ECIA

Contract Management

Best Practice Guide - no. 3

Engineering Construction Industry Association

EPI

Productivity Improvement Committee

Foreword – Contract Management

The ECIA Productivity Improvement Committee (EPIC) commissioned this Best Practice Guide on Contract Management to facilitate the sharing and utilisation of knowledge. From the information contained within the Guide, improved work practices can be developed to assist with improved productivity and performance.

Throughout this document the term 'Contract Management' refers to those activities performed by both clients and contractors to: establish a project; develop a scope, terms and conditions to manage a project; procure, negotiate and award a contract; administer delivery of the project and close the contract after delivery of the project scope.

This document breaks 'Contract Management' down into four phases which are generic to any form of contract and any type of project, including both new-build and Repair and Maintenance contracts. The recommended best practices, some of which are applicable to clients, some of which are applicable to contractors, and some of which are applicable to both, set forth ways in which the formation and administration of a contract can positively influence improved productivity and worker performance.

The ECIA wishes to thank the many stakeholder representatives who contributed both directly and indirectly to the production of this document. Industry support for its production is indicative of a commitment to a continuous improvement process to increase the performance and competitiveness of the UK Engineering Construction Industry.

For further information please do not hesitate to contact **ecia@ecia.co.uk**

Definitions

The following key terms are used in this document:

Client: Primarily the asset owner, developer or operator. Depending upon the nature of a particular project, references to the term 'Client' could refer to the ultimate Client who is developing and paying for a project or the term 'Client' could apply to contractors at all levels within the supply chain who are subcontracting services as part of their scope of delivery. As such, companies who could act as both 'Client' and 'Contractor', as part of a project's execution plan, should properly consider all the recommendations set forth in this Best Practice Guide.

Contractor: The Contractor who has primary responsibility to the Client for delivery of the project, Major Event or Repair and Maintenance (R&M) activities. Depending upon the nature of the scope of services and contract, use of the term 'Contractor' could refer to:

- A 'Managing Contractor' who manages multiple contractors with defined scope of services (that is, does not perform the work themselves)
- An 'EPCC Contractor' who performs most of the project's scope of work with their own resources
- A 'Construction Management Contractor' who subcontracts most of the project's scope of work to other contractors who perform the work.

Project Management: The professional discipline of managing a project from conception through to completion, using accepted industry standards and practices for execution of the multi-discipline activities involved in project delivery. The term is used with reference to both the processes and people involved in Project Management.

Project Team: Any member of the Client's, Contractor's or subcontractor's workforce charged with overseeing and execution of a contract.

Subcontractor: Any contractor in the Contractor's supply chain carrying out Engineering Construction tasks on a project.

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1. Introduction

Why promote best practice in Contract Management?

The 'Changing to Compete' report highlighted the need to use best practice in the management of projects

Section 1 gives the background and defines the 3 main areas of investigation for the promotion of best practice

1.1 Background

The UK Government's Review of Productivity and Skills in the UK Engineering Construction Industry ('Changing to Compete' - published in December 2009) contained a total of 13 recommendations to drive the improvement in the Engineering Construction sector and thereby enhance the success of future projects. A number of the recommendations refer to or imply that Contract Management can influence productivity and form the basis of the terms of reference for this document.

In response to the recommendations in the above report, the ECIA commissioned a study between December 2011 and January 2012 to further identify the barriers to productivity and areas for improvement. The resulting report identified Contract Management as one of a number of areas of improvement. Specifically, the following contributing factors were cited as influencing pre-construction, construction and Repair and Maintenance work:

- Risk Management
- Increase and changes in scope
- Obtaining authorisation to work.

The days of a simple handshake between a Client and a Contractor are long gone. Projects within the Engineering Construction Industry are now delivered within the culture of a contract governed under a legal framework. Improving how such contracts are managed will have a direct consequence for enhanced productivity and worker performance.

Establishment of EPIC to Examine Best Practice

The ECIA hosted a conference in October 2011 to explore productivity performance. Following this, the ECIA Productivity Improvement Committee (EPIC) was established to look at best practice within the industry.

The committee was tasked with three main areas:

1. To identify barriers to delivering successful projects and Repair and Maintenance work in the Engineering Construction Industry.

2. To establish and disseminate best practice to overcome and mitigate barriers found.

3. To benchmark performance and measure improvement.

In November 2011 EPIC commissioned an independent report to identify the key barriers to productivity in the UK Engineering Construction Industry (ECI). This report 'Barriers to Productive Performance in the Engineering Construction Industry 14 March 2012' identified, amongst others, three initial areas that EPIC would investigate further: Industrial Relations, Workforce Engagement and Contract Management. The aim was to produce guidelines for stakeholders by means of the establishment of working groups comprised of experienced people drawn from all levels of the Engineering Construction Industry. The Industrial Relations and Workforce Engagement Best Practice Guides were published in 2013.

2. What Did the Group Look at?

2.1 Terms of Reference

Definition of Contract Management

The term 'Contract Management' describes those activities which take place between a Client and Contractor, and then between a Contractor and subcontractors and other sub-tier suppliers, for the purposes of formulating, tendering, administering and closing a contract for services. These activities form a similar sequence, irrespective of the form of contract that is being employed.

Key Aspects Addressed

The working group addressed key aspects of the Contract Management process, with particular reference to their effect on productivity of the workforce on a day to day basis.

Main points covered were:

- The identification, control and mitigation of risks in Contract Management
- The best means for improvement of the Contract Management process to enhance productivity of the workforce
- Specific processes for the control and management of contract change and obtaining authorisation to work
- Factors that vary between new-build construction and Repair and Maintenance work
- Variations in factors in management of contracts between:
  - Clients and Contractors and
  - Contractors and their supply chains.
- The impact on productivity of particular aspects of Contract Management during the various phases of project delivery (from Planning through to Construction and Handover).

2.2 Premises and Assumptions

The primary focus of this Best Practice Guide is to describe barriers to workforce productivity which can be overcome through employment of best practices in Contract Management. This document also contains certain best practices which are generic to effectively managing any contract for new-build and Repair and Maintenance projects and will influence the successful outcome of a project on a number of levels, including workforce productivity.

This Best Practice Guide specifically does not consider best practices for any of the following:

- The advantages or disadvantages of employing any particular form of contract; this will be the subject of a future Best Practice Guide on Contract and Procurement Strategy
- The commercial arrangements of a contract
- The definition of Industrial Relations content within contract requirements and management of Industrial Relations during contract execution; this was the subject of Best Practice Guide No. 1 – Industrial Relations.

2.3 Approach to Contract Management

Importance of New Developments in Contract Management

Contract Management has developed in many ways over the past ten years as projects strive to reduce costs and improve financial and operational performance.

A Changed Environment

New regulatory requirements, globalisation, increases in contract volumes and increases in project complexity have highlighted the increasing importance of and potential benefits derived from effective Contract Management.

Introduction of Formal Structures and Procedures

The growing recognition of the need to automate and improve contractual processes and to satisfy increasing compliance objectives have led to adoption of more formal and structured Contract Management procedures. In parallel with this development, there has been increasing reliance on available software applications designed to address this more formalised approach.

Importance of Clear Service Delivery Arrangements

Effective and efficient Contract Management can only be achieved if the arrangements for service delivery continue to be satisfactory to both parties (Client and Contractor) involved in the delivery programme. In particular, it is inevitable that disputes will arise within the complexities of the contract's life cycle. It is the responsibility of those drawing up a contract to expect and account for such disputes and provide mechanisms which will allow for expedient resolution of issues to the mutual benefit of all parties. To do this, it is essential that the contract binds both parties to a clear and deliverable scope and programme, with an effective Change Management process that allows impacts and changes to be incorporated into the contract with the least impact upon workforce productivity.

Workforce Productivity Critical to a Successful Project

Successful project delivery is dependent, amongst other critical success factors, upon the productivity of the workforce. The way in which contracts are prepared, tendered, administered and closed can have an effect upon the productivity of the workforce and this should be taken into consideration when drawing up and implementing a contract.

The 'Summary Report on Barriers to Productive Performance in the Engineering Construction Industry' confirmed that the management of risks, control of scope growth, management of change and obtaining authorisations to work were factors that affect workforce productivity on a day to day basis. It follows that all of these factors should be considered in the Contract Planning stage.

2.4 Benefits

Benefits of Good Contract Management

The benefits of good Contract Management can be chiefly typified by:

- Clear definition of the Client's requirements
- Clear understanding of the Client's expectations
- Clear allocation of risk between the Client and Contractor
- Provision of sufficient time within each stage of the project life cycle to properly implement those actions needed to allow successful implementation of the contract
- Early and continued engagement of all key stakeholders
- Provision of clear and early communication channels and mechanisms
- Open and honest communication between the parties
- Use of Key Performance Indicators (KPIs) to drive the right behaviours on both sides of the contract
- Effective change control
- Effective and timely Contract Close-Out.


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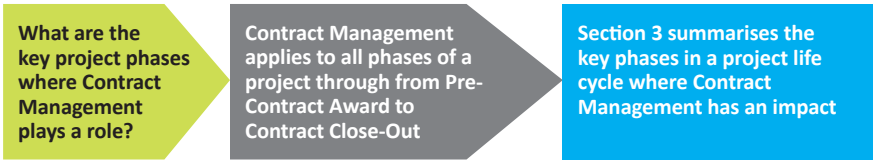
3. Contract Management in Engineering Construction



This section gives an overview of the key phases in Contract Management for an Engineering Construction project and includes a summary description of those tasks that pertain, in particular, to Contract Management.

3.1 Phases of Contract Management

General Overview of Project Phases

All projects can be subdivided into phases, where certain activities and events take place in a defined sequence.

The number and nature of project phases will vary based upon a variety of factors, including the scope, delivery model (for example, Client furnished design versus Engineering Procurement Construction & Commissioning (EPCC)), third party involvement and other external influences.

Phases are often structured around the key activities which comprise a typical project's life cycle, such as Planning, Design, Procurement, Construction, Commissioning and Handover. Many clients and contractors have procedures in place that define project phases with a gated approval process, governing the decision to consider one phase complete before entering into the next phase.

Different perspectives can also drive the description of project phases, as can be seen in *Section 3.2* of Best Practice Guide No. 1 – Industrial Relations, which depicts phases of the project life cycle from the perspective of Industrial Relations.

Model and Approach for Contract Management

From the perspective of Contract Management, a project can be seen to have four discrete phases which encompass the activities carried out during which a contract is formed, awarded, administered and closed. This model holds true for any contract or contract form, including new-build and Repair and Maintenance work. These four phases of Contract Management are:

- Pre-Contract Award
- Contract Award
- Contract Implementation
- Contract Close-Out.

The above phases apply to all contracts within a project's supply chain and the principles discussed in this Best Practice Guide would apply to all such contracts.

Influence of Activities in Each Phase

This Best Practice Guide has considered each project phase both in isolation and as a sequence of activities which comprise the life of the project. Each phase influences subsequent phases; hence it is not possible to discuss barriers to productivity or best practices in isolation.

This approach can be summarised as follows:

- The activities which are accomplished during the Pre-Contract Award and Contract Award phases significantly influence the success of Contract Implementation and Contract Close-Out.
- The activities which are accomplished during Contract Implementation significantly influence the success of Contract Close-Out.
- The activities which are accomplished during Contract Close-Out will influence decisions made during the Pre-Contract Award and Contract Award phases of subsequent projects.

As such, some of the best practices which are described herein for one phase of Contract Management are reflective guidance for activities actually accomplished in other phases of the project.

NOTE:

Often, insufficient time is allowed in the Pre-Contract Award and Contract Award phases to allow effective planning and decision making for the best outcome of the Contract Implementation and Contract Close-Out phases. Clients and contractors must both understand the importance of ensuring that sufficient time is allowed for in the early phases of a project to achieve a successful project outcome.

Pre-Contract Award

The Pre-Contract Award phase commences when a Client decides to implement a project and includes all the activities conducted by both the Client and the potential Contractor up to and including the submission of proposals in response to a Request for Proposal (RFP).

Clients

This phase includes those activities that clients must accomplish to confirm the scope of a project:

- Obtaining funding for the project
- Preparing specifications, works information and contract requirements
- Identifying potential bidders
- Prequalifying potential bidders into a list of companies or joint ventures from whom to request proposals
- Preparing and issuing tender documents to procure the project
- Responding to requests for information from the bidders during bid evaluation.

Contractors

This phase includes those activities that contractors must accomplish to:

- Make bid/no-bid decisions on prospective proposals
- Gain internal approvals to submit a proposal for a project
- Develop a 'win' strategy
- Develop cost estimates
- Engage the supply chain
- Prepare proposals in response to a Client's tender documents and gain final internal approvals to submit a bid.

Contract Award

The Contract Award phase includes:

- The Client's evaluation of tender submissions
- The exchange of information between clients and bidders to clarify and normalise bids
- The obtaining of internal Client approvals necessary to award a contract
- The obtaining of internal Contractor approvals necessary to enter into a contract
- And finally, the signing of a contract between the two parties.

Contract Implementation

The Contract Implementation phase commences after Contract Award and includes everything that the Client and Contractor must do to administer the contract until the Contractor has achieved completion of the works in accordance with the contract requirements.

Contract Close-Out

The Contract Close-Out phase includes all activities needed, once the Contractor has achieved completion of the works, to formally close the contract and implement the warranty period.

3.2 Contract Management Activities and Events

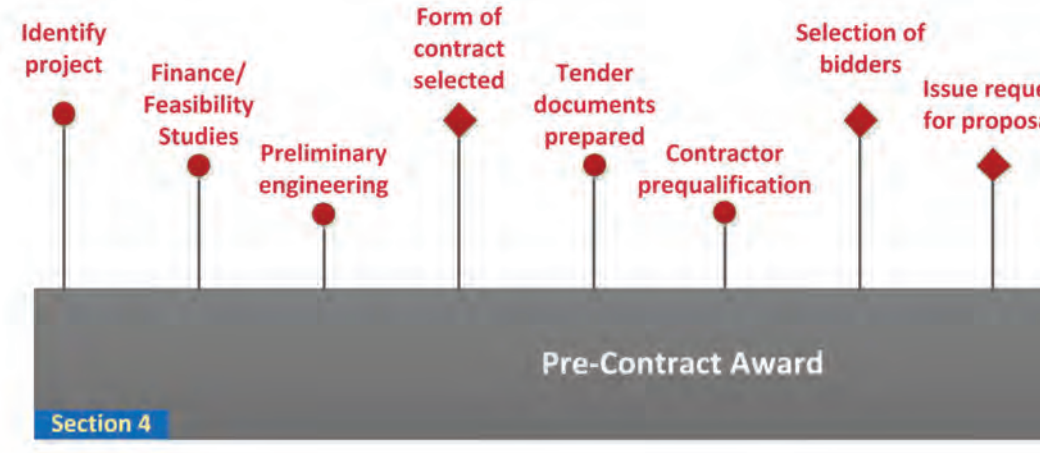
General Overview of Project Phases

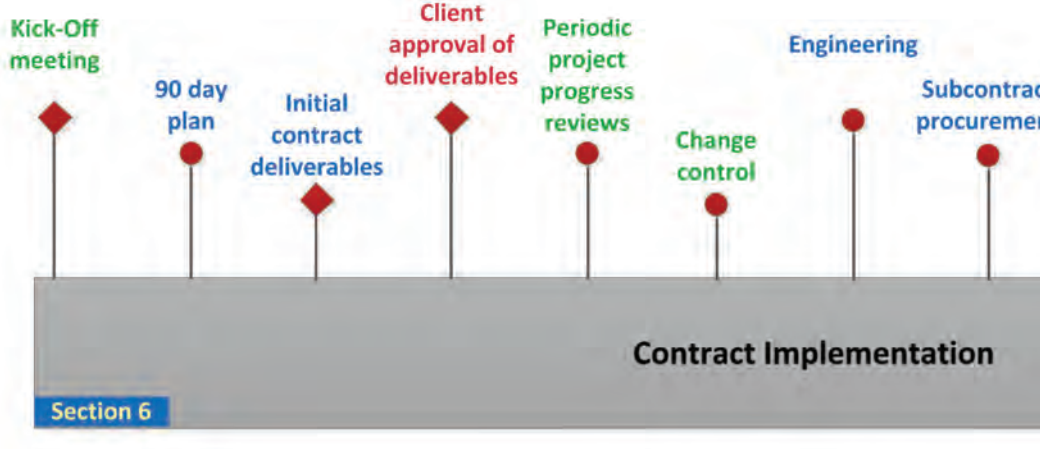
The flow sequence contained in this section shows typical key activities and events within each of the four phases of Contract Management. It is designed to provide a context for investigating the barriers to productivity within the Contract Management process as a whole.

Please note the following key to the process flow in this section:

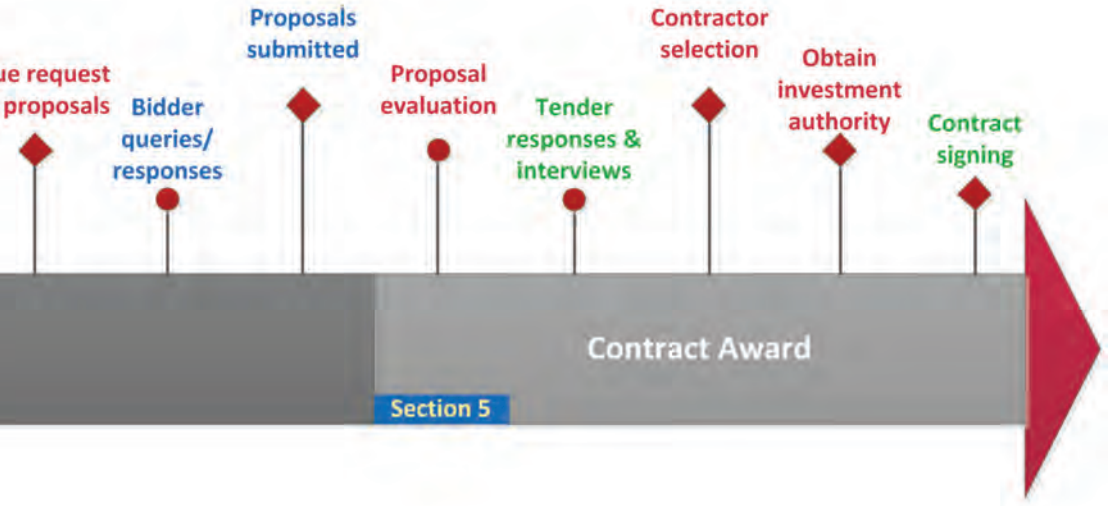
LEGEND: ● activity ◆ event / milestone

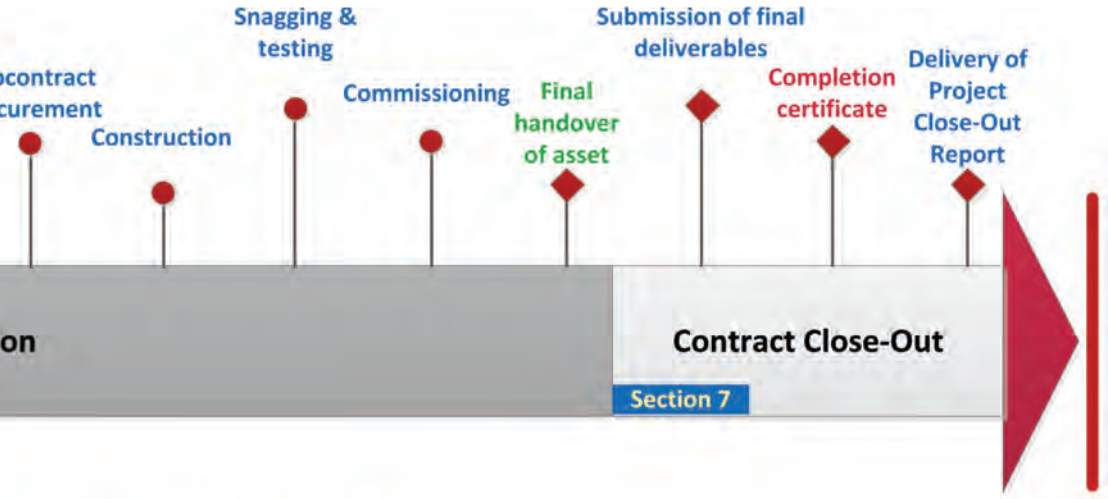
Process flow





TEXT KEY: Red text = Client Blue text = Contractor Green text = C





text = Client & Contractor jointly

4. Pre-Contract Award

What are the key activities in the Pre-Contract Award phase?

Identifying the project and form of contract, selecting bidders and issuing a Request for Proposal

Section 4 describes important factors for the Pre-Contract Award phase and summarises potential barriers to productivity

This section provides an introduction to the Pre-Contract Award phase and describes the key barriers to productivity and steps that can be taken in their mitigation, in order to create the basis for good productivity in the subsequent Contract Implementation phase. It also includes a number of best practice recommendations for successful management of this phase in a project.

The barriers to productivity covered in this section can apply at any point during the course of the key activities and events which take place within this phase of Contract Management.

4.1 Introduction

The Pre-Contract Award phase is a crucial period during which, if the appropriate procedures are conducted successfully, the contract will be positioned for a successful outcome, maximising high levels of productivity. The main key to overall success in this phase depends on communication and a willingness to work together.

Proper Understanding of the Contract

It is crucial that clear and precise understanding of the contract exists between all parties, in order to avoid creating barriers to achieving maximum productivity. (See *Appendix C* for a guide to the key contract elements that should form the basis of the Initial Enquiry Package.)

A properly prepared and compliant tender submission will have considered the many barriers to successful contract completion. Given that sufficient time has been allowed to compile the submission, issues will have been dealt with through intensive communication and in the course of development of a culture of working together. By mitigating many of the potential areas for conflict, the Project Team will be able to concentrate upon execution of the contract and achieving the highest levels of productivity throughout, rather than being split between dealing with contractual issues and execution.

During this phase, the Client should give key consideration to how the contract will:

- Impose appropriate incentivisation for timely delivery of design and specification details
- Demand detailed programmes for all aspects of the project's scope in sufficient detail to allow effective management of the work by the Contractor and evaluation of progress of the work by the Client
- Sufficiently consider and accommodate multiple locations involved in project execution and compel the Contractor to clearly identify which key activities, such as subcontract administration and management of off-site manufacturing, are to be conducted in which location

- Ensure that the requirement for the subcontractors to operate a site Industrial Relations policy fully reflects the best practice requirements laid down in the ECIA Productivity Improvement Committee (EPIC) Best Practice Guide Number 1 for Industrial Relations
- Ensure that the requirement to deliver a Project Quality Plan, aligned with the project's delivery programme, is a prerequisite, as lack of a clear project execution strategy clearly impacts delivery.

Potential Areas of Poor Performance

Of the numerous barriers that can create conflict within a contract, each should be considered for its potential impact before mitigating factors are put in place.

There are six key areas where poor performance can lead to serious barriers to productive working:

- Client has unachievable expectations
- Inadequate Pre-Qualification Questionnaire (PQQ) process
- Enquiry packages incomplete at time of bid
- Lack of qualified contractors
- Contractor proposal doesn't address requirements of the Request for Proposal
- Insufficient time has been allowed for building the Project Team and ensuring the correct levels of skill required.

4.2 Managing Barriers to Productivity

Some key potential barriers to productivity are described here with their causes, and suggestions are given for an approach which will lead to identifying factors for success.

Client has Unachievable Expectations

The problem of unachievable expectations can arise from a number of contributory factors. Generally such expectations stem from a lack of current understanding of the supply and manufacturing market at the time, coupled with time and/or budget constraints.

To achieve successful understanding of the current market, meetings need to be implemented before the contract starts between all parties, including Client/Contractor Project Teams, and then held on a regular basis. These meetings should have the objective of discussing, defining and agreeing parameters during this phase of the project.

In particular, it is essential that:

- Work levels are defined, including safety and quality requirements
- The understanding from both Client and Contractor of what has to be delivered, and to what programme, is set down clearly, in order to make the most efficient and cost effective use of resources
- Enough time is allowed for completion of the work in all phases of the contract.

Inadequate PQQ Process

Poorly managed PQQ requirements are often seen as a barrier to the pre-qualification process.

An effective PQQ process will facilitate:

- Dialogue between Client and Contractor, giving due consideration to both the Client's and Contractor's requirements, in particular as to how packages are placed. These requirements should give the ability to bundle packages together, which can achieve an enhanced performance from a Contractor and deliver flexibility and high levels of productivity.
- Developing a culture of trust between all parties to achieve a set of requirements specifically relevant to the contract scope; consideration should in particular be given to detailed reporting and productivity incentivisation.
- Ensuring, whilst developing these requirements, that full consideration is given to both safety and quality, each of which will complement good productivity throughout the contract.

Enquiry Packages Incomplete at Time of Bid

Enquiry packages can be incomplete as a result of a number of factors:

- Design information is incomplete
- Design Specification quality is not up to standard
- There is poor or late definition of scope
- Interfaces have been insufficiently considered or defined
- Local conditions are unknown
- The programme of work is incomplete or wrong
- The scope of the deliverables is not clearly defined.

NOTE:	*This list is not exhaustive and other factors can contribute to this problem.*

In order to achieve a successful Contract Award and continue through to successful implementation of the works, it is essential that meetings and other channels for dialogue are initiated during the Pre-Contract Award phase and continue on a regular basis. This process should begin before the contract starts, and should include all Client and Contractor Project Teams involved in the project.

The objectives are to ensure that:

- The Client is made fully aware of and understands why the required information is incomplete, where this is the case, and how it could result in the need for qualifications within the bid submission. The potentially negative effect upon efficient productive working, for example through the need for re-work, should also be considered.
- By developing a 'Culture of Trust' and working closely together, Client and Contractor can avoid any future dispute which could adversely affect the productivity of the project. All parties must commit to working together!

Lack of Qualified Contractors

A lack of general market intelligence and poor understanding of the skills market by the Client can have an adverse effect on planning and productivity. In particular, supply chain requirements and availability should be identified in relation to the contracting community sufficiently ahead of the demand, otherwise the subsequent potential delays and skill shortages can have a significant negative impact on the economic model on which the proposed project has been established.

To prevent these problems, forward planning with early announcement of proposed contracts is essential. Both Client and Contractor should fully evaluate the market so that all parties understand the forthcoming requirements in relation to the available skills market.

This will allow potential tenderers sufficient time to establish clear plans and appropriate teams for engagement with the proposed new project, and provide a solid base from which the Pre-Contract Award process can be conducted.

Contractor Proposal Doesn't Address Requirements of RFP

A number of issues can arise when the Contractor's proposal doesn't address the stated requirements of the RFP. These can include:

- Inadequate timescale provided for bidders to respond to the RFP
- Lack of resource
- Lack of engagement with the supply chain during bid development.

Detailed and complex enquiries should not be put out to the market place without adequate time being allowed to understand the Client's and Contractor's requirements. It is essential to allow such time to enable a fully compliant bid to be submitted.

Once again, it is suggested that close working relationships, which involve the building of trust and mutual understanding, are essential for creating a full appreciation from all parties of the proposal requirements. This understanding can then be transferred onto the Project Team for implementation and will assist in achieving high levels of safety and productivity during project execution.

4.3 Best Practice

PRE-CONTRACT AWARD	
Managing Client expectations	The Client should: ■ Engage at an early point with the supply chain to avoid unrealistic expectations ■ Ensure high levels of communication between all parties – this is considered essential ■ Use pre-contract meetings and general site meetings to build a culture of trust and open communication when working together. The Contractor should: ■ Never be afraid to say "I Don't Understand!"
Ensuring correct understanding and conditions of the contract	The Client and Contractor should: ■ Ensure the contract conditions are understood and that they are applicable to the contract works being issued. The Client (including all clients along the supply chain) should: ■ Ensure the strict application of good IR practices as embodied in NAECI. This requirement should be included in contracts and 'enforced' by clients. ■ Use contracts that incentivise the efficient use of workforce man-hours and materials. The Contractor should: ■ Provide individuals who have experience of the form of contract supplied by the Client.
Employing competent contractors and subcontractors	The Client should: ■ Ensure that they appoint contractors and subcontractors who are competent to do the job. This means not only selecting those able to organise the work efficiently but also those able to manage the workforce effectively through good leadership.

PRE-CONTRACT AWARD	
Ensuring appropriate knowledge and understanding on the part of the Contractor	The Contractor should: ■ Have sufficient knowledge about and have performed due diligence with regard to a Client ■ Understand the level of investment required to prepare and submit a competent proposal ■ Have shown that they are experienced in dealing and working with UK Trades Unions, such as outlined in NAECI.
Involvement of the Trades Unions in the communications process	The Client and Contractor should: ■ Ensure that Trades Unions that are recognised signatories to NAECI are involved at an early stage in preliminary planning, so that they fully understand what is happening.

5. Contract Award

This section provides an introduction to the Contract Award phase and describes the key barriers to productivity and steps that can be taken in their mitigation. It also includes a number of best practice recommendations for successful management of this phase in a project.

The barriers to productivity covered in this section can apply at any point during the course of the key activities and events which take place within this phase of Contract Management.

5.1 Introduction

The period spanning the time from when the Client receives proposals in response to an Invitation to Tender up to Contract Award is critical for two key reasons:

- Ensuring that the intent of the contract has been satisfied by the preferred bidder's proposal
- Ensuring that the contract can be administered during the Contract Implementation phase in a manner that achieves the desired outcomes for both parties.

Implicit in these aims is the objective of ensuring that any potential barriers to productivity can be efficiently identified, mitigated and managed in order to minimise any impact upon the productivity of the workforce.

In this context, there are four key areas where poor performance can lead to serious barriers to productive working:

- Contract awarded without proper estimate of cost
- Contract awarded with unrealistic scope/schedule
- Poor understanding of the key project risks
- Comprehensive project governance not incorporated into the contract.

5.2 Managing Barriers to Productivity

Contract Awarded without Proper Estimate of Cost

A number of causes usually contribute to a contract being awarded without a proper estimate of the cost as a basis for the awarded contract value:

- Unrealistic bid timescales are provided for contractors to prepare competent technical proposals and cost estimates
- The Client's scope is not sufficiently defined or is subject to on-going research and development which could lead to change in scope

- Contractors don't sufficiently engage with their supply chain in preparing cost estimates
- The risk profile and allocation of responsibility for mitigation of risks is not clearly understood by either the Client and/or bidders.

Client Responsibilities

Clients need to ensure that they have provided sufficient information in their Request for Proposal to clearly specify the project's scope, programme and risk so as to allow contractors to prepare competent technical proposals and cost estimates/price in response; this is because the contractor's proposals for time and cost form the basis for the planned productivity of a project. The Client's Request for Proposal should provide bidders with a detailed Work Breakdown Structure (WBS) that clearly represents the project scope and breaks down the cost in sufficient detail to allow a robust evaluation.

Sufficient time must be allocated during this phase for contractors to prepare a competent proposal and clients to fully interrogate and understand the bidders' cost estimates/price. If the Client does not have the competence or resources internally to conduct a thorough bid evaluation then securing external support may be necessary.

A structured tender query should be established which allows all questions to bidders to be identified and tracked to resolution as part of the evaluation process.

Finally, clients need to be aware of contractors over-committing or simply trying to 'buy the job' when they are trying to meet internal objectives and financial models.

Contractor Responsibilities

Contractors need to provide the necessary resources, supply chain involvement and internal reviews to ensure proper estimates of cost to deliver the project scope within the specified programme and risk profile.

Contract Awarded with Unrealistic Scope/Schedule

As with cost, clients must take measures during tender evaluation to ensure that contracts are not awarded on the basis of an unrealistic scope or schedule.

A number of causes can contribute to this:

- Clients don't provide a sufficiently detailed programme within the Invitation to Tender in order to communicate programme expectations to the bidders
- Contractors don't sufficiently study and understand the conditions and circumstances that will affect the productivity and schedule of the project
- Contractors don't sufficiently study the project's scope and risk profile to determine whether the programme expectations of the Client are achievable
- Contractors don't sufficiently understand Local, National or International demands for services, with the result that they offer schedules that cannot respond to pressures caused by manual staffing, 'white collar' staffing shortages and subcontractor or supply chain capacity
- Client and/or Contractor programmes don't provide for the required level of pre-mobilisation and mobilisation activities before the start of construction
- Risk Management reviews focus on the implications of cost rather the implications of both cost and time.

Client Responsibilities

The Client's Request for Proposal needs to provide a Tender Programme which bidders must achieve, based upon the same Work Breakdown Structure used to develop the project's cost estimate/price. During tender evaluation, clients need to be conscious of whether timescales for the project have been changed or influenced by events which have transpired since the Tender Programme was developed.

Contractor Responsibilities

Contractors must take similar diligence in preparation of the Project Programme as they do for preparation of cost estimates as outlined above.

Poor Understanding of the Key Project Risks

With risks comes the potential for unplanned change, which can have an adverse impact upon productivity during Contract Implementation.

Causes which contribute to a poor understanding of the key project risks include:

- Insufficient consideration of project risks by the Client prior to tendering for a project
- Insufficient consideration of project risks by the Contractor prior to submitting a technical proposal and cost estimate/price
- Risk reviews that focus on cost, without proper consideration of time and effect of risk upon productivity
- Risk reviews that do not consider all measures which could minimise risks and prevent impact upon cost and time
- Risk ownership that is not agreed prior to Contract Award.

Client Responsibilities

A Client needs to comprehensively evaluate the project's risks prior to going out to tender. The Client's allocation of risk between themselves and the Contractor must be realistic and specified in the tender documents, so as to allow contractors to sufficiently consider and understand costs and risks within their technical proposal and estimate.

Contractor Responsibilities

Contractors need to conduct robust risk reduction workshops during proposal preparation to understand the implications of the project's risks to their cost estimates and programme. These risk reduction workshops need to review the project risks from the individual Contractor's perspective and not simply take the Client's specification of risk for granted.

Contractors need to allocate appropriate resources to the consideration of risks during bid preparation and build the infrastructure of their Risk Management Programme into their proposal. The flow down of risks must be also considered by contractors in the preparation of their subcontracting strategy.

Comprehensive Project Governance not Incorporated into Contract

Failure to put appropriate governance in place within the contract can lead to situations where work cannot proceed, which directly affects workforce productivity. There are a number of causes which contribute to failures in the Contract Award phase which need to be considered to ensure that effective project governance is incorporated into the contract:

- Performance measures are not defined or agreed prior to Contract Award
- Robust communication and stakeholder engagement protocols are not agreed prior to Contract Award
- Lines of accountability and authority have not been specified in the Client's tender documents
- Contractors have failed to establish clear authorities and responsibilities for approval of changes to the contract
- Contractors have failed to put mechanisms in place for payment of subcontractors and sub-tier suppliers in a timely manner
- Change control procedures are not clearly defined and/or adhered to
- The contract is not administered in an appropriate or timely way.

Client Responsibilities

Clients need to give proper thought to a project's governance and be very clear in the tender documents as to how that governance will be adhered to. This requires clarity in specifying what the Contractor must submit with the proposal so that the Client can properly understand the Contractor's interpretation of the project's governance.

Clients must ensure that:

- The preferred Contractor's proposal has understood the governance requirements contained in the contract and has outlined the organisation and management systems that will be used to meet those requirements during Contract Implementation
- They understand what organisation and management systems they, as the Client, need to have in place to administer the governance requirements during Contract Implementation
- They have clearly defined responsibilities for control of and approval of contract changes
- Their expectations and requirements are clearly established in the tender documents so that the bidders can understand and propose how they will operate under the contract's governance.

Joint Responsibilities

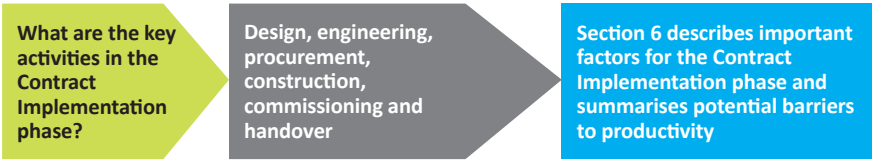
Both parties (Client and Contractor) need to recognise the investment in project resources that will be required to adhere to the project's governance, and this needs to be reflected in the Contractor's proposed organisation and staffing plan.

5.3 Best Practice

CONTRACT AWARD	
Ensuring projects are delivered to budget	The Client should: ■ Develop a comprehensive pre-tender estimate of costs and require a price breakdown in sufficient detail from contractors to facilitate evaluation ■ Incorporate a formula for disqualifying bids where prices are expected and determined to be abnormally low in their evaluation criteria. The Contractor should: ■ Sufficiently engage with the supply chain in development of bid prices ■ Develop prices to Client specifications and not to standard estimating templates.
Ensuring projects are delivered on time	The Client should: ■ Develop a comprehensive pre-tender schedule for the works and require Tender Programmes from contractors that are in sufficient detail to facilitate evaluation ■ Specify that programmes are tied to the same Work Breakdown Structure as prices ■ Incorporate a formula for disqualifying bids where programmes are expected and determined to be unachievable in terms of evaluation criteria ■ Require a pre-award programme review with the nominated Contractor. The Contractor should: ■ Involve the Project Team who will deliver the project in establishing the Tender Programme ■ Ensure the Tender Programme provides sufficient details in all parts of the project scope, including Planning and consents, Engineering, Procurement, Construction, Commissioning and Handover.

CONTRACT AWARD	
Ensuring projects understand and manage risks	The Client should: ■ Specify a Risk Management tool to be used for the project and require contractors to submit a Project Risk Register with their bid ■ Request contractors to provide specific proposals for the mitigation of risks that could affect workforce productivity ■ Require a pre-award risk review with the nominated Contractor.
Implementing appropriate project governance	The Client should: ■ Outline a detailed change approval process in tender documents including clear time limitations for approval, which are to be strictly adhered to during Contract Implementation ■ Provide a tender question which poses a hypothetical change and requires the Contractor to describe in their bid how they would manage and mitigate the impacts of that change ■ Request bidders to propose Key Performance Indicators that they would suggest using during Contract Implementation to evaluate performance ■ Conduct pre-award interviews and values screening with the Contractor's key staff as part of kick-off activities ■ Establish project bank accounts to provide transparency of Contractor payments to sub-tier suppliers.

6. Contract Implementation



This section provides an introduction to the Contract Implementation phase and describes the key barriers to productivity and steps that can be taken in their mitigation. It also includes a number of best practice recommendations for successful management of this phase in a project.

The barriers to productivity covered in this section can apply at any point during the course of the key activities and events which take place within this phase of Contract Management.

6.1 Introduction

Contract Implementation commences upon the Contractor's receipt of a signed contract and runs through to acceptance of the completed asset by the Client. This phase includes all aspects of Design, Engineering, Procurement, Construction and Commissioning.

Effective implementation and administration of the awarded contract can have a significant effect upon achieving the budgeted cost and scheduled delivery of any project, not only as it relates to the productivity of the workforce but also to many other aspects of successful project delivery. Decisions made during the Pre-Contract Award and Contract Award phases will have laid the foundation for effective Contract Implementation.

It is imperative, therefore, that:

- The Contractor's initial activities during the Contract Implementation phase effectively translate those decisions and requirements embedded in the Client's contract requirements and the Contractor's proposal into a robust Project Execution Plan.
- Both the Client's and Contractor's procedures drive the right practices and behaviours to effectively manage and administer the contract in a manner that affords decisions and actions which prevent barriers to productivity.

The barriers to successful Contract Implementation are considerable and cross all the project deliverables. In particular, there are ten key areas where poor performance can lead to serious barriers to productive working:

- Safety performance
- Mobilisation
- Operations Management
- Commercial Management
- Materials and Equipment Management
- Change Management

- Project Control Management
- Relationship Management
- Supply Chain Management
- Commissioning and Handover.

6.2 Managing Barriers to Productivity

The overarching requirement for any project should be to ensure that the maximum continuity is maintained post Contract Award. This can only be achieved if the Client's and Contractor's Project Teams have been actively involved in the contract negotiations and award process. This group should be fully aware of the rights, obligations and deliverables enshrined in the contract.

In conjunction with the above requirement, there are detailed below some of the key barriers to successful and productive projects and their causes. These barriers can exist throughout the project life cycle and suggested best practices have been recommended, which should go some way to help minimise their impact and drive the key factors for success.

Safety Performance

Studies have proven that there is a direct relationship between poor site safety performance and poor project productivity. Poor safety performance can have many contributing causes, which can be brought about by one or more of the following conditions (this list below is not exhaustive):

- Lack of visible senior management commitment (Client and Contractor)
- An inadequate or poorly defined command and control programme which dictates the key roles, responsibilities and accountabilities
- Inadequate levels of experienced and qualified supervision on the project
- A lack of safety ownership on the part of the Client's organisation
- A safety culture that is not well established or implemented
- Accident/Incident/Near Miss recording and reporting that is either inadequate or does not lead to observations being effectively followed up.

Approach to Mitigation of Risk

There is no single way to mitigate the above conditions, but it is clear that the provision of a Project Safety Programme as part of the initial project enquiry package will go a long way to setting the expectations of both the Client and the Contractor. It will also allow the potential subcontractors to clearly articulate how they intend to deliver safety excellence throughout the site Construction and Commissioning processes.

The agreed contract should allow for several Performance-Based Incentives (PBIs) to be established against the site safety performance. These PBIs should be linked to a contract's commercial incentive mechanism aimed at the subcontractor and rolled down to the on-site and off-site workforce.

Mobilisation

Late or slow contract start-up/mobilisation is the first area where productivity can start to be affected. This impact is usually caused by several contributing factors:

- The lack of key engineering and trade resources, usually caused by the lack of front end planning and/or the selection of an overstretched Contractor
- Insufficient schedule time allowed for effective site mobilisation
- The lack of an accurate and contractually agreed project schedule at Contract Award
- Failure to effectively engage with key stakeholders (Trades Unions, Regulators, Client Production Management, etc.)
- The Contractor's ineffective transitioning from sales to project delivery.

Approach to Mitigation of Risk

The lack of a clear and detailed front end Contract Schedule (where sufficient time is allowed for key activities) and Resourcing Plan can be the main contributing factors to a slow starting project. The contract needs to ensure that a detailed Contract Schedule is agreed and in place before a contract is awarded.

Failure of the subcontractor organisation to fully understand the key resource requirements at the bid stage, coupled with contracting parties' failure to conduct sufficient due diligence of the Contractor's proposals for the early project requirements are both significant contributors to this issue. As stated earlier, the bid process should carry out a robust review of a potential Contractor's/subcontractor's offer.

The pre-contract negotiations need to have ensured that a clear governance programme is agreed for the project delivery phase, including a robust site mobilisation plan. The mobilisation plan will detail the requirement for a detailed site kick-off meeting; the scope and agenda for this will have formed part of the original enquiry documentation package, the contents of which will be the subject of a detailed response from the potential subcontractor organisations.

The agreed contract should contain several PBIs which cover mobilisation and resource provision. These PBIs should carry significant weighting within the contract's commercial incentive mechanism.

Operations Management

Extension of time during construction is driven by several key issues which can seriously derail the project's productivity and timeline. Most of the issues below should appear on a well thought out and detailed Risk Register and the solutions for these risks should be evident in the mitigation strategies.

These generic risk elements include:

- Detailed information regarding the local area and ground conditions (see Construction Design and Management (CDM) Regulations)
- The project's interfaces with the existing operational facilities and their potential impact on the project
- Design quality issues, leading to a potential need for re-work or delays waiting to proceed, which can impact efficiency

- Stakeholder engagement issues
- The effects of inefficient working practices, for example the failure to adequately plan work areas and access
- Failures in the delivery of key equipment and materials
- Poor Industrial Relations management.

Approach to Mitigation of Risk

The original Invitation to Tender should not be released if it does not contain significant detail regarding critical project inputs such as the existing site ground conditions, which should include information on:

- Potential contamination
- Drains, services and utilities
- Ground load-bearing capabilities
- Access and egress
- Emergency arrangements.

It should also be ensured that:

- There is an effective and timely design review process
- Key stakeholders who can impact on progress, for example regulatory authorities and local resident groups, are kept informed and 'on board'
- There is effective project planning and scheduling
- Good workforce relationships are maintained by following the recommendations of EPIC Best Practice Guides 1 & 2.

Commercial Management

Although not an obvious barrier to productivity, cost escalation as an element of Commercial Management can be a key indicator of issues in the wider project.

Behaviours in and around Project Cost Management can have a significant effect on delivery. A Contractor who is commercially challenged is less likely to provide the oversight and support needed to fulfil the Client's objectives. Stresses which come with significant commercial issues will potentially result in distractions to both the Contractor's and Client's Project Team and senior management, which will likely result in conflict. This can lead to a breakdown in communication and trust between the parties, which can also cascade down through the supply chain.

Risk elements include:

- Alignment between Client and subcontractor business objectives not effectively managed
- Inadequate or poor risk mitigation activity
- Poor or inadequate Design Specification quality
- Inadequate subcontractor management
- Inadequate logging of site activities throughout the project life cycle.

Approach to Mitigation of Risk

Cost escalation is mainly driven by three key elements:

1. Inadequate preliminary engineering preparation (for example, FEED) which leads to inadequate scope definition and, subsequently, a large amount of change.
2. Poor estimating practices by the subcontracting entity.
3. Poor understanding of the project risks and subsequent lack of sufficient contingency budget.

All of the above elements are preliminary engineering input from activities in the Pre-Contract Award and Contract Award phases of the project. The provision of adequate preliminary engineering documents and a robust 'first pass' Risk Register are essential weapons in the fight against cost escalation.

Materials and Equipment Management

The ability to manage the delivery of on schedule, right first time equipment and materials to site is a fundamental requirement of a Construction Contract and can be one of the biggest causes of poor productivity.

There are several risks associated with this activity:

- The provision of inadequate equipment and materials
- Inadequate delivery management processes and procedures
- Poor execution of the Delivery Schedule, which will significantly impact productivity.

Approach to Mitigation of Risk

Contractors need to demonstrate that they have the requisite skills to manage this delivery process by:

- Establishing a robust off-site Equipment and Delivery Schedule, supported by appropriate expediting systems
- Establishing processes that ensure the Design Specification quality is of the highest standard
- Ensuring that schedule logic and milestones allow sufficient time for manufacture and delivery requirements
- Ensuring that off-site workmanship quality is underpinned by robust quality programmes and systems.

The following factors should also be addressed:

- **Milestones:** The contract should clearly detail the key equipment delivery milestones; these milestones should form a part of the project's Performance-Based Incentives within the contract's commercial incentive mechanism.
- **Bulk materials:** Elements such as bulk material requirements (pipe, fittings, cables etc.), especially exotic materials, should be identified and managed as schedule deliverables.

- **Project Quality Plan:** The project should develop a robust Project Quality Plan that is integrated into a Master Contract Schedule, with sufficient time allowed to complete all of the design quality reviews and any off-site pre-inspection activities. The quality of this document should be a high scoring element of the Pre-Contract Award assessments.

Change Management

Clients and contractors consistently underestimate the disruptive impact of change on a project; even the smallest of changes can result in significant delays. When change is poorly managed on either or both sides of the contract, this will drive bad behaviour within the contracting and delivering entities.

Poor Change Management is usually categorised by:

- Unclear or ambiguous Change Management processes
- The late identification of change
- Poor and/or slow change communication
- Slow change approval
- Local agreements made outside the governance process
- Work instigated without requisite approvals
- Slow response to technical queries or concession requests.

Approach to Mitigation of Risk

The contract document needs to clearly detail the required Change Management process and the appropriate subsection of the contract should:

- Detail the Client's and Contractor's personnel with change instruction/approval responsibilities and accountability
- Ensure that Client and Contractor are aligned and staffed to execute the chosen form of contract. (Fixed Price Contracts will be executed significantly differently to target cost.)
- Include the implementation of a Change Management Register, which is proactively managed by the project as part of the agreed governance change review process
- Include provision to allow for the escalation of unresolved change issues to an overarching Client-led arbitrator/ombudsman, with powers to instruct or reject change
- Provide a clear timeline for the identification and issue of a change request and a clear contractual time for review and approval. The utilisation of the site's document control system is a key element in this process.

NOTE:	*If the project is of a significant value, consideration should be given to the introduction of a Change Control Board (CCB) to manage the Change Register, in the same way as risk is managed. This Board should consist of the key Commercial and Project Management resources from both the Client and Contractor. The duties of this Board will be to sanction all contractual change encountered on the project.*

Project Controls Management

Those who are managing projects need to know how the cost and schedule performance is progressing against the baseline and so accurately predict completion. Failure to control these two key project health indicators can significantly impact delivery performance.

Some elements that can impact project controls are:

- Contractor's data is inaccurate or of poor quality
- A Project Control process has not been established or is inadequately deployed
- There is a lack of experienced project control resources
- PBIs are not established to drive the necessary behaviours
- There are too many or overly complex reporting demands from within different parts of the Client's organisation.

Approach to Mitigation of Risk

In order to deliver accurate schedule and cost data, the contract between the Client and Contractor, and subsequent subcontracts, should clearly define the Project Control process requirements detailing the:

- Schedule and cost control software requirements
- Working level Work Breakdown Structure
- Data reporting requirements and reporting frequency.

Where subcontracted entities are not large enough to carry the software and/or Project Controls Management (PCM) resources, the contract should clearly identify the type, format and frequency of the base data that will be required for progress monitoring.

The contract should also contain Performance-Based Incentives which are structured to reward/penalise the provision and delivery of accurate data.

Relationship Management

Conflicts on a project can seriously harm productive delivery, the obvious area for conflict being Industrial Relations. The EPIC Best Practice Guide Number 1 covers this important topic in detail, therefore this element is not considered here. However, several other areas can also be responsible for poor Relationship Management, and include elements such as:

- A lack of clear and concise leadership
- The Client does not retain an intelligent customer capability, therefore the project is starved of clear Client guidance at critical times
- Poor Client/Contractor relationships as well as poor inter-team dynamics
- Poor relationships within key elements of the supply chain
- Failure to take action/address issues when conflict arises.

Approach to Mitigation of Risk

Leadership at all levels of a project is of key importance and is driven from the top down. Every level of the project organisation from front line field supervision through to members of the Project Team needs to have a clear understanding of the roles and responsibilities within the Project Team for delivering the project objectives and milestones. These roles and responsibilities need to be clear, concise and fully understood. The contract should make the delivery of these goals a contractual requirement in the Prime Contract document.

The introduction of a Project Team Building programme between the Client, Contractor and subcontractor organisations will drive the types of behaviour that are needed to engender collaborative working throughout the duration of the project. This process is often more effective and timely when a third party facilitator, who is impartial to the differences being experienced, is engaged to lead the alignment process. A case study is presented in *Appendix B*, which illustrates the principles involved.

It is essential that the Project Manager act swiftly to defuse tensions and conflicts within the Project Team; failure to respond quickly and decisively will result in deterioration of working relationships.

Supply Chain Management

Effective Supply Chain Management depends on a collaborative approach between the Client, Contractor and subcontractors. The importance of strong links within all elements of the supply chain cannot be overplayed and any failures in Supply Chain Management will significantly impact equipment and material deliveries. Trust between the three parties is an absolute requirement, and failure to establish a relationship of trust will lead to conflict and ultimately have a significant impact on productivity and project delivery.

Supply Chain Management has a common link with Equipment and Materials Management, which is detailed above. However, there are several additional elements which do not directly impact equipment and materials delivery and can be potential barriers to successful delivery:

- The Prime Contract requirements are not passed down to the subcontracts, therefore key terms and conditions of the Contract are not represented throughout the supply chain, causing discontinuities in contract deliverables
- There is a lack of suitably qualified and experienced subcontract administration resources; this can lead to a lack of visibility of key subcontracts
- Payments to suppliers, if not made on time, can significantly impact trust
- Failure of the contracting authorities to fully understand the Local, National or International supply chain capacity can have a negative impact.

Approach to Mitigation of Risk

In order to maintain strong supply chain relationships, the Prime Contract should require that key terms and conditions be integrated into any subcontracts.

The Prime Contract should demand that any subsequent subcontracts ensure that payment mechanisms and timelines are maintained (where performance meets expectations and PBIs).

6.3 Best Practice

CONTRACT IMPLEMENTATION	
Safety Management Plan	The Client should: ■ Ensure that the Contractor's Safety Management Plan is aligned with the tender requirements and the Contractor's bid submission ■ Develop and implement a monthly safety performance evaluation of Contractor performance, which impels the Contractor to develop and implement monthly safety improvement plans to drive improved safety performance. The Contractor should: ■ Ensure that appropriate measures to safeguard workforce health are implemented to reduce health-related risks to worker productivity ■ Ensure that worker safety and near miss observations are addressed in a timely manner ■ Develop and implement a periodic (e.g. monthly) director-level safety steering group with the Client in order to drive the correct behaviours and practices on-site.

Risk Management Plan	The Client should:
	■ Ensure that a Risk Register is assembled and that risk ownership is properly assigned and forms a key part of the initial Enquiry Documentation
	■ Ensure that the tender/contract negotiations deliver an all-party agreed Contract Risk Register.
	The Contractor should:
	■ Ensure, in conjunction with the Client, that they proactively manage the Contract Risk Register throughout the project life cycle, taking account that:
	  ■ Regular (monthly) reviews and updates are conducted
	  ■ New risks are identified and mitigation strategies established
	  ■ Realised risks are documented as planned and mitigation strategies remain robust.

CONTRACT IMPLEMENTATION	
PBI Schedule	The Client should: ■ Ensure that the contract contains Performance-Based Incentive measures that cover all the main parts of the Delivery Programme including: ■ Safety Management Plan ■ Equipment and Materials Delivery Schedules ■ Site Arrangement and Conditions Plan compiled and agreed during the bid negotiation period of the Contract Award ■ Construction. In order for these measures to be effective, they should be linked to the contract's commercial incentive mechanism.
Document requirements	The Client should: ■ Establish a detailed schedule of all the prerequisite documentation and deliverables required throughout the project life cycle. The Contractor should: ■ Include all prerequisite deliverables as part of the Contract Schedule in order to monitor delivery of these deliverables, which should include elements such as: ■ Lifetime quality documentation ■ Custody transfer documentation ■ Testing and conformance certification ■ Operation and maintenance documentation.
Contract Change Management Governance *(continued overleaf)*	The Client should: ■ Specify, implement and enforce a clear and concise Change Control process that precludes delays in agreeing contract change through use of commercial disincentives to the Contractor. This process should include: ■ Identification of personnel empowered to instruct change

CONTRACT IMPLEMENTATION	
Contract Change Management Governance *(continued from previous page)*	■ Introduction and proactive management of a Change Control Register ■ The requirement, when necessary, to establish a Change Control Board consisting of the key Commercial and Project Management resources. The duties of this Board will be to sanction all contractual change encountered on the project. ■ Ensure that the appropriate level of authority for approval of change is delegated to the Client's site representatives and require the same from the Contractor. The Contractor should: ■ Ensure that no change is implemented without the correct and agreed level of approvals ■ Ensure that cost and schedule impacts are accurately assessed and that the Project Schedule is amended accordingly.
Manufacturing Plan	The Contractor should: ■ Ensure that the contract requires detailed off-site Manufacturing Plans, which should be managed by subcontract administrators ■ Ensure that systems and processes are in place to ensure that Design Specification quality is of the highest standard.
Industrial Relations Plan	The Contractor should: ■ Ensure that the contract dictates the requirement for the subcontractors to operate a site Industrial Relations policy fully reflecting the best practice requirements laid down in the ECIA Productivity Improvement Committee (EPIC) Best Practice Guide Number 1 for Industrial Relations.
Quality Assurance Plan *(continued overleaf)*	The Client should: ■ Specify and support a Quality Innovation Programme which incentivises the Contractor to demonstrate the use of innovation to make improvements in the project's quality, budget or schedule.

CONTRACT IMPLEMENTATION	
Quality Assurance Plan *(continued from previous page)*	The Contractor should: ■ Ensure that the contract includes a detailed Project Quality Plan that highlights all the quality control requirements and links these requirements to a robust PBI programme.
Change Management	The Client and Contractor should: ■ Avoid changes, where at all possible. They lead to re-work, confusion and poor morale (including a view that management does not know what they are doing). Good discipline in the Client organisation can often determine best practice in this area. ■ Ensure that the Contract Schedule clearly details the required Change Management process, where this is required.
Relationship Management	The Client and Contractor should: ■ Ensure that all organisations involved are working in the best interests of the project. Bad relationships at management level can permeate through the site and affect the morale of all participants, including craft. ■ Ensure team building development and good communication at all levels of senior management ■ Ensure appropriate training at all levels. The Client should: ■ Work to avoid relationships tipping over into a 'lose-lose' mentality. Whilst a Client has a right to ensure that a Contractor delivers the work he is contracted to do, and at the agreed price, this needs to be tempered with a recognition that a Contractor who is losing money rarely tries to get out of a hole by increasing the efficiency of his working practices. Ensuring the right contractors and realistic prices in the first place will help eliminate this problem.

7. Contract Close-Out

This section provides an introduction to the Contract Close-Out phase and describes the key barriers to productivity and steps that can be taken in their mitigation. It also includes a number of best practice recommendations for successful management of this phase in a project.

The barriers to productivity covered in this section can apply at any point in the course of the key activities and events which take place within this phase of Contract Management.

7.1 Introduction

The Contract Close-Out phase can normally be considered the 'critical path' for the Client in moving towards plant ownership and an operational mode.

This phase requires:

- Attention to detail in final completions
- Team working between contractors to ensure a safe and timely handover to the Client's operational staff
- The signing of the relevant completion certification and
- Crucially, incorporating lessons learned and producing a comprehensive Project Close-Out Report.

The close-out period for most contracts generally occurs when the installations are in the main completed and final handover certification documentation has been completed or is nearing completion.

It is recognised that in this phase of the contract there is, by and large, minimal impact on the hands-on productivity of labour and supervision due to the completion status. Indeed, at this point in time significant demobilisation of the workforce will have occurred, leaving only suitably skilled and qualified snagging teams to complete any minor outstanding works required for final completion, and a general support team dedicated to the Client's operational transition phases.

7.2 Managing Barriers to Productivity

The barriers to productivity noted below are essentially the forerunners to what can delay and disrupt smooth and timely completions and subsequent handovers. The list is not exhaustive but identifies the major Contract Management issues that can prevail on large complex projects.

Extended Commercial Close-Out

There are a number of barriers that can affect the commercial close-out and in some cases extend the contract duration, causing financial loss to both contractors and clients. These barriers can occur at different phases of the contract life cycle, and for the purposes of this guide we have identified the key areas at risk as:

- Design and Procurement
- Construction and Commissioning
- Clearance of defects and snagging during Contract Close-Out.

Design and Procurement

Barriers to satisfactory close-out in this area can include:

- Late or incorrect design
- Incorrectly specified procurement of components
- Poor supply chain support.

Construction and Commissioning

Barriers to satisfactory close-out in this area can include:

- Delayed handover of completed plant to Client Operational Staff
- Site completions/snagging growth
- Late commissioning/Client Operational Staff engagement.

Approach to Mitigation of Risk

The Project Team must be issued with a clear and correct design from the outset of construction. Any changes to this design must be minimised and robustly managed to reduce impact on the installation, testing and commissioning completions and final handovers of completed systems.

Close-Out Documentation

Project Quality Assurance (QA) documentation ranges from off-site supply chain to site test records and the Life Time Quality Records (LTQR) packages.

Design and Procurement

Barriers to satisfactory close-out in this area can include:

- Late Supply Chain documentation
- LTQR packages not generated accurately or in a timely manner.

Construction and Commissioning

Barriers to satisfactory close-out in this area can include:

- Inadequate snagging and poor communication feedback
- Construction Trade and Commissioning Team area and plant access conflict
- Functional defensiveness appearing when teams are under pressure to deliver milestone targets

- Lack of attention to detail. Missing scope or the smallest of items missing can derail the handover.
- No clear or defined handover strategies/procedures in place at the outset of construction activities
- LTQR packages not generated accurately or in a timely manner
- No handover sign-off agreements/processes/procedures in place.

Approach to Mitigation of Risk

Control of site QA records requires significant managing and monitoring expertise to avoid any impact on a satisfactory close-out. It is essential that such expertise is in place at an early stage in the project. Requirements for Supply Chain documentation must be specified in the Purchase Order, so as to minimise the potential for delays in submission.

7.3 Best Practice

CONTRACT CLOSE-OUT	
Managing Client relationships	The Client and Contractor should: ■ Ensure time is spent on mutual relationships throughout the life cycle of the contract. This should not be limited to the Project Teams, but extended to functional leaders, senior managers and the Client's operational staff.
Providing a close-out schedule/programme	The Client should: ■ Ensure good co-ordination between themselves and contractors to allow snagging to be done efficiently. This can include building relationships with the plant operators. The Contractor should: ■ Consider a specific and detailed close-out schedule/programme that all parties contribute and agree to, as it is likely that the main schedule will not have sufficient detail to cover all the minor elements of close-out.

CONTRACT CLOSE-OUT	
Appointing a Completions Manager	The Contractor should: ■ Appoint a specific resource to manage the completion Handover phase (dependent on contract value and plant complexity). This individual must be appointed early in the Construction phase with the responsibility of establishing and developing the Handover process with full Client support.
Managing the documentation (LTQRs)	The Client should: ■ Ensure that the LTQR structure has been defined at the start of the contract. The Contractor should: ■ Ensure that documentation is collated contemporaneously ■ Implement frequent monitoring of the documentation collation process.
Agreeing a handover strategy	The Client and Contractor should: ■ Agree a handover strategy and process at the beginning of the contract ■ Identify the structure and documentation requirements at a very early stage in the contract, so that Procurement can specify to the supply chain the contract requirements and the collation of the document packs; this needs to be in place at the commencement of the Engineering and Manufacturing stages.
Capturing lessons learned	The Client and Contractor should: ■ Ensure that lessons learned from the full project delivery life cycle are captured within the Project Close-Out Report. This must include an analysis of the lessons learned in closing out the contract, which should include the positives as well as the negatives. Refer to *Appendix D* for an example of the types of attributes which should be considered by both Client and Contractor organisations to ensure that effective analyses of the lessons learned from one project can influence improved productivity on future projects.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8. Repair and Maintenance

The best practices identified during the four phases of Contract Management apply equally to projects for:

- Repair and Maintenance (R&M)
- Major Events.

This section addresses the use of best practice for each of these categories and amplifies aspects that are unique to both these types of project.

8.1 Repair and Maintenance Contracts

It is essential for the successful operation of long term R&M contracts to try and develop a culture of trust and working together with the respective Client throughout the organisation. This should involve higher management teams, procurement teams and engineering teams, wherever the day to day work is carried out. This helps to create a sense of involvement and ownership among the workforce, which assists in producing high levels of safety and productivity on a regular day to day basis.

The recommendations in all the previous sections of this Best Practice Guide also apply to R&M works in varying degrees. Problems often arise for this category of project from the very limited timescale in the Pre-Contract Award phase and the very short nature of most R&M contracts, with a high probability of emergent work, so particular attention must be paid to working relationships. Clients, in particular, should put effort into working with their appointed Contractor so that both parties own and understand the problematical issues that can affect productivity. It is critical on these short duration contracts to work together to achieve a constant high level of productivity and safety, achieving timely completion of the contract works.

8.2 Major Events

The Major Event categorisation is used for shutdowns and turnarounds. The key differences from new-build projects are:

- Work scope normally must be completed within a tight timescale, often requiring shift working and with complex operations being completed in close proximity to each other
- In most cases the nature of the work is well known; however volumes may not be known and here the value of historical data comes into play
- A significant amount of service and access preparation work is required to be completed before workforce mobilisation
- Even minor risk realisation can significantly impact access availability (overruns and failure to complete activities on time will more likely block out follow-on trades than on new-build projects)
- A Major Event runs over a very short timescale in comparison with a new-build project
- Health and Safety arrangements need to take cognisance of the close proximity of complex operations and tight timescales
- A Major Event may require a rapid mobilisation of labour resources and, at the end of the shutdown, a rapid demobilisation. The workforce may include a significant proportion of travelling labour.
- Completing the Major Event on time is a critical success factor, as the asset is generally required back in operation as soon as possible.

8.3 Best Practice

REPAIR AND MAINTENANCE AND MAJOR EVENTS	
Repair and Maintenance	The Client and Contractor should: ■ Read and understand the contract requirements in full ■ Create a culture of working together, with the emphasis on safety, quality and productivity as priorities ■ Share and understand each other's problems ■ Develop good lines of communication between each other, ensuring that this permeates down to the workforce where necessary ■ Establish a good Planning Team with highly integrated collaboration and planning between Client and Contractor to achieve maximum productivity.
Major Events	The Client and Contractor should: ■ Ensure that high level access is well understood and in place well before the event commences ■ Develop clear and concise Risk Mitigation and Schedule Management processes ■ Understand the contract conditions and their requirements ■ Ensure the supply chain can provide all required materials ■ Develop good lines of communication between each other as well as between the Contractor and all subcontractors.

9. Conclusions

9.1 Contract Management

Decisions made during each of the four phases of Contract Management can have a direct effect on productivity and worker performance. As the best practice recommendations in this guide suggest, it is those decisions made early in the project life cycle, before a contract is signed, which have the most effect upon how risk is managed, how change is controlled and how work is authorised during implementation of the contract.

The recommendations provided in this Best Practice Guide are intended to ensure that productivity is managed through:

- Management of risks
- Control and management of change
- Ensuring proper governance is in place to allow decisions and approvals to be made in a manner that does not stop work.

The earlier these considerations are weighed in the project life cycle, the more benefit there will be in improvement of productivity.

Early engagement and dialogue between the parties is essential to instil an appropriate culture of collaboration and co-operation which can survive the life of the project.

9.2 Summary of Recommendations

CONCLUSIONS FOR EACH PHASE	
Pre-Contract Award	■ An appropriate period of time must be allocated, so as to allow for all bidders to assess and compile a fully compliant bid. The use of experienced Project Management and Commercial personnel is essential. ■ Technical specifications need to be clear and fully complete, and all parties should respond rapidly to queries and questions to allow the tender period time to be used efficiently. ■ A high level of communication with bidders is essential throughout the pre-qualification and tender periods. Building a culture of collaboration and being realistic about the time needed to tender will contribute to achieving a compliant bid.
Contract Award	■ Appropriate resources must be provided by both clients and contractors during bid evaluation, Contractor selection and contract negotiation. ■ Sufficient due diligence must be accomplished during bid evaluation to ensure that clients understand whether or not the preferred Contractor's proposal will deliver what is being procured. ■ A Client's expectations for performance and a Contractor's plans for delivering that performance must be understood and agreed before a contract is signed.
Contract Implementation *(continued overleaf)*	■ The agreed contract should allow for several Performance-Based Incentives to be established covering site safety performance, mobilisation and resource provision. ■ A plain English version of the Contract should be made available to all those personnel in a supervisory role. Where the project delivery involves non-English speaking supervisors, appropriate translations should be provided.

CONCLUSIONS FOR EACH PHASE	
Contract Implementation *(continued from previous page)*	■ Requirements to deliver a Project Quality Plan should be a prerequisite. ■ Contractors need to demonstrate that they have the requisite skills to manage the delivery process. ■ The contract between the Client and Contractor and subsequent subcontracts should clearly define the Change Management and Project Control process requirements. ■ Team building programmes should be introduced to engender relationships that will avoid conflict. ■ Key terms and conditions of the contract should be integrated into any subcontracts. ■ The contract documentation should identify the requirements for the Commissioning and Handover portion of the Project Schedule.
Contract Close-Out	■ The Project Team must be issued with a clear and correct design from the outset of construction to avoid the risk of extended commercial close-out. ■ The LTQR structure should be defined at the start of the contract and the documentation collated contemporaneously and frequently monitored. ■ The Project Close-Out Report should be initiated and completed in conjunction with Contract Close-Out. ■ Both clients and contractors should conduct lessons learned workshops to inform and influence future project delivery.
Repair and Maintenance Operations	■ A culture of working together must be created, with the emphasis on safety, quality and productivity as priorities. ■ It should be ensured that the supply chain can provide all required materials. ■ Good lines of communication must be developed between Client and Contractor and between these parties and their subcontractors.


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A. Checklists for Contract Management

A.1. Pre-Contract Award

- [ ] Has the Client properly researched and understood the work to ensure that it would fit into a portfolio in which they should be involved?
- [ ] Is there clear and precise understanding of the contract among all parties (Client, Contractor and relevant Trades Unions)?
- [ ] Have meetings been implemented before the contract starts among all parties to establish the project's credibility and that the Client's requirements are realistic?
- [ ] Does the Client have a realistic understanding of the state of maturity of the project, its scope, requirements and remaining areas of uncertainty?
- [ ] Has the Client properly researched local market conditions, capabilities and subcontracting and employment practices?
- [ ] Have Client and Contractor established that they can build Project Teams of the required size and competence to manage the project, with full evaluation of the available skills market, to pre-empt lack of qualified contractors?
- [ ] Has a structure been developed in which high levels of communication can exist and which promotes a culture of working together?
- [ ] Has due consideration been given to both the Client's and Contractor's requirements in the Pre-Qualification Questionnaire?
- [ ] Are enquiry packages complete and, if not, does the Client fully understand why the required information is incomplete?
- [ ] Is there a detailed front end Project Schedule and Resourcing Plan to minimise the risk of slow contract start-up/mobilisation?
- [ ] Does the Contractor's proposal address all the requirements of the RFP, such as timescale, resources, engagement with the supply chain and existing site ground conditions (e.g. potential contamination, drains, access and egress and emergency arrangements)?

A.2. Contract Award

- [ ] Has the intent of the contract been satisfied by the preferred bidder's proposal?
- [ ] Has the contract been awarded with a rigorous estimate of costs, which has been reviewed and agreed?
- [ ] Has the contract been awarded on the basis of a realistic scope and schedule?
- [ ] Have uncertainties in scope been explored in the contract award process in an open and collaborative manner?
- [ ] Have bidders established that there is an adequate supply of personnel in all trades and professions to execute the work?
- [ ] Is dialogue at all levels (including with sub-suppliers) being maintained during bidding and contract negotiations to ensure that the Client's requirements are understood and that Contractor commitment is being maintained? This includes commitment to an agreed bidding process and timescales.
- [ ] Has a risk assessment been carried out, with key project risks understood and evaluated, and effective mitigation measures established?
- [ ] Have clients satisfied themselves as far as possible that commitments made by the chosen tenderer are realistic and that they understand local market conditions and employment practices?
- [ ] Have effective governance arrangements been established in both Client and Contractor organisations? Are levels of authority and escalation arrangements established and understood and incorporated into the contract?
- [ ] Has the Change Management process been agreed?

A.3. Contract Implementation

Ensuring Processes are in Place

- [ ] Is there a robust Project Execution Plan, which incorporates the Client's contract requirements and the Contractor's proposal?
- [ ] Are there effective Client and Contractor procedures in place to drive the right practices and behaviours to effectively manage and administer the contract?
- [ ] Is there an appropriate Project Safety Programme in place, with a set of Performance-Based Incentives established against the site safety performance?
- [ ] Is there provision of adequate preliminary engineering documents (e.g. FEED) and a robust 'first pass' Risk Register to mitigate cost escalation?
- [ ] Is there a robust off-site Equipment and Delivery Schedule, supported by appropriate expediting systems and with key equipment delivery milestones?
- [ ] Is there a robust Project Quality Plan that is integrated into a Master Contract Schedule, allowing for completion of all design quality reviews and any off-site pre-inspection activities?
- [ ] Is there a detailed Change Management process, where appropriate responsibilities and accountability for personnel are designated?
- [ ] Has a Project Control process been clearly defined so that cost and schedule performance progress against the baseline can be accurately measured?
- [ ] Is there a clear understanding of the roles within the Project Team and the responsibilities for delivering the project objectives and milestones?
- [ ] Has a Project Team Building Programme been introduced between the Client, Contractor and subcontractor organisations to engender collaborative working throughout the duration of the project?
- [ ] Does the Prime Contract require that key terms and conditions be integrated into any subcontracts to mitigate potential problems in the supply chain?
- [ ] Does the Prime Contract demand that any subsequent subcontracts ensure that payment mechanisms and timelines are maintained?

On-going Monitoring

- [ ] Is the Client ensuring that the Contractor is following agreed Industrial Relations processes?
- [ ] Is the Client showing sufficient commitment at all levels, including senior management, to high standards of health and safety?
- [ ] Is effective engagement between all key participants being maintained (Client, contractors, subcontractors and Trades Unions)?
- [ ] Are project requirements being fully and accurately implemented along the supply chain as subcontracts are being awarded?
- [ ] Are effective Change Management arrangements being maintained? Are changes being minimised and controlled?
- [ ] Are projects risks and mitigation arrangements being regularly reviewed?
- [ ] Are regular checks being made at all points in the supply chain to ensure quality, and thereby minimise the need for re-work?
- [ ] Are all key aspects of project performance being reported regularly and accurately, with timely interventions as necessary?
- [ ] Are conflict management arrangements working effectively? Is sufficient senior management and Trades Union Officer dialogue being maintained?
- [ ] Is the Client mobilising the operational team in good time for them to become familiar with the plant and participate effectively in Commissioning and Handover?
- [ ] Are deficiencies in the plant being identified at the earliest possible stage to avoid delays in Commissioning and Handover?

Commissioning

- [ ] Has planning for commissioning and handover been started early in the project and are commissioning personnel being appointed in good time?
- [ ] Are detailed commissioning Operations and Maintenance (O&M) plans available?
- [ ] Are commissioning spares available for the activities to be undertaken during this phase?
- [ ] Have clear roles and responsibilities been established for the key members of the Commissioning Team?

A.4. Contract Close-Out

- [ ] Has a specific and detailed close-out schedule/programme been agreed for clearance of snagging items and exceptions agreed at handover?
- [ ] Have arrangements been put in place that will both minimise commercial downtime of plant for remedial work and ensure efficient use of Contractor resources to do this work?
- [ ] Has a plan been agreed for completion of outstanding deliverables and settlement of final account?
- [ ] Has a Completions Manager been appointed?
- [ ] Has the relevant completion certification been signed?
- [ ] Has a comprehensive Project Close-Out Report been produced, incorporating lessons learned?
- [ ] Are there in place suitably skilled and qualified snagging teams to complete any minor outstanding works required for final completion?
- [ ] Is there in place a general support team dedicated to the Client's operational transition phases?
- [ ] Has appropriate close-out documentation been supplied (e.g. Project Quality Assurance documentation, site test records and the Life Time Quality Records packages)?

B. Case Study – Relationship Management

B.1. Background

In late 2012, a major project was experiencing a 'misalignment' in operation focused on three major areas:

- Commercial tension
- Safety performance
- Organisational issues.

A third party facilitator was approached to lead an alignment process between the Client and the Contractor in order to repair the damaged relationship which had developed.

Commercial Tension

Significant commercial tension had arisen between the two parties due to disagreement around changes to scope. The Client was concerned that the cost of change did not represent value for money and had become a barrier to 'getting the job done'. A previous attempt to address the issues in a commercial workshop facilitated by the Contractor failed to achieve wider buy-in. The legacy of this experience was a level of cynicism amongst some key stakeholders about the likelihood of success for a facilitated outcome.

Safety Performance

Following a high profile near miss and a recent serious incident on one of the sites, the Client was concerned that the Contractor was not sufficiently focused on safety leadership. The Client felt that there was an urgent need for improvement in safety performance.

Organisational Issues

The Contractor was a joint venture company which had formed specifically to bid for the project and was still in the early stages of organisational maturity. The JV partners had limited experience of working together, which meant that the Client often received contradictory messages.

The facilitator proposed an alignment process designed to get the parties to understand the issues together and agree a set of outcomes in a way that built openness and trust, enabling them to work towards a collaborative solution.

B.2. Approach

A simple four stage process was designed involving:

- Building trust with leaders
- Separate workshops with teams
- Integrated workshop
- Maintaining on-going momentum.

Building Trust with Leaders

The alignment process began with a series of confidential one-to-one interviews to establish trust and rapport with the leaders of each team. A senior Client representative volunteered to serve as an 'internal champion'. This stage took several weeks and required considerable tenacity. Getting the various stakeholders on board with a collaborative alignment process is often an important part of the work, as key leaders are not always positive about an alignment intervention. Meetings were frequently rescheduled due to project pressures (as is typical on intense projects).

A key breakthrough in this process came when a senior member of the Contractor's organisation admitted that a past experience on another project, where a conflict over commercials had ended up in court, was affecting his ability to trust. Although this was separate to this project it had a very real and corrosive dynamic; it was an 'elephant' that needed to be named.

Separate Workshops with Teams

The facilitators designed separate 'mirror up' workshops for the Client and Contractor teams. These took place simultaneously in the same venue, in the morning before the main integrated workshop. The participants explored three simple questions:

- What are we doing as a team that impedes our effectiveness?
- What are we doing as a team that impedes their effectiveness?
- What are they doing as a team that impedes our effectiveness?

Integrated Workshop

In the afternoon integrated workshop, both teams reviewed the outputs from the morning session from 'different ends of the same telescope'. This resulted in a series of breakthroughs as the participants understood the impact of their behaviours on each other.

In a further exercise designed to access submerged feelings, the participants selected photos from magazines to help express how they felt now and how they wanted to feel in the future.

By the end of the workshop, the participants agreed to a shortlist of nine programme-critical tasks to help them work together more effectively. Because the tasks were jointly created by the Client and Contractor teams, there was a far greater sense of shared ownership. At the workshop, the group also decided to establish an integrated leadership steering committee to make sure things happened and to remove roadblocks.

Maintaining On-going Momentum

In the early days of the steering committee, the facilitator helped the team agree some ground rules and continued to support the teams in working collaboratively. This involved working alongside the two most senior leaders from the Client and Contractor teams, to maintain momentum and keep a focus on collaborative activities, when the inevitable pressures of day to day work distracted people from their jointly made commitments.

Soon thereafter, a strategic planning exercise was facilitated with the joint leadership team. This involved looking back to the successes of each team during the previous period, which built increased confidence in the potential for further alignment.

B.3. Conclusions

Since the alignment process began, some significant issues have been resolved while others are 'work in progress'. What is beyond doubt is that there has been a major improvement in the effectiveness of the relationship between the Client and Contractor, based on new ways of working and continued open and constructive dialogue. There has also been a significant improvement in the Contractor's performance in terms of safety, cost and schedule and it has successfully delivered some major project milestones. Both parties agree the level of realignment which has been achieved would not have been possible had a third party facilitator not been engaged.

B.4. Lesson Learned

There have also been a number of lessons learned:

- There are no easy solutions to resolving tensions within a project; it needs time and a patient approach to establish trust. Even after months of careful work, there is a constant sense that it can all go wrong at any stage. But the reasons why it is difficult are the same reasons that make it worth doing.
- A major risk of this kind of work is that unless you are serious about following through on the actions, it can raise people's hopes only to dash them. Everyone has to be prepared to commit to a new way of working.
- Having an internal champion on board who is not connected with the project is critical to help clear blockages.
- Having an impartial facilitator is a key factor in building trust between all parties. In the Project Management world, based on facts and cognition, it is rare for players to admit to feelings that can obscure objectivity. Getting people to open up in this way does not happen by chance; it occurs only when the participants feel that they are in safe hands with a credible and trustworthy professional.
- Hurrying the process does not result in the most effective outcome. Both parties should be willing to invest the time and resources necessary to foster a collaborative project environment.

C. Key Contract Elements – Initial Enquiry Package

The Initial Enquiry Package should contain a series of Supplementary Conditions, in the form of documentation, which require addressing during the tender process; these issues will become key elements in the tender evaluation process and will eventually be attached to the final contract.

Supplementary Conditions Document Elements	Description
Safety Management Plan	An outline of the Site Safety Plan as agreed during the tender negotiations.
Roles and Responsibilities	A description of the Roles and Responsibilities of all the key delivery functions.
A Schedule of Performance-Based Incentives (PBIs)	A list of all the agreed Performance-Based Incentives (PBIs) with percentage shares within the contract's associated commercial incentive mechanism.
Contract Schedule	A detailed baseline Contract Schedule as agreed during the tender negotiation process.
Risk Register	A detailed baseline Risk Register which identifies clear mitigation strategies, and cost and time impacts if risks are realised, as agreed during the tender negotiation process.
Risk Ownership	The Risk Register should have the risk owners identified and agreed during the tender negotiations.
Local Conditions Schedule	A schedule of all the key local conditions, which should include: ground conditions, access and egress, emergency arrangements, welfare requirements and local agreements.
Stakeholder Engagement Requirements	A list of the main stakeholders with an outline of the engagement requirements.
Milestones Schedule	A schedule of the project's key delivery milestones.
Equipment Delivery Schedule	A standalone Equipment Delivery Schedule agreed during tender negotiations.

Supplementary Conditions Document Elements	Description
Project Quality Plan	A Project Quality Plan which covers all aspects of the project's right first time delivery process agreed during tender negotiations.
High level Work Breakdown Structure (WBS)	A detailed project scope and cost breakdown for evaluation by the Contractor.
Project IT and software requirements	A comprehensive list of the IT and software requirements for the project.
Team building requirements	The team building requirements through the life of the project, with a simple target completion date.
Project kick-off meeting requirements	As a minimum this should contain the agenda items for the project kick-off meeting.
Mobilisation Plan	A detailed schedule of the key activities for project mobilisation and transition between the Design/Construction/Commissioning phases.
The Commissioning Plan Outline	General outline of commissioning requirements and focus.

D. Lessons Learned – Close-Out

It has been widely acknowledged that learning lessons from one project can positively influence the productivity of future projects. Often, however, the lessons learned process will produce output which is not sufficiently considered or incorporated into future execution plans. Lessons learned processes can also become overly complicated as a result of trying to focus on too many things rather than considering a lesser number of lessons which can make a difference. The following table provides a number of examples of the types of subjects which should be considered during the lessons learned process to influence improved productivity on future projects.

Contract Award

Design and Engineering

Key Deliverables:

- Process design
- Detailed design
- Constructability in design

Key lessons learned:

- A design must be produced that can be constructed in accordance with the CDM regulations, incorporating constructability in the design process.
- The design must be completed to schedule and be robust to minimise change during the later phases of delivery.
- Construction/ constructability milestones must be identified in line with overall programme deliverables.
- Design deliverables must be aligned to the construction programme.
- Outline construction methodologies should be identified and generated.
- Lessons learned events should be completed on a planned basis and fed into a continuous improvement plan.

Procurement & Manufacture

Key Deliverables:

- Procurement and engagement of subcontractors
- Manufacture of components

Key lessons learned:

- Procurement and Manufacturing LTQR package requirements must be clearly communicated and understood.
- The work must be planned and its alignment with the construction programme deliverables ensured.
- QC standards must replicate site QC standards during procurement of parts and components and consistency must apply.
- Completed works must be supported with completed and comprehensive documentation packs aligned to the LTQR requirements.
- Design close-out must be confirmed to mitigate change impact to construction strategy
- Lessons learned events should be completed on a planned basis and fed into a continuous improvement plan.

Construction

Key Deliverables:

- Building of the p schedule and in effective manne

Key lessons learned:

- The site works C documentation continually prog monitored.
- Clear and define handover strate be established a from the onset c construction.
- During construc completion and phases to comm plant access pric must be clearly established.
- Lessons learned should be comp planned basis ar a continuous im plan.
- It should be ens the continuous improvement pl and active and c communicated.

Contract Close-Out

tion	Testing & Commissioning	Close-Out and Handover
rables: g of the plant to ule and in a cost ve manner	**Key Deliverables:** ■ Complete system testing ■ Cold and hot commissioning programme	**Key Deliverables:** ■ Complete close-out documents and Project Close Out Report ■ Plant handover
s learned: e works QA entation must be ually progressed and pred. nd defined ver strategies must ablished and agreed he onset of uction. construction etion and handover to commissioning, ccess priorities e clearly agreed and shed. s learned events be completed on a d basis and fed into nuous improvement ld be ensured that ntinuous vement plan is live tive and clearly unicated.	**Key lessons learned:** ■ Commissioning should be engaged early in the project to ensure commissioning strategies are identified and included in the programme. ■ There should be Interface with design and construction to establish the system or part system commissioning scope. ■ For the commissioning area there should be continuous participation in construction co-ordination reviews, access reviews and completion reviews on a daily basis. ■ Lessons learned events should be completed on a planned basis and fed into a continuous improvement plan. ■ It should be ensured that the continuous improvement plan is live and active and clearly communicated.	**Key lessons learned:** ■ All the phased lessons learned should be captured, compiled and included in the Project Close-Out Report. ■ The continuous improvement plan should be completed and included in the Project Close-Out Report. ■ An analysis of the lessons learned should be undertaken and communicated to the Client and company management teams. ■ It should be ensured that the continuous improvement plan is live and active to final close-out and handover.

E. Abbreviations and Acronyms

Abbreviation	Description
CCB	Change Control Board
CDM	The Construction Design and Management Regulations 2007
ECI	Engineering Construction Industry
ECIA	Engineering Construction Industry Association
EPCC	Engineering Procurement Construction & Commissioning
EPIC	ECIA Productivity Improvement Committee
FEED	Front End Engineering Design
IR	Industrial Relations
JV	Joint Venture
KPI	Key Performance Indicator
LTQR	Life Time Quality Records
NAECI	National Agreement for the Engineering Construction Industry
O&M	Operations and Maintenance
PBI	Performance-Based Incentive
PCM	Project Controls Management
PQQ	Pre-Qualification Questionnaire
QA	Quality Assurance
QC	Quality Control
R&M	Repair and Maintenance
RFP	Request for Proposal
WBS	Work Breakdown Structure