

Use of Standard FIDIC Contracting to Minimize Disputes in Nuclear Power Plant Construction

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Abstract—Nuclear Power Plant (NPP) construction projects involve some of the most complex contracting arrangements for any undertaking. Specific ‘Terms and Conditions’ associated with these Contracts can be complex and not well understood or monitored by those executing the work. Historically, due to technical complexity and political wrangling, such projects have often been met with schedule delays and cost overruns. Despite the checkered historical record of failing to address such challenges (e.g., WPPSS 4&5, Flamanville 3, Olkilouto 3, Virgil C. Summer 2 & 3), many countries continue to show an interest in nuclear power due to demonstrated advantages in terms of energy security, low and stable fuel cost, and opportunities for domestic buildup of technical capabilities and associated industries. With this backdrop, this paper specifically examines use of contracting to address one aspect of NPP construction risk, namely approaches and methods to minimize contract disputes. From past experience, lessons learned and best practices are overlaid on the standardized template of the Fédération Internationale Des Ingénieurs-Conseils (FIDIC) Red Book (a now widely adapted contracting approach). The focus of this paper is disputes regarding Extension of Time (EOT) or Additional Payment due to EOT for ‘newcomer’ countries where NPPs may be introduced in the near future. An evaluation of root causes for Owner-Contractor disputes is examined and recommendations to avoid or minimize such disputes at the contracting stage is presented including: 1) jointly identify and address possible circumstances leading to EOT disputes and to include comprehensive and explicit project controls related to timely identification of and management of EOT-type risks in the contracting stage, 2) include in the Contract a comprehensive schedule for calculation of EOT-related liquidated damages, 3) require by Contract that the Contractor affirmatively provide formal notice of delay, or to affirmatively state that there are no delays which could lead to an EOT request, and to formally provide this information to the Owner on a regular basis (to be included in the master project schedule), 4) require by Contract regularly scheduled meetings between the Owner and Contractor to explicitly address contract disputes, even when there are no formal issues in dispute, and 5) require by Contract regular training of both Owner and Contractor managers and staff on compliance with the Contract in terms of EOT reporting and conflict resolution. **Keywords**—FIDIC, EOT, Additional Payment, NPPs, Owner, Contractor, Notice of delay, Conflict Avoidance Mechanisms

I. INTRODUCTION

A. Background

Many NPP construction projects have been plagued by project delays and cost overruns [1] [2] [3] [4]. Despite this,

many ‘newcomer’ countries [5] continue to demonstrate interest in pursuit of new nuclear projects. Population growth and even greater growth projections related to electricity demand drive the interest in all sources of power, and in many cases, of nuclear power in particular.

The World Nuclear Association (WNA) reports that nuclear power capacity is projected to grow by up to 60%, to 543 GWe in 2030, and further to 624 GWe by 2040. Based on declared intentions of various host governments, much of this growth is assigned to newcomer countries. With this backdrop, it can be expected that rigorous approaches for NPP contracting between Owners and Contractors will be of interest in the near future [5].

Opportunities to minimize contract disputes and the magnitude of such disputes (e.g., as for EOT and Additional Payment) can be best addressed at the contracting stage. This paper specifically addresses contracting approaches to minimize the number and impact of disputes related to ‘EOT’ and ‘Additional Payment’.

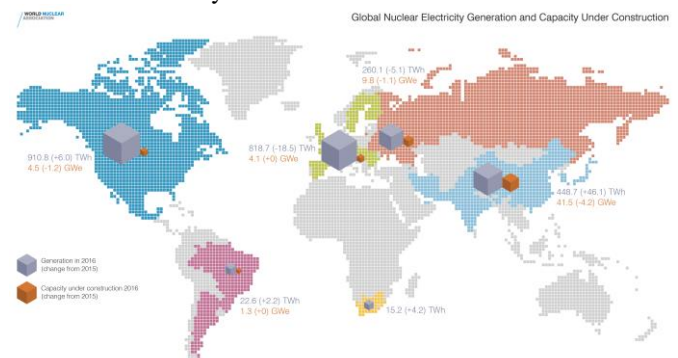


Fig 1. Global nuclear generation and construction 2017 [5]

B. Purpose of the study

This paper examines contracting approaches to minimize the number of and impact associated with EOT and concomitant Additional Payment claims within the framework of the FIDIC Red Book contracting template. Historically, disputes have arisen due to ambiguous contractual conditions and due to a failure to read, understand, or take exception to onerous conditions prior to signing the Contract. More directly and impactful are psychological motivations of managers and subordinates in relation to late reporting of project schedule slip and cost overruns. By understanding conflict avoidance mechanisms and

motivations, contract approaches can be used to address these basic human inclinations.

II. METHODOLOGY

The chronology and reasons for major NPP project failures is typically difficult to discern. This is primarily due to commercial or political motivations to avoid publicizing the root causes. Contractors are not eager to advertise failures while Owners likewise wish to avoid blame. However, certain basic instincts for conflict avoidance can be applied to understand 'surprise' announcements of project delays and cost overruns.

It is proposed here that industry standard approaches considering the FIDIC contracting template can be refined to address the potential for and magnitude of such failures.

By contractually forcing the Owner and Contractor to formally recognize developing impediments to contract schedule and elements driving cost overruns in a forthright, open, and timely manner, these issues can be dealt with directly without delay. The approach presented here is as follows:

- examine approaches used in NPP construction contracting
- examine FIDIC structures and philosophy
- examine psychological motivations related to conflict avoidance (leading directly to 'late' reporting of project issues)
- examine best practices for delivering 'bad news', and
- make recommendations in the context of contracting under the FIDIC Red Book.

III. INTERNATIONAL CONTRACT OVERVIEW

Successful projects require a firm underpinning of a Contract which is fair and equitable to both parties. Contracts can also be used to require good communication by identifying requirements while at the same time offering an element of trust. The International Atomic Energy Agency (IAEA), as part of promoting nuclear energy has developed a Nuclear Contracting Toolkit as guidance for contract management.

A. Nuclear Contracting Toolkit

The Nuclear Contracting Toolkit [6] is intended to support all levels of procurement activities relevant to an NPP project. It is designed to help manage expectations of Owners and Contractors alike, consisting of five (5) parts. These are:

- 1) *Strategy Development,*
- 2) *Procurement Preparation,*
- 3) *Bidding and Evaluation,*
- 4) *Negotiation and Contracting, and*
- 5) *Contract Management, and Lessons Learned.*

Generic in nature, the toolkit does not specifically address any related laws, regulations, guidelines, or procedures, as may be required in the host country. As such, the tool kit is not a substitute for the technical, legal, financial, and other professional aspects of contracting for a first NPP [6]. It does however provide a comprehensive template for the various aspects of contracting for an NPP project.

B. Types of Contracts in Nuclear Industry

The recommendations here may vary by the nature of the contracting approach. Hence, various approaches are described below for further consideration. Historically, three principal types of contractual approaches have been most common. One additional type of contracting approach, particularly for newcomer countries with limited domestic technical expertise is the Build-Own-Operate (BOO) model. This has come into play in the Turkey. A related approach is the Build-Own-Operate-Transfer (BOOT) model where the ownership stake is transferred to the host government after a defined period of time [7] [8].

1) The Turn key approach

The IAEA [8] describes the turnkey approach as a single Contractor or a consortium of Contractors, with extensive project management and engineering resources, who assumes the overall or chief subsidiary (e.g., licensing) responsibility for the project. The merit of this approach is that apparent risk associated with EOT and Additional Payment is transferred to the Contractor. In practice, while this approach was entered into in the 1970s, in the current environment there are essentially no organizations willing to engage in such arrangements. From the perspective of responsibility, disputes between parties related to EOT and Additional Payment will be minimized. By contrast, the project control of the Owner is limited regarding design and design changes for the project. With this, there is some likelihood that the completed project may not align with Owner expectations, giving rise to disputes following project completion.

2) The Split Package ('Island') approach

The IAEA [9] identifies that NPP project responsibilities may be divided into a few major groupings of systems, each of which can be contracted separately. With this approach, overall responsibility is divided between a relatively small numbers of Contractors, each coping with a large section of the plant in the split-package approach. At its simplest, this approach divides the plant into two packages:

- Nuclear Island (essentially, the reactor containment building, safety related equipment buildings, buildings' housing radioactive substances, and all associated systems and components), and
- Conventional or Turbine Island (the turbine generator and all associated nonsafety related systems and buildings)

This approach can simplify worker qualifications for a large portion of the plant (i.e., nonsafety related). In general, this approach should more clearly be able to identify and assign causes of delay and cost overruns. The principal challenge relates to the interface between Contractors. Correspondingly, this interface must be rigorously managed and disputes must be addressed in a timely and active manner.

a) The Two-package approach (Nuclear Island and Turbine Island)

In this approach there are two prime contracts related to the Nuclear Island and Turbine Island. A higher degree of competition and technical choice can be affected by

classifying the main plant into two packages with this approach. However, the problem of harmonizing the interfaces and having two civil Contractors working close to one another should be explicitly addressed [9].

b) The Three-package approach (Nuclear Island, Turbine Island and Civil Works)

This approach segregates the civil works from both the Nuclear and Turbine Islands, with each a separate contract placed directly by the Owner. This approach does not alleviate potential issues related to the interface between the nuclear reactor and turbine Contractor. For an Owner to engage in such a contract, engineering and interfacing skill and experience are required [9].

c) The Five-package approach (Nuclear Lot, Turbine Lot, Civil Works, Electrical Lot, and Mechanical Balance of Plant (BOP) Lot)

With this approach, the problems associated with the interface between the Nuclear Island and Turbine Island can be directly managed and controlled by an experienced Owner with recent experience on similar projects [9].

3) The Multi contract approach

In this approach, the Owner or the Architect Engineer (A/E) takes the overall responsibility for detailed engineering and construction of the plant. In this method, the A/E typically issues a large number of contracts [10].

This approach provides the Owner the maximum influence on the design and construction of the plant, but also the most responsibility for the success of the project. When selecting this approach, it is typical for an external A/E to manage the overall project since only a few large nuclear utilities have this expertise in-house [10].

The merit of this approach is that a wide range of preferred vendors can be engaged. In contrast, this approach will typically require additional layers of Owner oversight. Also, this approach will incur risk regarding delay and cost overruns (e.g., 'finger pointing') with additional contractor interfaces presenting challenges.

TABLE I. USUAL LEAD TECHNICAL RESPONSIBILITIES FOR DIFFERENT CONTRACT TYPES [5]

Activity	Lead Responsibilities		
	Turnkey	Split Package	Multiple Package
Pre-project activities	U	U	U
Project management	MC	AE or U	U + AE
Project Engineering	MC	AE + SS	U or AE
Quality assurance	MC + U	AE + SS + U	U + AE
Procurement	MC	AE + SS	U or AE
Application for license	U	U	U
Licensing	RA	RA	RA
Safeguards, physical protection	U	U	U
Manufacturing	MC	SS + EM	EM
Site preparation	U or MC	U or AE	U or AE

Erection	MC	AE + SS	U or AE
Equipment installation	MC	AE + SS	U or AE
Commissioning	MC	AE + U	U or AE
Plant operation and maintenance	U	U	U
Fuel procurement	U	U	U
Fuel fabrication	FS	FS	FS
Waste management	U	U	U

Symbols 1. AE : Architect Engineer, 2.EM : Equipment Manufacturer, 3.FS : Fuel Supplier, 4.RA : Regulatory Authority, 5.MC : Main Contractor, 6.SS : System Supplier, 7.U : Utility

4) Build-Own-Operate (BOO) or Build-Own-Operate-Transfer (BOOT)

Historically, the BOO or BOOT model has most commonly been applied to obtain private project financing for funding major construction projects such as highways, water, and sewage projects. For such projects, the BOO Contractor can expect revenue from the project for a period of time following completion.

In this approach, a Special Purpose Vehicle (SPV) may be established to operate for a guaranteed period (e.g., 20 years) with concession related to fees, tolls, or user charges [11] [12].

The SPV has obligations for designing and constructing the project, and for operating the project during the concession period. Private investors provide financing and typically accept most of the commercial risks [12].

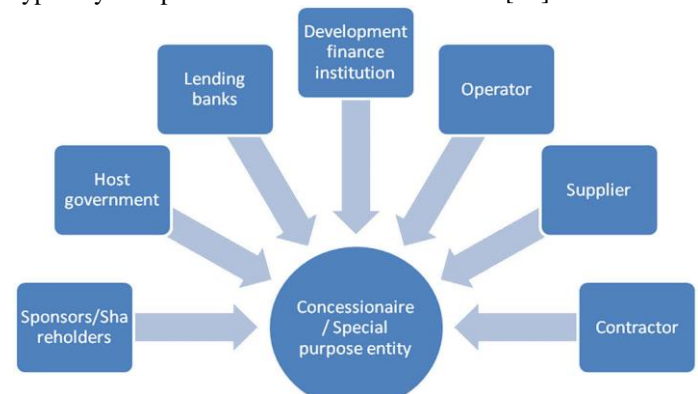


Fig 2. . BOOT model diagram [11]

With BOO or BOOT projects, there is residual risk associated with political interference or force majeure incidents such as earthquake damage or war. Typically, the host government will accept provisions to compensate the BOO or BOOT Contractor for a defined list of circumstances.

C. International Standard Contractual Condition (FIDIC)

FIDIC is the engineering standards organization which in part maintains a set of standard forms of international construction contracts [13].

Fifty nine (59) countries including initial Belgium, Denmark, France, Germany, the Netherlands, Switzerland, the United States, Austria, Hungary, Canada, Russia and Britain, met in Ghent, Belgium on 22 July, 1913 in order to discuss the creation of FIDIC. Belgium, France and Switzerland became chief proponents of the FIDIC

standardization and many European countries were involved. However, FIDIC became a truly international organization when in the late 1950s Australia, Canada, South Africa and the United States joined. In the mid-1960s, many developing countries such as Colombia, Malawi, Zambia and Zimbabwe were granted membership [14].

The FIDIC contractual templates related to various contracting arrangements are delineated by colors illustrated in Fig.3 as briefly described below [15].

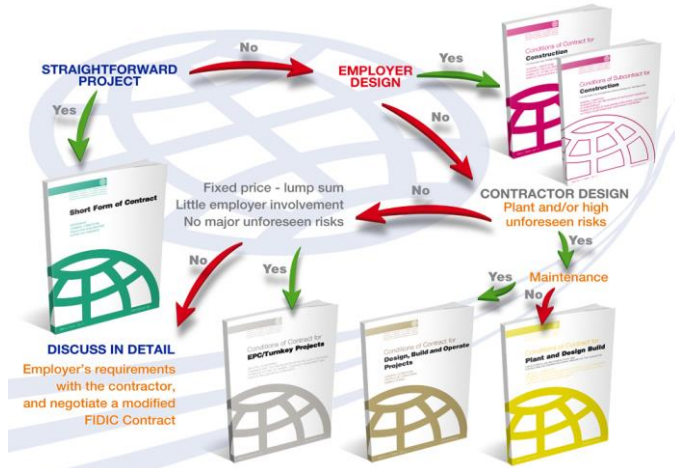


Fig 3. Various types of FIDIC Contracts [13]

1) Red Book

This template is the most traditional FIDIC form under which the Owner is responsible for all or most of the design and retains an important role for an administering the contract [15]. The Red Book aligns with the typical procurement approach of Design, Bid, and Build. The Red Book includes characteristics as listed:

- The accepted contract amount is based on estimated quantities, and
- The Contractor is paid for the actual quantities of completed work (e.g., time and materials) [17].

Under the Red Book contracting approach, the contract is typically managed by the Engineer as a third party [14].

2) Yellow Book

Under this scheme, Owner requirements are explicitly defined in the Invitation to Tender, and this information is the baseline if future claims regarding the scope and quality of the works are to be adjudicated [18].

Furthermore, the Yellow Book (plant) is a contract form wherein the design is carried out by the Contractor who must be paid on a Lump Sum basis. This form is considered as a well-considered approach, maintaining an equitable balance between the interests of both parties to the contract [17].

The Yellow Book employs progress payments based on certification by the Engineer [14].

3) Silver Book

The Silver Book is a contract form wherein the design is carried out by the Contractor with payment based on a Lump Sum basis. In addition, the Silver Book is configured for EPC/Turnkey projects where most of the common risk can be

transferred from the Owner to the Contractor. It is not intended for use when major unidentified risks are presumed or may materialize [17].

4) Gold Book

FIDIC recognizes the growing demand for contract terms that combine design and construction obligations with the obligation to run long-term projects.

FIDIC appointed a new working group to contractually address this problem as a result of frequent sudden deterioration of the object regarding construction due to design defects, erroneous construction, poor quality materials and facilities, immediately following the delivery of the construction objective material.

As a result, FIDIC published the Gold Book in 2008 which assigns design, construction and operation to a single contracting party and entrusts the parties with a set period of operation (e.g., 20 years) on behalf of the Owner [14].

Overall, the objective of the Contract is to define duties and allocate risks between parties. Accordingly, simple and clear wording in contracts is a key for forestalling disputes [16].

It is noteworthy that FIDIC is widely used in international construction contracting. FIDIC strives to delineate the obligations of each party in order to clarify responsibilities. As a result, clear and fully understood terms and conditions in the FIDIC standard form can assist parties in minimizing disputes associated with obscure responsibilities and liabilities.

The analysis presented here is based on the Red Book contracting scheme. However, recommendations can be easily adapted and adjusted as necessary to other FIDIC forms.

IV. PSYCHOLOGICAL AVERSION TO REPORTING

'Helping behavior' is a type of pro-social behavior recognized by psychologists as unique to the human genome, not found in other primates. Experiments with pre-verbal toddlers have demonstrated that most humans are 'programmed' to please and assist others in their 'clan' with or without the enticement of immediate reward. This type of behavior may actually represent an impediment to conflict and dispute avoidance as described below.

Project Managers are selected and promoted based on their ability to deliver 'on time' and within budget. A proven history of such performance leads to greater responsibility and higher positions. However, many times 'good' performance is driven by extra individual or team effort, or in the worst cases, by abuse and intimidation of subordinates. For the sake of argument, it is assumed that the latter types of managers are screened out and only the former are considered for top positions on the NPP projects examined here.

With this type of personality trait, when schedule 'slip' and cost overruns become evident, the 'good' manager typically considers the 'blame' to fall on the team. Recovery is handled internally and the 'bad news' is withheld from the Owner. To deliver such news is an 'admission of failure' on the part of the manager. This can lead to 'avoidance breeding

avoidance' as identified below, allowing what begins as a relatively small issue to grow to unmanageable proportions.

Psychological traits which can lead to late reporting of EOT and Additional Payment issues share a common theme with conflict avoidance. Common avoidance mechanisms are examined below and these are used to formulate contract language to address the underlying causes of late reporting.

A. Conflict Avoidance Mechanisms

John Ng, an expert in mediation and conflict management, has studied conflict avoidance in the workplace. He describes six common mechanisms employed to avoid reasonable and essential conflict in his book, 'Smiling Tiger and Hidden Dragon' [19].

Conflict avoidance is one of the key elements leading to disputes between the Owner and Contractor. Top Project Managers take it 'upon themselves' to rectify issues without 'bothering' the Owner. The psychology behind this tendency is encapsulated in the behavioral descriptions below.

1) *The boss is always right*

This trait varies by local culture, but to some extent is reflected in a portion of the workforce for all cultures and locations. For illustration, at an operating U.S. NPP under forced shutdown due to regulatory issues, the Re-start Manager queried his lead manager team, "We can accomplish re-start within six months. Is there anyone in this room who does not believe we can achieve this goal?" When the licensing manager with more experience stated, "There is no way we can complete this work in less 18 months." the embarrassed Re-start Manager told the recalcitrant manager, "You're not a team player, you can leave the meeting." The actual re-start took 24 months.

This type of management style is common and may work on less complex projects, but for large projects, this level of intimidation leads to 'Yes Men' and a fear of reporting bad news.

2) *Indirect is better*

To avoid conflict, people are apt to communicate indirectly. However, for large projects, indirect communication of project challenges can cause small challenges to grow.

3) *Fear of consequences*

As circumstances develop individuals most directly cognizant of the challenges have a concern that the 'blame game' may boomerang back to those who identified the issue. This can lead to additional work or duties, and in the worst case, a fear of demotion or dismissal.

4) *Lack of competence*

Similar to fear of consequences, a fear of lack of competence is common for performers who lack self-confidence. Reporting project challenges as they evolve to drive EOT is suppressed by a fear of lack of competence.

5) *Avoidance breeds avoidance*

Early identification of project challenges always permits additional time for resolution and also permits assignment of additional resources to address what may be a festering

problem. Avoidance this month leads to avoidance of a bigger problem next month and so on. When NPP projects report cost overruns of 100% of the original contract, it is easy to consider that earlier actions may have led to a better result.

6) *Taking it personally*

When a manager or subordinate reports a project challenge which may relate to EOT or Additional Payment, that individual may take it as an admission of failure on their part.

From the conflict avoidance mechanisms described above, much of the difficulty lies in a lack of trust. Explicit contract clauses and project training can be used introduce and re-enforce good behaviors while at the same time instilling trust throughout the team.

B. Best Practices for Notification of EOT

Robert Bies, a professor at Georgetown University's McDonough School of Business, has spent more than twenty years studying how managers deliver 'bad news'. Notification of EOT or Additional Payment claims certainly represents 'bad news' to the Owner and conflict avoidance mechanisms will often come into play under such circumstances. Late claims are one of the most common and contentious causes of Owner-Contractor disputes. Bies has developed the 'Ten Commandments for Delivering Bad News' [20].

Considering these as 'best practices', contracting approaches to ease the delivery of 'bad news' (i.e., claims for EOT or Additional Payment) can be proposed.

1) *Treat people with respect*

This is always a best practice but not always practiced. This dictum can be reinforced through mandatory training.

2) *Follow up and follow through*

Project challenges should be identified and dealt with in a timely manner and not allowed to linger and grow.

3) *Remember multiple audiences*

EOT and Additional Payment claims can affect multiple parties and result in tangled counterclaims. Operating in a closed environment only involving the General Contractor and Owner can lead to distrust with other parties and non-functioning communications channels. This issue can be addressed through training.

4) *Bring solutions to the table*

Identification of the challenge is not enough. All affected parties must bring solutions to the table, identifying what contributions each can make.

5) *Look for the silver lining*

As challenges arise, new opportunities can also appear. For example, a workplace accident can lead to enhanced training and procedures, improving safety for everyone.

6) *Justify the reason for delivering the information*

This approach can lead to improved trust and communications.

7) *Put it in writing*

On NPP projects, contract clauses related to written notice of EOT and Additional Payment claims are universal, but may also be universally ineffective in dispute avoidance. Improved clauses are suggested here.

8) *Never hide the facts*

See 'avoidance breeds avoidance' above.

9) *Never delay*

Notice of Delay related to EOT or Additional Payment must be timely to be effective in managing schedule and cost.

10) *Never surprise*

Surprises occur when the Owner did not expect a notice. By requiring the Contractor to report regularly (e.g., monthly) either new claims or no new claims in the past 30 days, the Contractor is put on notice that justifications for late notification will not be accepted and cannot be reimbursed.

C. *The Requirement of FIDIC Contract Clauses*

Specific contract clauses to address the inherent aversions to conflict and reporting of 'bad news' are proposed here. Overall, the recommended clauses which relate to as EOT claims, Additional Payment claims, liquidated damages associated with EOT, and Training related to the aforementioned are presented. The FIDIC Red Book section which best aligns with each clause is also identified.

1) *Recognition at the Contract Stage*

In formal meetings, both the Owner and Contractor must identify and jointly address possible circumstances leading to EOT disputes and include comprehensive and explicit project controls related to timely identification of and management of EOT-type risks in the contracting stage (before signing).

<Red Book>

- * Clause 8.6 - Rate of Progress
- * Clause 19.3 - Duty to minimize Delay
- * Clause 20.2 - Appointment of the Dispute Adjudication Board

2) *Establish a Detailed Rate Table for EOT claims*

Replace Contract defined computation, negotiation, arbitration, and possible litigation of EOT claims from either side with liquidated damages defined by a comprehensive schedule (timing, duration) for calculation of EOT-related claims. The schedule can be two-way, for claims of the Owner against the Contractor, and vice versa.

The cost borne by the Contractor will vary with the timing of the EOT and with the duration. A detailed schedule of liquidated damages should be agreed upon in the contract.

This will protect the Owner since for Owner instigated EOT events, the Owner cannot control Contractor claims. In this case, the Owner can expect the Contractor to include in the claims 'everything but the kitchen sinks' leading directly to dispute.

For the Contractor, the liquidated damages clause limits the liability for Contractor instigated EOT while assuring a known payment limiting uncertainty.

<Red Book>

- * Clause 4.21 - Progress Report
- * Clause 8.3 - Programme
- * Clause 8.7 - Delay Damages
- * Clause 9.2 - Delayed Test
- * Clause 13.6 - Day work

3) *Regular Notice of 'Claim' or 'No Claim'*

Require by Contract that the Contractor affirmatively provide formal notice of EOT or Additional Payment claims, or to affirmatively state that there are known circumstances which could lead to finding of an EOT claim, and to formally provide this information to the Owner on a regular basis (e.g., monthly, to be included in the master project schedule)

The Contract can include a nominal payment for each affirmation to maintain the Contractors attention

The Owner should also monitor the regular filing of such affirmations as part of the project schedule review.

<Red Book>

- * Clause 4.12 - Unforeseeable Physical Conditions
- * Clause 4.21 - Progress Report
- * Clause 4.24 - Fossils
- * Clause 8.3 - Programme
- * Clause 8.4 - Extension of Time for Completion

4) *Regular Meetings to Discuss Disputes*

Require by Contract regularly scheduled meetings between the Owner and Contractor to explicitly address contract disputes, even when there are no formal issues in dispute.

By requiring a regular meeting even when there are no identified disputes, the Contractor is forced to affirmatively confirm, in addition to the monthly filing above, there are no claims or pending claims.

<Red Book>

- * Clause 4.2 - Progress Report
- * Clause 8.3 - Programme
- * Clause 20 - Claims, Disputes, and Arbitration

5) *Regular Project Training on Contract Compliance*

Require by Contract regular training of both Owner and Contractor managers and staff on compliance with the Contract in terms of EOT reporting and conflict resolution

Adequate training is necessary to inform all the importance of working together as a team and of early identification of project challenges. In this way the best resources can be applied to minimize or eliminate the challenge.

<Red Book>

- * Clause 3.1 - Engineer's Duties and Authority
- * Clause 20 - Claims, Disputes, and Arbitration

TABLE II. FIDIC REQUIREMENTS

Requirements (FIDIC Clause)	Conflict Avoidance Mechanisms	Best Practices for Notification of EOT
1. Recognition at the Contract Stage (Clause 8.6, Clause 19.3, Clause 20.2)	1) The boss is always right	1) Treat people with respect 10) Never surprise
2. Establish a Detailed Rate Table for EOT claims (Clause 4.21, Clause 8.3, Clause 8.7, Clause 9.2, Clause 13.6)	-	10) Never surprise
3. Regular Notice of 'Claim' or 'No Claim' (Clause 4.12, Clause 4.21 Clause 4.24, Clause 8.3, Clause 8.4)	2) Indirect is better 3) Fear of consequences 4) Lack of competence 5) Avoidance breeds avoidance 6) Taking it personally	3) Remember multiple audiences 4) Bring solutions to the table 6) Justify the reason for delivering the information 7) Put it in writing 8) Never hide the facts 9) Never delay 10) Never surprise
4. Regular Meetings to Discuss Disputes (Clause 4.21, Clause 8.3, Clause 20)	3) Fear of consequences 5) Avoidance breeds avoidance	2) Follow up and follow through 4) Bring solutions to the table 5) Look for the silver lining 7) Put it in writing 9) Never delay 10) Never surprise
5. Regular Project Training on Contract Compliance (Clause 3.1, Clause 20)	3) Fear of consequences 5) Avoidance breeds avoidance	1) Treat people with respect 3) Remember multiple audiences

V. CONCLUSION

Human nature and past experience of successful managers may stand in the way of avoiding conflict and disputes on large and massively complex projects such as found with NPP construction. Contracting can be used to address the proclivities related to conflict avoidance mechanisms and an aversion to delivering bad news.

By including Contract clauses which require managers and staff to introspectively consider emerging project challenges, reporting can be improved. If regular reports and meetings are contractually required they become just one additional aspect of successfully executing the project. Further, the clauses can relieve the onus of being 'the one' who bears the bad news. This notification of project delays or cost overruns is no longer an admission of failure or incompetence but rather a 'success' in fulfilling contract requirements crafted to represent best management practice.

In addition, education and training concerning : (i) Contract requirements, (ii) conflict avoidance, and (iii) delivering of bad news can be used to condition the workforce to employ best practices and condition the managers to avoid bad behaviors.

From TABLE II, Contract clauses can be used to address 'Conflict Avoidance Mechanisms', and 'Best Practices for Notification of EOT' claims. These can also be integrated directly into the FIDIC Red Book template. However, these clauses will not be effective in a vacuum. Ignorance of Contract requirements and best practices can only be vanquished by effective training of all involved.

This training can also address the final and possibly most important element which is development of trust between manager and subordinate, Contractor and Subcontractor, and Owner and Contractor. In this regard, training programs may be most effective with a mixed audience from Owner, Contractor, and other project organizations.

Success or failure of an NPP project will rely on a wide range of factors. Contract clauses related to EOT and Additional Payment claims when properly communicated and implemented can contribute to early resolution, avoidance of Owner-Contractor disputes, and overall project success.

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