitations, compensations and the like — or clauses specifically referring to the word "risk," for instance: clauses dealing with the owner or contractor risks in construction contracts or the loss or damage risks in sales contracts. Most seem to think that these are the only terms of the contract which deal with risks. Such view would be too

narrow (Haapio, H., 2013). Contracts' Risks can take many forms and originate from many different sources. One way to understand risky terms and concerns (and minimize the possibility of things going wrong) is to learn from previous experiences concerning conflicts and allegations. (Li, H., Arditi, D. 2012), in their study, hypothesized that the owner should be prepared to deal with project complexity in order to achieve good project efficiency and minimize project uncertainty by ensuring that the design is as complete as possible. The owner should also ensure the early participation of the contractor and subcontractors in the project and promote healthy competition between them and the bidder.

2.1 General Conditions of Contract as a Source of Dispute

Contracts, even those with standard general conditions, would be a time consuming challenge to negotiate and sign if the specific contractual clauses were not written responsibly or incorrectly tuned, and therefore would take a considerable amount of time away from the overall time that was originally allocated, (Tatarestaghi, 2011). In addition to inefficiencies in the contractual risk management, the volume and contract's complexity have expanded dramatically in recent years, exposing many organizations to unprecedented risk, (Assaad and El-adaway 2020c). Contracts often become a battlefield in which the parties abandon their search for mutual ground or interests and instead focus on relative power and risk-allocation capability. The prevailing view of contracts in many parts of the world remains centered on their legal purpose, (Cummins, T., 2015). (Keane, P.J., 2015) studied the reasons of claim in construction projects and found that variations and additional work, lead to a high number of contractual claims. While according to (Van Weele, A., 2014) unfair contract / unfair risks' allocations, variations, delay complaints, and contracts' terminations are all common grounds for a claim. (John E Miller, 2014) noted that differences in contract interpretation among project parties, unrealistic tendering, and inadequate contract drafting would lead to construction claims. (Suprpto, M., 2016) found that in average, if they tackled the issues that commonly undermine contract performance, companies could generate over 9 percent improvement to their bottom line. In respect of owner-contractor co - operative relationships and contract type criteria, (Suprpto, M., 2016) addressed that, in general, the partnering / alliance contract is indirectly correlated with better project performance compared to the lump-sum or reimbursable contract due to better relationships and teamwork quality. The research shows that lack of clear scope, poor communication and unclear responsibilities were the most common sources of claims, disputes and broken relationships. The terms and conditions that attract the most attention during the negotiations concern liabilities, reimbursements, liquidated damages, intellectual property, data protection and price (IACCM 2015). Sharing of project results is considered an essential mechanism for aligning contractors' interests with those of the owner, (Hosseinian, S.M. 2013, and Chang, C.Y., 2014). Where negative incentives to perform in this negative environment must be balanced by more positive qualities that promote mutual accountability and cooperation and build opportunities for creativity, quality improvement and shared benefits. Compliance-based, defensive, risk-averse contracts undermine the results. Hence, the emerging agreements are far more likely to lay down principles for improved governance and recognize the need for greater flexibility. To reduce entrepreneurial opportunism, owners should consider what kinds of risks contractors face and resist the temptation to misuse mediated power against them (Zhang, L., 2017). It has been noticed that the most business-to - business negotiations are dominated by discussions about financial issues (price and payment) and risk allocation (liabilities, indemnities, data security, performance undertakings, and liquidated damages). While these issues are significant, they do not lead to the win-win strategy that negotiators prefer. Moreover, the causes of disputes weren't due to the clauses highlighted in the contract discussion. However, unless the risks are properly identified, assessed, and managed throughout the bid preparation and project execution stages, this project delivery system turns to be a risky system for both owners and contractors. Project risks must be properly identified, allocated, managed, and mitigated for any project to succeed, including design-build projects, (Banik, G.C. and Hannan, F., 2008). If the contractual terms and conditions are not properly considered during project execution, i.e. the contracting parties may not have a clear understanding of what they have agreed upon, any claim can be considered a favorable environment for contractual disputes. Contractually, design-build gives the owner a single point of contact for both design and construction services. The design-build contractor is responsible for all phases of a project, from planning to conceptual and preliminary design, detailed design, procurement, construction, and operation. Contractually, design-build gives the owner a single point of contact for both design and construction services. The design-build contractor is responsible for all phases of a project, from planning to conceptual and preliminary design, detailed design, procurement, construction, and operation, (Hughes, W., et al., 2015). The approach to negotiation has begun to change visibly in the last few years. Negotiators are more focused on performance and governance criteria which drive positive outcomes and results. Behind this change in mindset in some industries there is a steady awakening to the fact that many of today's agreements must be more sustainable and much more flexible, which is reflected in the IACCM 's annual analysis of the most frequently negotiated terms as shown in Table 1. (IACCM 2014). Indemnities and liabilities are the most frequently negotiated

conditions. Focusing on securing assets and preventing losses produces an often-adversarial culture where risk management's wars weaken the ingenuity and transparency that encourage innovation and value. Owners and contractors who want to use the design-build contracts will have more confidence if these risk factors are identified and managed properly, (Nguyen, P.T. et al., 2020). Contract clauses that address risk allocation are known as denied or exculpatory clauses. These clauses, in general, transfer the risk of injury, responsibility, and loss from one contracting party to the other. Previous research has focused on how exculpatory clauses affect the cost surcharge related to the inherent risks in construction contracts, rather than how these risks are shared among project parties via contract clauses and how their legal enforceability is established, (Khalef, R., et al., 2021). Their research identified how liability and project risk were managed by the standard contract forms. As the employer is usually the one who initiates changes to SFCs, (Youssef, A., et al, 2018). The main contractor is still responsible for all design and construction activities of the DB project including the work done by subcontractors. (Nguyen, P.T. et al, 2020). So exculpatory clauses were implemented to construction contracts between contractors and owners to better allocate risk among the parties and avoid or reduce the inclusion of excessive contingencies in bid pricing. (Khalef, R., et al, 2021), provided a better understanding of how exculpatory clauses affect risk allocation.

Comparing the disputes' causes throughout year 2015 (Global construction dispute report 2016), with the most frequently negotiated terms' in the year 2014 (IACCM 2014 top terms), and the most important terms, Table 2, revealed that the most business-to - business negotiations are dominated by discussions about financial issues (price and payment) and risk allocation (liabilities, indemnities, data security, performance undertakings, and liquidated damages). While these issues are significant, they do not lead to the win-win strategy that negotiators prefer. Moreover, the causes of disputes weren't attributed to the clauses highlighted in the contract discussion. Although considering intellectual property to be a significantly higher priority, the Middle East agenda tends to be dominated by price, payment and guarantees issues. This was evident in the Global Construction Dispute Report 2016, where its annual report shows that the ambiguous conditions in the contract document are the main cause of disputes in the US, while those in the Middle East and ASIA have failed to manage the contract properly, incomplete design information or employer requirements (for Design and Build).

Table 1: The most frequently negotiated terms (IACCM 2014)

	Top 30 Terms 2013/14		Top 30 Terms 2013/14
1	Limitation of Liability	16	Insurance
2	Price/ Charge / Price Changes	17	Data Protection/ Security
3	Indemnification	18	Security
4	Service Levels and Warranties	19	Rights of Use
5	Payment	20	Dispute Resolution
6	Service Withdrawal or Termination	21	Change Management
7	Warranty	22	Information Access and Management
8	Intellectual Property	23	Audits/ Benchmarking
9	Performance/ Guarantees / Undertakings	24	Force Majeure
10	Delivery / Acceptance	25	Communications and Reporting
11	Liquidated Damages	26	Applicable law/ Jurisdiction
12	Scope and Goals	27	Assignment/ Transfer
13	Responsibilities of the Parties	28	freight / Shipping
14	Invoices/ Late Payment	29	Business Continuity/ Disaster Recovery
15	Confidential Information/ Non-disclosure	30	Product Substitution

Table 2: The Most Important Terms (2015)

	Cause of disputes and claims	Most negotiated term	Most important term
1	Failure to properly administer the	Limitation of Liability	Scope and Goals
2	Poorly drafted or incomplete and unsubstantiated claims	Price / Charge / Price Changes	Responsibilities of the parties
3	Errors and/or omissions in the contract document	Indemnification	Change Management
4	Incomplete design information or employer requirements (for Design and Build)	Service Levels and Warranties	Delivery / Acceptance
5	Employer/contractor/subcontractor failing to understand and/or comply with its contractual obligations	Payment	Communications & Reporting

Loosemore, M. et al., 2015, proposed five guidelines to achieve optimum risks' allocation for the party taking the risks. These guidelines relate to whether the risk-bearing party: 1) is completely aware of these risks; 2) has the greatest ability to effectively and efficiently manage risk; 3) has the capacity and expertise to deal with the risk's consequences; 4) possesses high skills to take the risk; and 5) has been provided with sufficient incentives to take the risk.

2.2 FIDIC as Standard Form of Contracts

FIDIC, known as the International Federation of Consulting Engineers, produces standard forms of civil engineering contracts. It was established in Lausanne, Switzerland in 1913 by three countries. FIDIC is known for producing Standard forms of contract for civil engineering construction, and mechanical and electrical plant. The first edition of the "Conditions of Contract for Works of Civil Engineering Construction" known as the "Red Book" published in 1957. The group involves different types of contracts that are commonly used across the globe and have become popular in the world and especially in the Middle East. The Red Book's Second Edition was released in July 1969, when the document was accepted and ratified by the Asian and Western Pacific Contractors' Associations International Federations. In 1977, FIDIC released a collection of 'Notes on Documents for Civil Engineering Contracts' relating to selected aspects of the different clauses in the Red Book Third Edition. The present suite of FIDIC contracts, mostly best known by their colors, replaces the package originally released in 1987. From 1987 to 1999, FIDIC accepted the need for a design and construction contract and thus produced what became known as the Orange Book in 1995. With the introduction of the 1999 set, the need for the Orange Book became obsolete, as either the Yellow or the Silver Book accommodated the need for a design and development contract. The 1999 set includes the following four forms of contract: <https://fidic.org/> :

1. Conditions of Contract for Construction (First Edition, 1999) The Red Book;
2. Conditions of Contract for Plant and Design-Build (First Edition, 1999) The Yellow Book;
3. Conditions of Contract for EPC/Turnkey Projects (First Edition, 1999) The Silver Book;
4. Short Form of Contract (First Edition, 1999) The Green Book); and
5. Contractor partnership agreement (the White Book)

'FIDIC is the most widely used form of contract,' They have been widely used in the Middle East and North Africa region for many years. The FIDIC contract forms' success arises from the fact that they are adaptable to a wide range of legal systems, that they are well-known among market participants, including financiers, and that they have been proactively updated to serve their market. The FIDIC form of contract has been widely used in Egypt on a number of major projects, including the new Cairo airport (Terminal Two), the project of the Greater Cairo Wastewater, the Grand Egyptian Museum's third phase, the Cairo Metro Project, and now the fourth phase of the Metro. Egypt hosted several conferences for FIDIC, including the conference hosted by FIDIC with the International Chamber of Commerce in 2005, which discussed the settlement of disputes in international construction contracts.

2.3 New FIDIC Forms of Contract

The use of the FIDIC forms of contract has increased widely over the last 20 years since the publication of the 1999-versions of FIDIC books. At the FIDIC international Contract Users Conference in London on 5 and 6 December 2017, the three new 2017 FIDIC forms of contract were announced. "The central objective of most of the adjustments to FIDIC 's 2017 contract updates is to improve clarity and certainty, reduce the possibility of disagreements over the definition of contract terms and thus increase the probability of effective projects (Peter Fogh, 2017). In line with the above, FIDIC has improved the contract provisions by making them more prescriptive and by introducing step-by - step project management and procedural mechanisms, by setting out exactly what is expected of the employer, the contractor and the engineer while the contract is being performed (CMS guide to the FIDIC 2017 suite)." The brochure includes suggestions for Particular Conditions for provisions that deal with difficulties that arise frequently and necessitate changes to the standard terms. For the development of Particular Conditions, FIDIC has now added their 'Golden Principles.' Among them is the principle that the Particular Conditions must not change the risk/reward distribution established in the General Conditions. The new modifications' main goal and objective is to improve: • Transparency, clarity, and certainty; Reciprocity of rights and obligations; contract management strategies; and • Dispute avoidance.

3. RESEARCH OBJECTIVES AND METHODOLOGY

The major goal of this research is to improve current risk allocation practices in Mega industrial projects by developing and validating a standard contract that can be used by the construction project parties to allocate project risks more effectively and efficiently in order to mitigate problems that arise in construction projects. This study aims to determine the contract clauses that contain risks, whether these clauses mention the risks directly, or whether the risks are latent in the clause itself, according to the risk factors that were concluded in the first part of the research, see (<https://doi.org/10.5281/zenodo.6579176>). The research involves an Inductive Approach, the new standard forms of FIDIC contracts 1999 and 2017 (Yellow Book) were reviewed, as well as general contractual matters. The reasons for the changes made to this standard form of contract were then investigated further. This is accomplished through a semi structured interviews and questionnaire survey to gather information. The response of the experts was very valuable and an addition to this paper research as most of these responses to risks have already been developed and used in developing a balanced construction contract to try to overcome the problems that prevent optimal allocation of risks in the individual construction industry. The results will recommend some amendments to the clauses that contain the significant risk factors in Mega industrial projects.

4. SIGNIFICANT RISK FACTORS AND RELATED CONTRACT CLAUSE/SUB-CLAUSE

In order to draft a balanced contract based on FIDIC form 2017 Yellow Book, a number of Sub-clauses included in The FIDIC forms are often subject to modifications aimed at making the contract more balanced in terms of risk. Hence, the author will analyse some driving selective Sub-clauses based on the previous analysis. To reach risk-related Sub-clauses, this paragraph includes a list of driving selective sub-clauses that the two contracting parties can amend based on semi-structured interviews with a number of experts in project management. The FIDIC yellow book will be considered, and any changes will be evaluated based on the numerical order of relevant sub-clauses. Table 3 shows the important risk factors and the corresponding modified clauses of the contract.

Table 3: Important Risk Factors and Corresponding Modified Clauses

	Clause/Sub-Clause	Risk Factor
1	Standard Sub-Clause 1.13: Compliance with Laws	<ul style="list-style-type: none"> • Late issuance of licenses • Delay due to statutory bodies
2	Standard Sub-Clause 1.15: Limitation of Liability	<ul style="list-style-type: none"> • Unclear responsibility matrix
3	Standard Sub-Clause 4.1: Contractor's General Obligations	<ul style="list-style-type: none"> • Unclear responsibility matrix • Insufficient site investigation • Insufficient FEED documents • Insufficient technical specifications
4	Sub-Clause 4.4: Subcontractors	<ul style="list-style-type: none"> • Lack of coordination between subcontractors
5	Standard Sub-Clauses 5.1: General Design Obligations	<ul style="list-style-type: none"> • Design errors, and contradiction in documents
6	Sub-Clause 8.3: Programme	<ul style="list-style-type: none"> • Indecisive management • Subcontractor's failure to comply the schedule • Material delivery doesn't comply with the
7	Standard Sub-Clause 8.7: Rate of Progress	<ul style="list-style-type: none"> • False progress reports
8	Standard Sub-Clause 8.8: Delay Damage	<ul style="list-style-type: none"> • Material delivery doesn't comply with the program Procurement problems
9	Standard Sub-Clause 11.3 Extension of Defects Notification Period	<ul style="list-style-type: none"> • Lack of procedure to correct errors between the employer and the Contractor
10	Standard Sub-Clause 11.4: Failure to Remedy Defects	<ul style="list-style-type: none"> • Defective Materials
11	Standard Sub-Clause 11.10: Unfulfilled Obligations	<ul style="list-style-type: none"> • Lack of procedure to correct errors between owner and contractor
12	Standard Sub-Clause 14.1: The Contract Price	<ul style="list-style-type: none"> • Change scope of work

A. Standard Sub-Clause 1.13: Compliance with Laws

Where many partners are involved in projects, governments and regulatory bodies are the secondary partners, these partners have direct and indirect complex contractual relationships with one another. They have different objectives, strategies, and are involved in the project at different stages and phases. Furthermore, they view risks each from his own

unique perspective. It can be concluded that the different project participants' competitive attitudes, and also the complexity of contracts, can be obstacles to optimum risk allocation. In the traditional contracts this risk is generally allocated to the owner. So, it is important to pay attention to this clause in the contract, and insure that both parties will help each other in getting the permits. The FIDIC 2017 Yellow Book takes pride in having a balanced and fair risk allocation strategy. This has resulted in an increase in the number of reciprocal rights and obligations. Sub-Clause 1.13 is a nice illustration of this where both the Contractor and the Employer are now forced to comply to all applicable laws. (Sub-Clause 1.13(c)) The Contractor is now also obligated to assist the Employer in obtaining permits and other approvals. To do this, the author suggest to add the following sentence after (Sub-Clause 1.13(d))

The Contractor shall submit, in good time, the details of Goods to the Employer, who shall then promptly obtain all import permits or licences required for these Goods. The Employer shall also obtain or grant all consents including permits-to-work, rights-of-way, and approvals required for the Works.

This modification clarifies the contractor's obligation to provide information of all procurement that the contractor will supply as quickly as possible so that the employer could assist the contractor in acquiring the necessary permissions and approvals from the appropriate authorities.

B. Standard Sub-Clause 1.15: Limitation of Liability

Limitation of liability (Sub-clause 17.6 in 1999 FIDIC Yellow Book) has been moved to be (Sub-clause 1.15 in the 2017 publication) to highlight its importance while also indicating that it extends more widely and is not limited to the indemnities or Payment after Termination. In FIDIC 2017, Delay Damages, Variations, and claims under the IP (Intellectual and Industrial Property Rights), and indemnities by Contractor or indemnities by Employer are now included in the carve-outs from the exclusion of liability for loss of profit/indirect and consequential damage. The author suggests that the following to include in the carve-outs from the exclusion from Limitation of Liability:

- *Sub-Clause 1.7 (Assignment);*
- *Sub-Clause 1.12 (Confidentiality);*
- *Sub-Clause 1.13 (Compliance with Law);*
- *Sub-Clause 4.18 (Protection of the Environment); and*
- *Sub-Clauses 6.7 (Health and Safety).*

This carve-outs were added because:

- If the Contractor fails to perform any obligation under the Contract, and if the Company terminates the work because this failure, Whereas, the company may engage third parties to complete the Work and for this purpose so the Contractor shall: assignment to the Company of all Sub-Contracts for Contractor Provided Items to be delivered as the Company may request.
- Because of the nature of industrial projects, especially petrochemical, oil and gas projects, the Contractor shall treat all documents forming the Contract as confidential, and the Employer and the Engineer shall treat all information provided by the Contractor and marked “confidential”, as confidential.
- The Contractor shall in relation to all persons affected or likely to be affected by the performance of the Work take such steps as are reasonably practicable to ensure their health, safety and security. The Contractor shall take adequate and effective precautions in order to protect the Work, the Contractor’s Personnel, the general public, all other persons, the environment, the property of the Company and the property of third parties and to avoid or reduce to a minimum any inconvenience to the public.

C. Standard Sub-Clause 4.1: Contractor’s General Obligations

The dominant reason for the modification is to clarify the phrase “fit for purpose”, as this sentence contains risks to the contractor related to design, methods of implementation and supply of materials as per project specifications, such that the purpose must be stated in the Employer’s Requirements (rather than anywhere in the Contract). The amendment includes confirmation that the contractor is responsible for the design, that the design complies with the approved standards and

rules, and that it is free from inherent defects. The amendment also includes the contractor's compliance with occupational health, safety and environmental requirements, as well as protecting the employer from any potential risks associated with the project's operational designs. The modification also will protect the employer from any error or ambiguity in the design that may affect the final result of the project. Another problem with this subsection is that if there is no fixed period for approval of the documents, the delay caused by the employer may affect the schedule for the supply of materials. The author suggest that the modifications will be written in Italic Red color as follow:

1. The Contractor shall execute *and complete* the Works in accordance with the *requirements of Contract and with all due skill, care, and safety measures as should be exercised by a fully qualified, competent and first class Contractor, fully skilled and experienced in the design and carrying out of work similar in nature and extent to the Work*. When completed, the Works (or Section or Part or major item of Plant, if any) shall be fit for the purpose(s) for which they are intended, as defined and described in the Employer's Requirements *and the standards set out in the Contract* (or, where no purpose(s) are so defined and described, fit for their ordinary purpose(s)).

2. The Contractor shall *at its own cost* provide

2.1 the Plant all Contractor Provided Items and Equipment (and spare parts, if any)

2.2 the Contractor's Documents specified in the Employer's Requirements,

2.3 all Contractor's Personnel, Goods, consumables and other things and services, whether of a temporary or permanent nature, required to fulfil the Contractor's obligations under the Contract.

3. The Works shall include any work which is necessary to satisfy the Employer's Requirements, Contractor's Proposal and Schedules, or is implied by the Contract, and all works which (although not mentioned in the Contract) are necessary for stability or for the completion, or safe and proper operation, of the Works.

4. The Contractor shall be responsible for

4.1 the adequacy; stability and safety of all the Contractor's operations and activities, of all methods of construction and of all the Works;

4.2 *the engagement and management of Sub-Contractors in connection with the Work;*

4.3 *the timely provision of all items referred to in the Contract including the timely ordering and delivery of all Contractor Provided Items and Equipment to be provided by the Contractor in order to ensure that commencement, performance and completion of the Work is in accordance with the Programme;*

4.4 *obeying all local rules and regulations in importing and exporting Contractor items and shall indemnify, defend and hold the Company harmless against any claims suffered through the Contractor's breach of these requirements;*

5. *The Contractor shall be ensuring that all Contractor Provided Items and Equipment supplied by or on behalf of the Contractor for incorporation in the Facilities shall, unless specifically stated in the Contract to the contrary, be new and suitable for the purpose for which they are specified;*

6. The Contractor shall, whenever required by the Engineer,

6.1 submit details of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works.

6.2 *give all notices and comply with all other obligations under the Contract promptly and with due diligence*

No significant alteration to these arrangements and methods shall be made without this alteration having been submitted to the Engineer.

The aforementioned amendments also contain details of the arrangements and methods of implementation that the Contractor proposes to adopt to carry out the works, since it is necessary to discover and notify the Engineer and the Employer of any error, omission or error before carrying out the corresponding construction works that would significantly reduce the risks associated with the feasibility of the project. Contract document must include human resource schedule; plant and equipment schedule; quality assurance plan, and work schedule.

D. Standard Sub-Clause 4.4: Subcontractors

To mitigate the risks resulting from the lack of coordination between subcontractors, the author suggests adding paragraph © after (Sub-clause 4.4 (b)). The modification will be written in red and Italic words as follow:

The Contractor shall not subcontract *or assign or otherwise transfer*:

- a) works with a total accumulated value greater than the percentage of the Accepted Contract Amount stated in the Contract Data (if not stated, the whole of the Works); or
- b) any part of the Works for which subcontracting is not permitted as stated in the Contract Data.
- c) *the whole of the Work, except that the Contractor shall assign all or any Sub-Contracts to the Employer upon receipt of the Engineer's direction in writing to do so.*

The Contractor shall ensure that every Sub-Contract shall: -

1. *provide that the Contractor may from time to time assign or otherwise transfer the Sub-Contract to the Employer;*
2. *contain a confidentiality undertaking imposing on any Sub-Contractor obligations similar to that undertaken by the Contractor;*
3. *contain restrictions on and provisions relating to Sub-Contracting to the same effect as in this contract;*
4. *contain suspension and termination provisions consistent with those contained in this contract;*
5. *contain defects correction provisions consistent with those contained in this contract;*
6. *include terms and conditions which are consistent with the Contract; and*
7. *contains obligations to comply with the quality assurance, control procedures and requirements set out in this contract.*
8. *contain provisions which entitle the Employer to require the subcontract to be assigned to the Employer under sub-paragraph (a) of Sub-Clause 15.2.3 [After Termination]."*

The sub-clause 4.4 have been modified in [©FIDIC 2017 Second Edition] and their writing has been expanded in order to mitigate the risks resulting from the lack of coordination between subcontractors, and their low productivity. The aforementioned amendments give the business owner the right to review the subcontracts, while preserving the contractor's right to withhold prices. The amendments also emphasize that the contractor may pay all subcontractors dues in order to maintain the rate of progress of the works. Where the main reason for the adjustment is that the success or failure of creating effective contracts that are just and equitable in the most efficient and productive manner is directly related to the profitability of general contractors and subcontractors. As the majority of project implementation work is carried out by subcontractors, it is clear that careful evaluation of subcontracts is essential to the success of the project. If only one of the subcontractor links fails, and a dispute arises, causing project delay or a cost claim or both, this sub contractual dispute will not only affect the principal parties to the subcontract, but the primary contract parties may be affected, and may be down Project due to delays and cost overruns.

E. Standard Sub-Clauses 5.1: General Design Obligations

Design risk is one of the most significant risks that affecting the industrial projects, where design risks can arise from various sources, like an inexperienced design team and/or improper design, and could lead to procurement problems and material supply delay. According to the Yellow Book, contractors are not liable for any error, fault, or other defect detected in the employers' specifications if "an experienced contractor exercising due care" couldn't have discovered the error, fault, or defect before submitting their tender. While detail design is usually beard by the contractor, who is also the weakest participant in the project. According to Sub-Clause 5.1, when completed the Works shall be fit for the intended purposes, thus, if the Contractor assumes the responsibility for the design or for parts of the design, he should be careful in dealing with this Sub-Clause. The modification will be written in red and Italic words as follow:

The Contractor shall *at its own cost* carry out, and be responsible for, the design of the Works, *so that the Work complies with the requirements of the standards, codes of practice, and all other requirements of the Contract provided.* Design shall be prepared by designers who:

- a) are engineers or other professionals, qualified, experienced and competent in the disciplines of the design for which they are responsible;

- b) comply with the criteria (if any) stated in the Employer's Requirements; and
- c) are qualified and entitled under applicable Laws to design the Works.

Unless otherwise stated in the Employer's Requirements, the Contractor shall submit to the Engineer for consent the name, address, detailed particulars and relevant experience of each proposed designer/design Subcontractor.

The Contractor warrants that the Contractor, the Contractor's designers and design Subcontractors are *adequately financed, competent, qualified and fully experienced in the design, procurement, fabrication, construction, testing, pre-commissioning and commissioning of projects of a similar scope, complexity, size and technical sophistication as the Work and that it possesses the high level of skill and expertise commensurate with that experience.*

The Contractor covenants that the Work shall be free from inherent or Latent Defects whether in design, engineering, workmanship or materials and shall be free of errors and omissions in design and engineering.

The Employer is relying upon the skill, judgement and expertise of the Contractor in the performance of the Work and the co-ordination and planning thereof including without limitation the preparation and execution of the Programme.

The Contractor undertakes that the designers and design Subcontractors shall be available to attend discussions with the Engineer and/or the Employer at all reasonable times (on or off the Site), until the issue of the Performance Certificate.

Promptly after receiving a Notice under Sub-Clause 8.1 [Commencement of Works], the Contractor shall scrutinise the Employer's Requirements (including design criteria and calculations, if any). If the Contractor discovers any error, fault or other defect in the Employer's Requirements, Sub-Clause 1.9 [Errors in the Employer's Requirements] shall apply (unless it is an error in the items of reference specified in the Employer's Requirements, in which case Sub-Clause 4.7 [Setting Out] shall apply).

Unfortunately, it is often the case that the intended purposes are not clearly defined or may even remain undefined. Most Contractors will feel uncomfortable with this, however, some consulting engineers and Employers are unable to make the best of Sub-Clause 5.1. Risk management is likely to be one of the most important challenges facing the contractor and the employer at the same time. Accordingly, it is important to apply a proactive approach in mitigating these risks by setting strict conditions that impose on the contractor great care in selecting the design preparation team, knowing the main purpose of the project and the field of work, and reviewing the foundations on which the designs will be made. These conditions may protect the contractor himself by setting a clear definition of the contractor's field of work, the specifications of each part, the codes used, and the main purpose of the project.

5. CONCLUSION

While it is clear that FIDIC forms provide a thorough foundation point for the drafting of Industrial project contracts, they also contain a number of clauses that contractors and employers should carefully evaluate for the significant consequences that may develop later. To summarise, the parties should endeavour for an agreement that satisfies them both in terms of a balance of risks for contractors and rational flexibility for employers, enabling the contractors to balance compensation with the degree of risk presumed, and the employers to adapt contractual commitments to changes in the condition that the project may face throughout its lifetime. This balance will probably help the overall project and have a good impact on the parties' contractual relationship and on project performance.

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