# ECIA

# Planning and Operations

# Best Practice Guide - no. 4

# Foreword – Planning and Operations

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

Throughout this document the term 'Planning and Operations' refers to the sequencing and co-ordination of construction activities, documentation and systems used in preparing and planning for works, resource planning, implementation of supervisory duties in the field and continuous performance review.

In producing this Guide a work group, comprising Contractor, Client and Trades Union representatives, has captured industry best practice and made recommendations aimed at removing or eliminating barriers to productivity.

The contents of the document are aimed at helping you understand, implement and improve on Planning and Operations in your organisation; information and best practice guidelines given here are intended for Employers and Managers, but will also be of interest to employee representatives and the wider industry.

This Guide is intended to be part of a continuous improvement process. In the future, the effectiveness of a Planning and Operations strategy and its implementation can be monitored against it, and the contents adjusted as working practices evolve and improve. Companies are encouraged to actively apply the best practice principles described here.

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:**  The asset owner, developer or operator.

**Contractor:**  The Contractor who has primary responsibility to the Client for delivery of the project, event or Repair & Maintenance (R&M) activity.

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

**Project:**  Describes all aspects of a contract from conception through to completion, including works, as well as management and administration activities.

**Works:**  Describes all site operations directly involved in the construction and/or Repair & Maintenance activity.


There are many different management roles within Planning and Operations and across different organisations they can have different names; for the purposes of simplicity within the Guide we have deliberately reduced these to the following four roles:

**Project Manager:**  Responsible for the project (or multiple projects/works) and for on and off-site activities; reports to Executive Level Management.

**Site/Construction Manager:**  Responsible for on-site activities relating to the works; reports to the Project Manager.

**Site/Project Engineer:**  Responsible for managing an aspect of the works on-site, whether a function, location or specialism; reports to the Site/Construction Manager.

**Field Supervisor:**  Responsible for managing the day to day workface activities; reports to the Site/Project Engineer and/or the Site/Construction Manager.

# Table of Contents

# 1. Introduction

| Why promote best practice to improve productivity in Planning and Operations? | 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 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 improvement in the Engineering Construction sector and thereby improve the success of future projects. A number of the recommendations related to Planning and Operations and form the basis of the terms of reference for this document.

The means of managing effective labour relationships to ensure project completion to time and budget has rested with the National Agreement for the Engineering Construction Industry (NAECI) since 1981. The NAECI was ground breaking when it was first introduced, and with subsequent revisions has remained the agreement of choice for Engineering Construction for more than 30 years.

Strict compliance with NAECI terms and conditions by all stakeholders is essential to a successful approach to Planning and Operations, thus securing high levels of productivity.

### 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 & 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. Work groups comprised of experienced people drawn from all aspects of the ECI produced Best Practice Guides for each of these areas, which were published in 2013 (Industrial Relations, Workforce Engagement) and 2014 (Contract Management).

This Guide continues the process of examination of best practice, considering the activities and behaviours that can reduce or eliminate barriers to productivity within Planning and Operations.

# 2. What Did the Group Look at?

| What aspects were examined? | Current practices and opportunities for improvements in Planning and Operations strategy and implementation | Section 2 defines terms of reference and scope for examination of Planning and Operations and summarises key benefits |
|---|---|---|

## 2.1 Terms of Reference

The work group looked at the significant potential of a good Planning and Operations strategy in a number of organisations, basing their views on researched evidence which the group deemed to be appropriate to the Engineering Construction Industry.

Key areas that the work group were requested to address relate to the main activities in a project's lifecycle which impact on Planning and Operations. These include:

- Activity planning
- Resource planning
- Preparing for productive construction
- Co-ordination of site activities, including supervision of work in the field
- Continuous performance review.

After examining these key areas, the work group identified and recommended a number of good practices for Planning and Operations.

## 2.2 Purpose of the Guide

The purpose and aim is to produce recommendations incorporated within a Best Practice Guide that is easily understandable and:

- Identifies best practice within Planning and Operations
- Is equally relevant to New Build and Repair & Maintenance
- Recognises the important role of the Client in supporting best practice
- Recognises the significant value to all parties of early engagement
- Considers the importance of a properly implemented best practice culture.

## 2.3 Benefits of Best Practice

Establishing and following best practice in Planning and Operations can bring the following benefits:

- Development of a best practice culture, which becomes habit and is self-perpetuating, driving engagement between all parties. Engagement is the bedrock of good Industrial Relations (IR) and has a significant role to play in eliminating/minimising lost time.

- Early identification and removal of barriers to productivity

- Improved availability of resources

- Improved communication between all parties

- Improved access to workfaces

- Greater levels of responsibility, motivation and accountability

- Career-driven Supervision, empowered, motivated and trained to drive productivity

- Reduction in walking time through better planning of the site layout

- A more efficiently managed project, improving own reputation and Client satisfaction

- An improved competitive edge.

# 3. Planning and Operations - Introduction

| What are the key project phases which apply to Planning and Operations? | Planning and Operations applies to all phases of a project through from project planning to delivery and project review | Section 3 summarises the key phases relating to Planning and Operations and important activities within each phase |

This section gives an overview of the key phases of a project, including actions and tasks, which pertain to Planning and Operations and summarises the initial actions of the Project Management Team.

Much of the information also applies to Repair & Maintenance (R&M) operations and Major Events (shutdowns and turnarounds).

## 3.1 Planning and Operations Activities

### General Overview of Project Phases

This section contains a process flow that shows typical key activities within each of the five phases of the Planning and Operations process. It is designed to provide a context for investigating the barriers to productivity within the process as a whole.

**Client engagement with Contractor**

**Define Scope of Works & deliverables**

**Define relationship approach**

**Implement Activity Programme**

**Plan work sequences**

**Plan welfare provision**

**Recruitme**

## Activity Planning

Section 4

Managing engagement and defining Scope of Works – planning for best practice

## Resource Pla

Section 5

Ensuring resource avai
delivery of constructi
(including labour, plan

**Ensure a safe site**

**Implement quality standards**

**Maximise resources**

**Implement supervision duties in the field**

## Co-ordination of Site Activities

Section 7

Co-ordination and supervision of activities across a multi-disciplined site

Recruitment

Ensure
lines of
communication

Record
time

Plan for
HS&E

Activity
Programme
review

Develop
Engineering,
Construction &
Quality
Programmes

Enable
productivity
& prepare
for success

## urce Planning

## Preparing for Productive Construction

**Section 6**

urce availability for the
nstruction operations
our, plant & materials)

Developing documents and systems
to enable productive construction

Ensure
engaged site-
wide workforce

Review
project
performance

Assess shared
contributions

Identify best
practice

Apply lessons
learned

## Continuous Performance Review

**Section 8**

Generating a consensus view on
the performance of the project

## 3.2 Roles and Responsibilities

Roles and responsibilities during the different phases of Planning and Operations can be summarised as follows:

- **Project Manager:** Responsible for the overall direction of the project/works.

- **Site/Construction Manager:** Responsible for leading, overseeing and organising all on-site resources and activities.

- **Site/Project Engineer:** Responsible for ensuring that everything is in place on-site to enable the Workforce to perform productively.

- **Field Supervisor:** Responsible for ensuring that the day to day works activities are carried out safely, to the right quality and productively.

## 3.3 Project Management – Initial Processes

After appointment of a Project Management Team, it is desirable to hold a Risk Management Meeting and develop a Project Mission Statement. This encourages buy-in from the Team and alignment on 'objectives' between Client and Contractor. As part of this Mission Statement:

- It is advantageous to define and agree upon 'SMART' (Specific, Measurable, Achievable, Realistic & Timely) KPIs.

- It is highly desirable to develop a Risk Management Strategy (and accompanying Plan/Risk Register), inclusive of mitigation plans; this provides an assessment of the level of risk and confidence in mitigating identified risks. A typical risk management graph could be as follows:

| Severity | | | |
|---|---|---|---|
| | Medium | High | Critical |
| | Low | Medium | High |
| | Low | Low | Medium |

**Likelihood**

In the graph above, the mitigation measures aim ideally to move risks from the top right hand corner (critical) to the bottom left hand corner (low likelihood and severity).

■ It is normal practice to agree project control processes such as progress reporting, productivity management and earned value reporting. The frequency of the report, content and distribution is usually defined in the contract terms and conditions.

■ A detailed Project Execution Plan should be defined and formalised (many common formats are available).

■ Project Management should develop roles and responsibilities for all key personnel, ensuring clarity in boundaries.

■ It is good practice to identify early training needs. Team building workshops are becoming good practice across a number of larger projects.

## 3.4 Best Practice

| PLANNING AND OPERATIONS - INTRODUCTION | |
|---|---|
| **Project Management – initial processes** | ■ Develop a Project Mission Statement, which encourages buy-in from the Team and alignment on objectives between Client and Contractor<br><br>■ Develop a Risk Management Strategy<br><br>■ Hold a Risk Management Meeting and spend sufficient time in identifying mitigation measures to reduce likelihood and severity of risks<br><br>■ Develop a SMART, frequent progress report. This should be reviewed weekly and content kept relevant to the period reported upon<br><br>■ Define and formalise a Project Execution Plan<br><br>■ Ensure written roles and responsibilities are clearly defined and displayed<br><br>■ Identify training needs. |

# 4. Activity Planning

| What are the key considerations in activity planning? | Engagement approach; project scope and deliverables; creating, implementing and monitoring an Activity Programme | Section 4 summarises the approach to activity planning at the Tender stage, post Contract Award and during Execution and Delivery |

This section describes the key activities for planning, developing and implementing construction operations.

Ownership of activities and processes changes during the course of planning and it is made clear where responsibilities reside in the relevant sections of this document. Activities will also overlap during the different phases of the works.

Key activities in this phase, with ownership, are shown in the diagram on the following page.

**Client engagement with Contractor**

**Develop engagement approach**

**Define Scope of Works**

**Define project deliverables**

**Select planning tools**

**Create draft Activity Programme**

**Allocate cost & resources**

**Define relationship approach**

**PRE-CONTRACT ENGAGEMENT**

**TENDER STAGE**

**PO**

Client/Contractor

Client/Contractor

**ACTIVITY PLA**

**Define relationship approach**

**Create detailed Activity Programme**

**Prepare for project delivery**

**Implement Activity Programme**

**Include milestones**

**Monitor/ review Activity Programme**

**Record accurate project delivery data**

POST CONTRACT AWARD

EXECUTION & DELIVERY

Client/Contractor

Contractor

TY PLANNING

## 4.1 Pre-Contract Engagement

### Focus on Early Engagement

The opportunity to plan adequately for the successful delivery of any project commences before contract engagement. It is therefore important to engage with potential Contractors early on to ensure alignment of plans and people. Such engagement can enable better connectivity between the Design team(s) and the Build team(s), better progression through the phases of the project and the chance to avoid an unnecessary sequence of iterations.

The value of early engagement has been recognised by Construction Design & Management (CDM), and the aim should be to seek to create a 'one site; one team' approach.

Importantly, early engagement both requires and encourages a culture of co-operation which is structured and clearly focused on building a successful project.

### Benefits of Early Engagement

Early engagement among the main parties of the contract is beneficial to any project as it can result in:

- Increased build-ability through greater integration of Client and Contractor

- Joint understanding and commitment to the project requirements and goals

- Understanding of both parties' drivers such that potentially contentious issues can be discussed in an open forum and mutually beneficial resolutions can be reached ('win-win')

- Sharing of all parties' experience and expertise to avoid potential pitfalls (a 'prevention rather than cure' approach)

- A willingness by all parties to act in accordance with the project's best interests

- Forming of relationships that can be carried forward to subsequent projects/works

- Less waste (in both time and resources) in the tendering process, avoiding iterations.

## 4.2 Tender Stage

### Defining Scope of Works

The Scope of Works for the tender which the Client requires to be submitted needs to be clearly specified and outlined within the Client's Invitation To Tender (ITT) documents, with the aim being not to change and/or revise the scope prior to Contractor selection.

### Defining Deliverables

At this stage a joint understanding of the deliverables of the project is desirable. This should include cost, but must also focus on the wider criteria of safety, quality, sustainability, legacy commitments, environmental impacts (both local and national), resource training and strategic importance of the project to the Client.

### Selecting Planning Tools

Before the development of an Activity Programme, the appropriate software tools need to have been selected and people experienced in their use identified.

There are various planning tools on the market and their selection is a matter of personal choice. Primavera is predominantly utilised on multi-disciplined works and Microsoft Project on smaller, less complex works. The critical action is to allocate a Planning Engineer before contract engagement, who can use the software to its maximum capability, in addition to having relevant experience of the Engineering Construction Industry.

### Creating a Draft Activity Programme

It is normal practice for level 1 or level 2 drafts[1] of the Activity Programme to be created by the Client during the Tender stage. This will usually be limited to key milestone activities and time-bound by the Client's required start and completion dates.

Creation of a detailed Activity Programme is described in *Section 4.4*.

### Allocating Costs and Resources

Sufficient cost and resource should be allocated during the Tender stage to allow delivery of all the necessary infrastructure and facilities required to remove any barriers to productivity.

Consideration must also be given to allocating sufficient 'Time For Safety' in the Activity Programme.

## 4.3 Post Contract Award - Defining the Relationship

The most successful modern projects have attributed their success to a mutual and project focused approach, as opposed to one that is individual and contract focused.

This type of collaborative approach between parties requires open and transparent consideration of risk and the expectation that all parties act in good faith with mutual co-operation and trust.

This is a continuation of the early engagement approach and is only possible with up front commitment from all parties (usually at Design stage), dedicated Management resources and a commitment that no party (or parties) will be disadvantaged.

### People Engagement

A focus on people engagement and the mechanisms intrinsic to this has been shown to be beneficial in realising successful projects. People engagement fosters open communication within the project. This allows respectful challenge to be instituted and decisions to be taken in the knowledge of the project goals, together with an understanding of how workers and the workplace influence the project outcomes.

**NOTE:** *See Best Practice Guide 2 – Workforce Engagement.*

### Industrial Relations Policy

It is essential that a thoroughly thought out and documented Industrial Relations policy, which has NAECI at its heart, is in place.

**NOTE:** *See Best Practice Guide 1 – Industrial Relations.*

[1] *See Appendix B for explanation of levels.*

## 4.4 Post Contract Award – Developing an Activity Programme

### Creating a Detailed Activity Programme

Often the Client or another Contractor has responsibility for delivery of certain services which are essential to achieving the project's milestones and in this case an Activity Programme is the key tool for enabling visibility to all relevant parties.

Post Contract Award, the Activity Programme needs to be developed by the Contractor to a minimum level 3[2], using a defined Work Breakdown Structure (WBS) showing the logical sequence of activities and their interdependencies as well as a calendar of working patterns, which is fully resourced and shows the interfaces with other parties.

The Activity Programme for the works should be integrated in such a way that all work groups' activities (and support services) are included and any bottlenecks or conflicts are readily visible in advance of delivery. This enables the Programme to be reviewed and optimised so that the project critical path is of the shortest duration. It should be remembered that the Activity Programme is all encompassing and should contain information not just related to site activities but also to:

- Engineering (design and process)
- Time risk allowance
- Off-site procurement
- Factory manufacture/overhaul
- Transport deliveries
- Non Destructive Examination (NDE)
- Commissioning activities
- Any other non-site-based activities.

## 4.5 Post Contract Award – Preparation for Project Delivery

Preparation for project delivery is a critical activity and its impact on the project's ultimate success should not be underestimated. Best practice in this area does have a cost implication but the most successful modern projects provide case studies that show the value of well-prepared sites. Such preparation encompasses many different facets, some of which are discussed below.

### Site Layout

The site should be planned and laid out so that the distances between entry points, welfare/changing facilities, canteens, clocking on/off stations and workface are minimised. It is also recommended that there are toilet/ablution facilities not only within the welfare area but also that there is a second/satellite set as close as possible to the workface.

Supervision should be sited as close as possible to the personnel they are to supervise and a forward office at the workface should be considered.

---

[2] See Appendix B for explanation of levels.

## Site Policies

Policies for the project on smoking, mobile phone use and inclement weather should be determined locally, be project-relevant and clearly communicated to all parties prior to any Workforce mobilisation. They should also be included in all employees' terms and conditions of employment.

Inclement weather in particular can be a barrier to productivity and whilst little can be done to manage the weather, much can be done to manage its effect on the Workforce through an agreed, well communicated and consistently applied policy.

## Car Parking/Travel

Adequate vehicle parking at the closest possible location to the works should be considered. If satellite parking is required, transport to and from the satellite location should be provided. To minimise individual car use, it is best practice to consider investigating and recommending:

- Car share/car pool
- Use of buses collecting and returning to designated pickup/drop off points.

## Shift Patterns/Break Timings

Consideration should be given to staggering start, finish and break times. This can eliminate bottlenecks at site entrance and egress points, reduce pressure on the canteen facilities and accelerate movement through the site in general.

## Welfare Facilities

Welfare facilities can be a barrier to productivity if poorly planned or of insufficient quantity or quality. The amount of time lost on the part of the Workforce and Management in dealing with issues that arise out of, or are aggravated by, welfare issues should not be underestimated. Best practice would be to:

- Situate facilities as close to the workface as possible to minimise walking time
- Ensure all welfare facilities are of a high standard and maintained accordingly
- Consider the cost, quality and range of food offered by the canteen, and how it will serve the numbers on-site, especially at peak
- Agree and communicate the policy on treatment of welfare facilities and ensure it is applied rigorously and consistently
- Ensure that lockers are provided and are of sufficient size
- Ensure that changing/drying areas are spacious and maintained regularly
- Provide toilet/ablution facilities to service the Workforce comfortably rather than meeting minimum standards.

**NOTE:** *See Best Practice Guide 2 – Workforce Engagement, pages 18-19.*

## Inductions

Inductions are essential to establishing the culture on-site. They must be as comprehensive as possible and provide personnel with an overview of and insight into the works.

The following is a list (not exhaustive) of key topics that should be covered:

- Client and Contractor background information
- Rules and regulations for all personnel who work on the project including:
  - Health, Safety, Welfare and Environmental matters
  - The working rule agreement and Supplementary Project Agreement (SPA), if any
  - Working hours, including overtime policy and the use of time clocks and swipe card systems
  - Performance incentive schemes, and how they are communicated (where applicable)
  - Policies for covering mobile phones, smoking, absences, holidays and drugs/alcohol
  - Meal and refreshment breaks
  - Vehicle parking and use of facilities on-site.
- Trades Unions' role on site.

## 4.6 Execution and Delivery

### Implementing the Activity Programme

During the Execution/Delivery phase, there is a need for constant reviews of systems and processes to ensure that the actions put into place during the pre-planning stage are still relevant and effective.

The Activity Programme and schedule should be sufficiently robust to allow fluctuations in productivity which may be caused by various factors that are often not within the site's control (for example, factory manufacture/overhaul delays, NCRs (Non Conformance Reports), Force Majeure or Emergent Works).

### Including Milestones

When scheduling Repair & Maintenance work it may be useful to include discovery milestones in the Activity Programme as early in the schedule as possible. A discovery-driven planning approach (where it is assumed that planning parameters may change as new information is revealed) can be used when there is either a higher than 50% expectation of emergent work or the condition of a particular item of plant is unknown. Exposing these items as early as possible within the schedule gives an increased opportunity for any remedial work to be incorporated within the Activity Programme and minimises the likelihood of over-runs.

| NOTE: | *When there is an expectation of emergent work it is important that this contingency is, as far as possible, pre-planned and costed in terms of spares, additional plant, tooling or resources such that the impacts are known in advance. It should also be recorded in the Project Risk Log and notified to all stakeholders so that, if the expectation becomes a reality, the necessary decisions as to whether to proceed or not can be taken from a position of knowledge.* |
| --- | --- |

### Management and Updating of the Activity Programme

The Activity Programme requires updating on a regular basis (for example, on a weekly basis for construction and possibly more frequently for R&M) and a protocol should be agreed and in place as to the frequency and responsibility for this to occur. The inputs to these revisions need to be accurate and reflect the actuality as opposed to any possible 'optimistic biases' as to true durations.

#### Checking Validity of Information

The information within any Activity Programme is only as good as the data input. There are several methods available to check the validity of the information:

- Benchmarks/historical data
- Return on Experience (REX) from previous projects
- Tables of norms
- Key Performance Indicators (KPIs)
- Peer reviews
- Specialist subject/design reviews.

All or any of these methods may be utilised. The most important thing is that the Activity Programme is valid, trusted and that all parties work to it and discharge their responsibilities in line with the commitments contained therein.

### *Monitoring and Reviewing the Activity Programme*

All iterations of the Activity Programme should be recorded and compared against the original baseline Programme. This allows accurate data to be recorded as to the actuality of the project delivery and ultimately, project on project, increases the accuracy of estimation in terms of durations, resources and costs. This is also a very useful tool for project close-out meetings/lessons learned/Return on Experience so that what went well and what could be improved on can be readily identified.

### Recording Project Data

The input of data into any Activity Programme update needs to be accurate and to that end it is recommended that, as a minimum, random sampling as a means of recording progress is undertaken by a person (or persons) who is not directly involved with supervising the activities. This minimises the possibility of incorrect data being entered, which could ultimately result in false expectations as to progress and completion.

| NOTE: | *It is best practice to record productivity data. For assistance with this, please contact the ECIA, who can provide additional support in relation to the storage and utilisation of KPI productivity data and norms.* |
|---|---|

## 4.7 Best Practice

| ACTIVITY PLANNING | |
|---|---|
| **Pre-Contract Engagement** | ■ Plan early engagement with potential Contractors<br>■ Approach the contract with a 'one site; one team' mentality. |
| **Tender stage** | ■ Define a clear scope and deliverables for the works<br>■ Select appropriate planning software and allocate a dedicated planner<br>■ Create a draft Activity Programme<br>■ Allocate costs and resources so as to minimise any effects on productivity during implementation. |
| **Post Contract Award** | ■ Adopt a collaborative approach and encourage open communication<br>■ Establish a clearly thought out Industrial Relations policy<br>■ Create a detailed Activity Programme, clearly showing sequence of activities, calendar of work patterns and interfaces with other parties<br>■ Carry out necessary preparation for project delivery, taking particular account of site layout and welfare facilities, car parking, travel arrangements and inductions. |
| **Execution and Delivery** | ■ Ensure systems and processes are in place to implement the execution of the Activity Programme productively<br>■ Ensure clear project milestones are scheduled<br>■ Monitor and review the Activity Programme and record project data to ensure lessons are learned for the future. |

# 5. Resource Planning

| What are the key considerations for resource planning? | Planning work sequences, planning welfare provision, recruitment, ensuring lines of communication and time recording | Section 5 summarises the approach to planning of appropriate resources to ensure the successful delivery of construction operations |
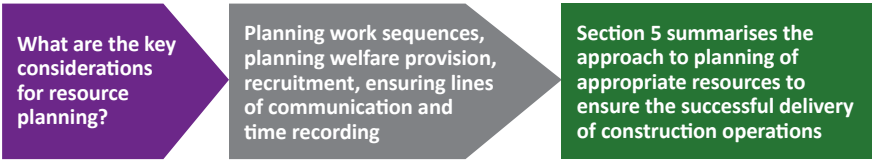
This section describes the key activities involved in resource planning, including labour, plant and materials; these activities ensure that the appropriate resources are available for the delivery of construction operations.

There are five key activities in this phase. These are shown in the diagram below:

**Plan work sequences**   **Plan welfare provision**   **Recruitment**   **Ensure lines of communication**   **Record time**

## Resource Planning

## 5.1 Approach to Resource Planning

In the Engineering Construction Industry no site is rigidly uniform in its approach to planning, managing, recruiting, organisational layout or administration.

When the Site/Construction Manager has some freedom to operate and manage their site as they see best, this brings the benefit of allowing a flexible approach in response to a specific site environment and the ability to manage change and accommodate the relevant Client's needs.

### Importance of Consistency

Greater flexibility can sometimes mean less consistency, often due to pressure from a Client and schedule constraints. It is important therefore to provide support from Senior Management and/or clear explanation of a company's resourcing and IR policies that govern resources and their utilisation.

Similarly, consideration should be given to the composition of the Project Team, with time allocated for the members to build relationships and share experience. Without this provision, differing experiences and expectations could lead to confusion, inefficiencies and even possibly unrest.

### Need for Planning Tools

The more complex the works, the greater is the need for effective planning and monitoring of resource allocation. A robust and diligent approach, utilising planning software, is needed to ensure that a timely and effective plan is applied. This ensures commonality of approach when setting up sites and when reacting to change variations, engineering deficiencies or delivery disappointments.

See also *Section 4.2*.

## 5.2 Resource Planning Process

The following summarises the key steps in a typical resource planning process:

```
┌─────────────────┐
│  Receive ITT    │
│ (Invitation to  │
│    Tender)      │
└─────────────────┘
        │
        ▼
┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│ Obtain details│   │              │   │ Create draft │   │              │   │  Agree and   │
│  of scope,    │──▶│ Agree detail │──▶│  Activity    │──▶│ Review with  │──▶│   finalise   │
│  key dates    │   │              │   │ Programme and│   │ key parties  │   │ durations and│
│ and man hours │   │              │   │  Manpower    │   │              │   │ resources for│
│               │   │              │   │  Histogram   │   │              │   │    tender    │
└──────────────┘   └──────────────┘   └──────────────┘   └──────────────┘   │  submission  │
                                                                             └──────────────┘
                        ┌──────────────┐              ◆                              │
                        │    Client    │         ◆         ◆                         ▼
                        │   Feedback   │◀── NO ◆    Bid      ◆
                        │   process    │         ◆ successful?◆
                        └──────────────┘         ◆         ◆
                                                      ◆
                                                     YES
                                                      │
                                                      ▼
                                              ┌──────────────┐
                                              │Internal Project│
                                              │Kick-off meeting│
                                              └──────────────┘
                                                      │
                                                      ▼
┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│ Present to   │   │Create Activity│   │   Assign     │   │Obtain date for│
│ Project Team │◀──│  Programme   │◀──│  dedicated   │◀──│  Activity     │
│              │   │ & Manpower   │   │  Planning    │   │  Programme    │
│              │   │  Histogram   │   │  Engineer    │   │  submission   │
└──────────────┘   └──────────────┘   └──────────────┘   └──────────────┘
        │
        ▼
┌──────────────┐
│Client Kick-off│
│   meeting     │
└──────────────┘
        │
        ▼
┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│ Subcontracts │   │   Resource   │   │Establish Office│  │Mobilise Site │   │Mobilise craft│
│  review and  │──▶│ interview and│──▶│ and Welfare  │──▶│ Management   │──▶│   trades     │
│    award     │   │  allocation  │   │  facilities  │   │    Team      │   │              │
└──────────────┘   └──────────────┘   └──────────────┘   └──────────────┘   └──────────────┘
                                                                                    │
                                                                                    ▼
                                              ┌─────────────────────────┐
                                              │      Works Start        │
                                              └─────────────────────────┘
```

# 5.3 Planning Work Sequences

Planning of work sequencing needs to be a joint effort that involves input from Construction, Procurement, Quality Assurance and Design Teams, not just from the Planning Department. The experience and skills of all participants contributing will invariably bring time and cost savings to the project. The Planning Department needs also to make schedule provision for subcontractor selection and incorporation of their specific schedules into the Master Time Schedule.

## Task Activities and Recruitment

Task activities should be broken down into the specific trade disciplines to detail man-hour allocation. This will enable accurate resource forecasting for recruitment and welfare provision requirements. Once a resource profile is produced, and after levelling any peaks and troughs, Employers can commence selection of internal company employees or recruitment of new candidates with suitable skill sets to cover any deficiencies.

These activities should begin as early as is practicable; this will give Employers as much lead time as possible to allow thorough recruitment processes before the mobilisation of the best available people.

## Pre-qualification Approval

Pre-qualification approval of subcontractors needs to be in advance of any bid tender pricing phase to minimise schedule impact. Pre-qualification of at least three Contractors is good practice, with adequate time allowed for issuing of bid enquiries and appraisals. Additionally, sufficient time should be allocated within the Activity Programme for any protracted contract award negotiations.

## Procurement Lead Time

As with recruitment, lead times for procuring critical materials/equipment need to be identified as early as possible. Planning Engineers need to engage with Purchasing Managers to confirm and address any impact on critical path schedule activities. Dates on the Activity Programme may then be used to work backwards to identify when specific orders must be placed to ensure start dates are achievable.

## 5.4 Planning Welfare Provision

Site welfare arrangements need to be planned and laid out to enable an efficient flow of resources from arrival at the car park through to site workface. Car parking needs to be sufficient, well maintained and monitored by Management.

### Facilities

Mess and changing cabins need to be of good quality with sufficient space to accommodate the Workforce. They need to be sited as close to the workface as possible to minimise walking time. Toilets also need to be planned for, with waste and water connections installed as early as possible. Again toilets need to be sited as close as possible to work areas as well as in the welfare areas.

A designated canteen is a preferred option but, if this is not possible, alternative hot food provision needs to be planned for, such as through pre order/delivery.

Thought should also be given to contingency plans, should the numbers on site exceed the original estimates.

| NOTE: | *See Best Practice Guide 2, Section 8.1.* |
|-------|-------------------------------------------|

### Access and Egress

Roads and designated walkways need to be established and maintained. Where possible, Planning Teams should consider scheduling the laying/installation of key site road foundations; this should be up to but not including the upper final surface layer. This will aid the efficient movement of labour and equipment to and from the workface.

### Clocking In and Out

Employees should clock in and out with their work attire on; this is a requirement of NAECI and saves considerable time.

## 5.5 Recruitment

The company recruitment policy must be followed to ensure consistency. This policy should include procedures for interviewing, validating competencies and checking experience with appropriate referees. This should be applied to all applicants, even if proposed by an internal sponsor.

The intent of the policy, and its practice, should be to secure the best possible skills, experience and expertise in accordance with best practice and in strict compliance with all relevant legislation. In accordance with such legislation, a company should give fair, reasonable, non-discriminatory and equal consideration to all available applicants who have suitable skills, experience and expertise. There should be a commitment to utilising existing employees, but Contractors may also wish to consider applicants who reside within the surrounding area of the works, depending on a company's overall work strategy.
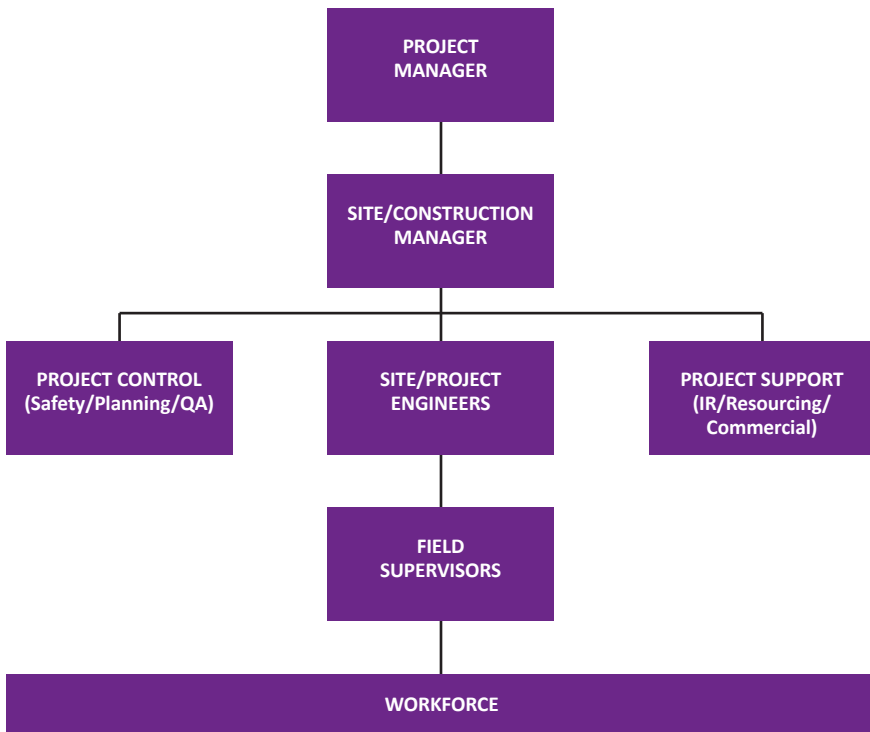
| NOTE: | *If Employment Businesses are being used to engage employees on in-scope sites, they must be ECIA members.* |
|-------|-------------------------------------------------------------------------------------------------------------|

## 5.6 Ensuring Robust Lines of Communication

Good communication is essential to establishing culture and ensuring engagement. Processes/conduits which allow for the clear and consistent dissemination of information to all relevant parties must be established as early in the works as possible.

Regular and frequent progress meetings, commensurate with the type of works, should be held by the Site/Construction Manager for their Management Team and this process should be cascaded down through the structure, so that every day every worker has been informed of what is expected of them and why. Additionally, daily co-ordination meetings with subcontractors are recommended to alleviate interface clashes.

The following organogram shows typical lines of communication within a standard construction project:

```
              PROJECT
              MANAGER
                 |
         SITE/CONSTRUCTION
              MANAGER
      _____|_____
     |           |           |
PROJECT CONTROL  SITE/PROJECT  PROJECT SUPPORT
(Safety/Planning/QA) ENGINEERS  (IR/Resourcing/
                 |              Commercial)
               FIELD
            SUPERVISORS
                 |
             WORKFORCE
```

**NOTE:** *See Best Practice Guide 2 – Workforce Engagement, Pages 10-11.*

## 5.7 Time Recording

All sites should have electronic time recording facilities installed, with the ability to produce various types of reports. This allows both Site/Construction Management and Supervision, along with the site wages clerk, ample information to allocate resources to tasks.

The installation of a clocking station requires other actions to be executed by Management, which are:

■ An electronic reader needs to be secured and positioned to allow a free flow of people through at clocking time. Ideally the station should be adjacent to the timekeeper accommodation with a clear viewing of people clocking in or out.

■ It is recommended that a clocking station should be opened at a reasonable time prior to start of work, and it should be mandatory for all to be wearing their work clothes and full Personal Protective Equipment (PPE).

■ Within a reasonable period after normal clocking in time, the clocking station should be secured and any latecomers must request permission to clock in. The same procedure is to be maintained in reverse at clocking off time, with the clock secure until just prior to finish time and only people wearing their PPE permitted to clock off the system.

■ The responsibility of observing the clock needs to be delegated to at least two members of Supervision and not left to the time clerk. If any clocking anomalies are witnessed, these will require the verification of at least two members of Supervision.

■ Management need to support Supervision at clocking times by being in attendance to address any issues, and to confirm PPE compliance.

## 5.8 Best Practice

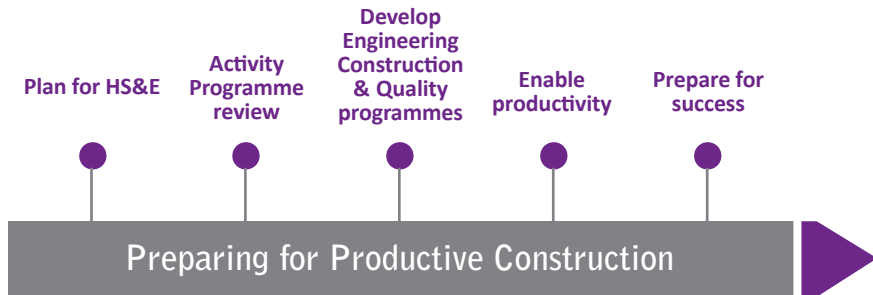| RESOURCE PLANNING | |
| --- | --- |
| **Planning work sequences** | ■ Break down trade task activity into man-hour allocation detail<br>■ Ensure recruitment lead time to enable mobilisation of the best available people<br>■ Pre-qualify subcontractors early to minimise schedule impact<br>■ Identify procurement lead times for critical materials/equipment. |
| **Planning welfare provision** | ■ Ensure the right quantity and quality of facilities are available at the right time, in the right place<br>■ Plan and maintain access and egress points to site and car parks<br>■ Ensure efficient and fair clocking on/off procedures. |
| **Recruitment** | ■ Adopt appropriate recruitment procedures<br>■ Develop and communicate consistent interview procedures. |
| **Ensuring robust lines of communication** | ■ Hold daily Management/Team meetings<br>■ Hold daily meetings with subcontractors. |
| **Time recording** | ■ Install an electronic time recording system<br>■ Designate responsibilities for monitoring the system. |

# 6. Preparing for Productive Construction

What should be the approach to preparing for productive construction?

Ensuring that task-specific documentation is ready and prepared prior to commencement of works

Section 6 summarises the approach to the preparatory stages prior to commencing productive construction

This section deals with the approach to producing task specific documentation and systems that are used in the preparatory stages prior to commencing work and productive construction.

There are five key activities in this phase. These are shown in the diagram below:

Plan for HS&E

Activity Programme review

Develop Engineering Construction & Quality programmes

Enable productivity

Prepare for success

Preparing for Productive Construction

# 6.1 HS&E Planning

It is imperative that an HS&E plan and procedures are developed and that environmental issues are fully considered.

## Basic Principles

The fundamental principles underlying the planning and delivery of Engineering Construction works are that success depends on:

■ Thinking clearly about what the work entails and deciding how it is going to be delivered before it starts

■ Ensuring that everyone knows what is required of them when work starts

■ Monitoring whether or not defined objectives are delivered after work has started

■ Taking appropriate action where those objectives are not met.

These principles apply equally to successful Health, Safety & Environmental management as much as they do to any other criteria.

Real Health, Safety & Environmental successes are more likely to be delivered when the actions required are driven by careful consideration of the particular circumstances of the particular works. Success is less likely where compliance with mere administrative and generic requirements assumes more importance than dealing with the project's particular needs, in other words:

*"When Managers can confidently explain **why** things are being done the way they are, they are more likely to be getting it right than those who can only describe **what** is being done."*

## Guidelines

It is not the purpose of this document to provide detailed guidance on specific Health, Safety & Environmental topics. Nonetheless, the following guidelines are universal whatever the type of work involved:

■ It is essential to allow adequate time to consider and plan for Health, Safety & Environmental needs before work starts. This applies at all stages from making early design decisions through to agreeing work methods with end stage Contractors.

■ Principal Contractors need to be proactive and consistent in their leadership of others.

■ Effective 'communication' means talking with people rather than at them. This applies as much to communication between organisations as it does between each Manager and their own Workforce.

■ Some risks are higher priorities than others. Management resources can and should be allocated accordingly, for example tackling office manual handling risks is a lower priority than confined space issues for a Contractor working inside refinery vessels. Unnecessarily focusing on trivial risks is not good risk management, and potentially harmful if it obscures the important issues.

■ Monitoring performance serves no useful purpose if it is not accompanied by a visible and appropriate response to what is found (which could be recognition of success just as much as correction of any failures).

### Further Information

ECIA members can find the following in 'Document library' in the Health and Safety section of the ECIA website (**www.ecia.co.uk**):

- ■ Waste Management guidance

- ■ Permit to work systems

- ■ Supervision assessment tool

- ■ Health and safety manual

- ■ CDM Regulations information pack (note that this refers to the 2007 regulations which will be replaced in 2015, but the key messages remain entirely valid).

The following documents can be downloaded free from the Health and Safety Executive website (**www.hse.gov.uk**):

- ■ Managing for health and safety (HSG65)

- ■ Leading health and safety at work (INDG417)

- ■ Managing contractors – A guide for employers (HSG159).

## 6.2 Activity Programme Review

Prior to commencing work, the Activity Programme should be revisited to ensure that it is accurate and reflective of current circumstances. Consideration should be given to the optimum time for a task activity to begin, taking into account float, resource and logic. Latest access and delivery dates should be incorporated and once optimum start times are agreed it is important to establish a new baseline for the Activity Programme so that it is live.

A highly visible piece of planning documentation is the Manpower Histogram (profiled by trade) based on man-hour scope. This shows the projected labour levels over the estimated duration of the works as drafted at the Tender stage. The Manpower Histogram should be updated with the actual number of operatives and actual duration so that planned and actual performance can be compared, investigated and understood.

See *Appendix C* for an example of a typical histogram.

## 6.3 Engineering Construction & Quality

Constructability can be defined as 'the optimum use of modifications/construction knowledge and experience to provide input to the Planning, Design/Engineering, Procurement and field implementation of a plant works to achieve overall project objectives (in quality, schedule and cost)'.

The following elements should be considered:

- ■ It can be advantageous if a shared services/common user co-ordination plan is developed for the project as a whole

- ■ It is desirable to develop a Constructability Improvement Log

- ■ It is desirable to define and document system limits and test packs.

A Quality Programme must be developed including an NDE (Non Destructive Examination) Strategy, all supporting Inspection Test Plans/Check lists and System Handover procedures.

## 6.4 Enabling Workforce Productivity
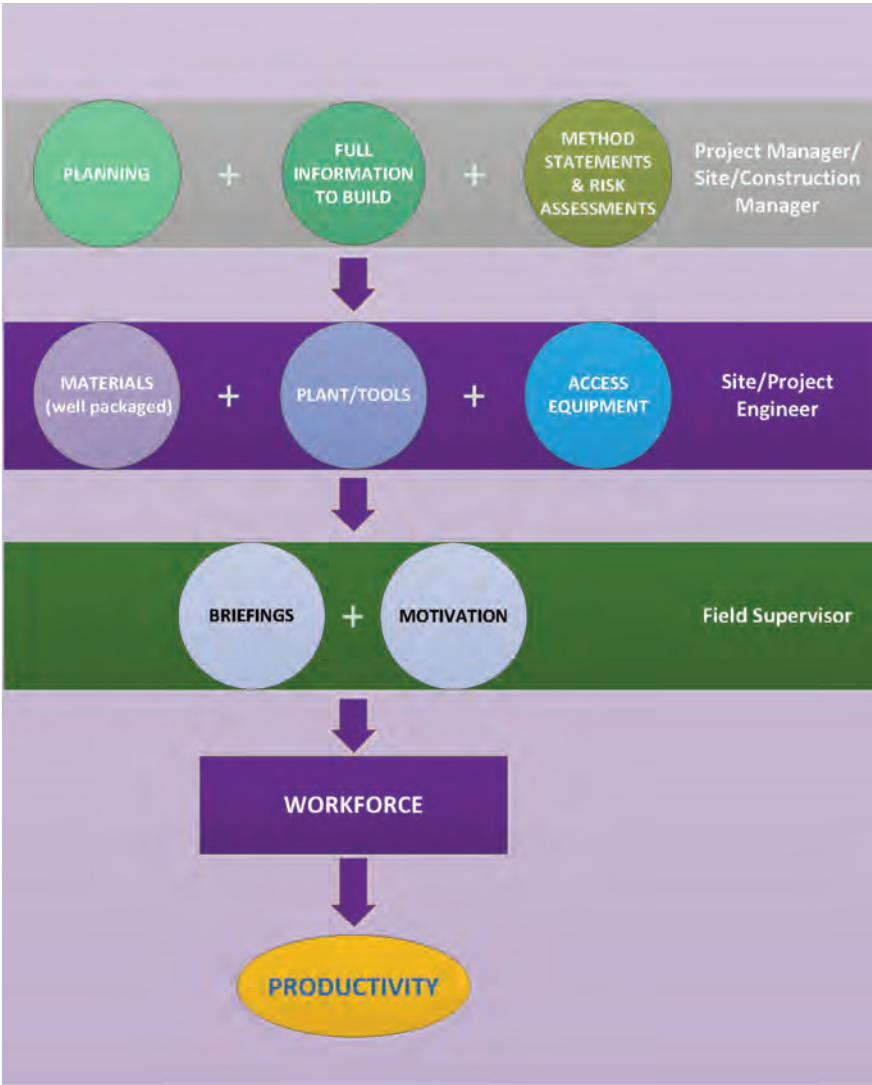
Depending on project specific requirements, 1, 2 or 3 week looking ahead provides clarity and focus with regard to short term work coming up, which must be discussed with Supervision and the Client to ensure understanding and priorities.

The following two points should be noted:

- Detailed daily allocation sheets should be completed by all Supervision to provide factual records of work undertaken against plan (see *Section 4.6* – Recording Project Data), and consideration should be given to entering data into the ECIA KPI database.

- Daily/weekly progress should usually be included within the weekly/periodic report.

| **NOTE:** | *A well-managed Incentive Bonus Arrangement (IBA) will also have a role to play in encouraging productivity.*<br><br>*See Best Practice Guide 2 – Workforce Engagement, Section 10.* |
|---|---|

## 6.5 Preparing for Success

All works need to be planned to ensure the availability of sufficient time and resources to complete the project in the most effective way. A successful project outcome is where the works are completed on time and the construction work is completed safely and productively by an engaged and committed Workforce. All stakeholders in the Engineering Construction Industry aspire to this. To this end, the Project Management Team should undertake a detailed assessment of the site and plan and monitor all site activities, paying particular attention to an integrated approach in team working, both within the Project Team and in relation to other teams on-site.

As well as identifying the best practices and optimum planning mechanisms appropriate, a 'one site; one team' philosophy of communication involving all levels of Management and Workforce should be adopted. This will enable all parties to share a common goal of productive working.

### Organising the Site

The site should be organised to achieve maximum efficiency, with good access, appropriate deployment of labour and level of skills, and ready availability of information, materials, plant and tools.

Appropriate facilities should also be provided in the right location to ensure that people feel that their welfare and wellbeing is being considered while they are at work and to minimise walking. (See also *Section 4.5* - 'Welfare Facilities'.)

| **NOTE:** | *See Best Practice Guide 2 – Workforce Engagement, Pages 18-19 Section 8.* |
|---|---|

## People

It is important to ensure balanced and integrated teams throughout the project life cycle, maximising the use of capabilities, skill sets and numbers to achieve the greatest productivity. A correct mix of skilled and unskilled labour should be deployed on the site.

In general, an environment should be created where people can perform to their maximum potential.

| | |
|---|---|
| **NOTE:** | *See Best Practice Guide 2 – Workforce Engagement, Page 22, Section 10.* |

## Integration of Site Activities

An integrated approach to all site activities should be adopted. This should include:

- Integration of project delivery teams from Main Contractor through to subcontractors
- Development of an integrated plan between the Project Team and Procurement, identifying and exploiting inter-project procurement opportunities
- Optimising and potentially sharing the services and facilities on-site
- Having a detailed commissioning strategy.

## Planning Approach

The best practice approach to delivering the benefits of good planning involves:

- Collaborative planning with all other trades and Contractors
- Providing appropriate space for one trade to work in one area
- Preparing and monitoring short term look-ahead plans
- Flushing out interface issues through daily meetings and monthly interactive planning sessions
- Building absenteeism into the Activity Programme
- Accurately reporting progress.

## 6.6 Best Practice

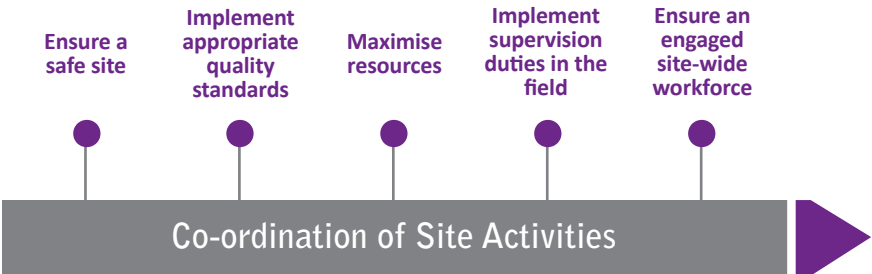| PREPARING FOR PRODUCTIVE CONSTRUCTION | |
|---|---|
| **HS&E planning** | ■ Plan for Health, Safety & Environment needs before work starts<br>■ Be proactive, consistent and communicate effectively<br>■ Prioritise risks according to level of potential severity. |
| **Activity Programme review** | ■ Review Activity Programme regularly; revise as necessary<br>■ Make realistic allowances for downtime stoppages as a result of:<br>　■ Seasonal and inclement weather<br>　■ Time For Safety initiatives<br>　■ Potential interface issues with Contractors<br>　■ Material defects.<br>■ Utilise graphic representation of data, such as a Manpower Histogram, where possible. |
| **Engineering Construction & Quality** | ■ Consider the use of shared service provision<br>■ Develop a Constructability Improvement Log<br>■ Define and document system limits and test packs<br>■ Develop a Quality Programme. |
| **Enabling productivity** | ■ Complete detailed daily allocation sheets recording work done<br>■ Include daily/weekly progress in the periodic reporting. |
| **Preparing for success** | ■ Organise the site and facilities to achieve maximum efficiency<br>■ Ensure a balanced and integrated Project Team<br>■ Ensure collaborative planning with all other trades and Contractors<br>■ Report progress accurately. |

# 7. Co-ordination of Site Activities

| How do you co-ordinate site activities to maximise productivity? | By ensuring a safe site, delivering quality standards, maximising resources & implementing supervision duties | Section 7 summarises the approach to delivering successful co-ordination of all major site activities |

This section provides guidelines for the co-ordination of site activities during the works with the aims of enabling productivity and delivering success through greater output and a 'one site; one team' approach.

See also *Section 4.5*.

There are five key activities in this phase. These are shown in the diagram below:

**Ensure a safe site**　　**Implement appropriate quality standards**　　**Maximise resources**　　**Implement supervision duties in the field**　　**Ensure an engaged site-wide workforce**

## Co-ordination of Site Activities

## 7.1 Ensuring a Safe Site

Creating and sustaining the right conditions on-site so that employees can perform to the best of their abilities is a key consideration at all times. Engineering Construction is an environment where a wide range of hazards are a constant feature of the everyday working environment, whether or not any accident has been experienced to date. Therefore the risks that the hazards generate need to be constantly controlled. This section does not set out to provide a comprehensive technical account of all health and safety requirements, but highlights a number of factors that are considered particularly relevant with respect to Employers, Supervision and employees.

### Employer Accountability

Employers have a clear legal duty to ensure that work related risks to their employees are properly controlled. Therefore, from the moment that employees report for work, Managers must ensure that appropriate and clearly defined procedures are in place and subsequently continue to be effectively applied.

It is important that required standards are firmly embedded from day one. A key part of this is communicating a clear message to all employees on the housekeeping and behavioural standards which are expected of everyone working on the site. This is usually part of the site induction process, but also needs to be reinforced and nurtured throughout the project lifecycle. These basic expectations set the tone for the wider health and safety agenda and furthermore help to provide a firm basis for productive working.

The following are important factors in maintaining high standards as the works subsequently progress:

- Early identification of project-specific risks and the necessary measures for controlling them

- Ensuring that appropriate health and safety plans are in place before the work starts

- Method Statements and Risk Assessments that are clearly relevant to the specific tasks rather than less relevant generics

- Ensuring that delivery of planned requirements is monitored and that the findings are actively resolved

- Periodic review of existing arrangements (regularly, and if changing conditions demand) to ensure they remain relevant and appropriate at all times

- Senior Managers being a visible on-site presence and providing clear leadership in pursuit of the required standards from all those working on the site.

### Role of Supervision within HS&E

The Field Supervisor plays a key role in ensuring construction works are built safely (and correctly). It is the Employer's role to plan and decide, in the longer term, how the work is going to be done and to what standards. It is the Supervisor's role to ensure that those decisions are put into practice when the work is being done.

An individual Supervisor can have a substantial impact on the success or otherwise of the overall project. Because of this, Supervision needs to be well trained, so that they are capable of performing the tasks they are asked to do.

The following are key skills and qualities for effective supervision with particular relevance for health and safety:

- Ability to plan short-term work activities, including the overseeing of specific Risk Assessments and Method Statements

- Confidence in arranging and delivering appropriate workplace briefings

- Being receptive to feedback

- Ability to ensure the necessary resources to complete work are in the right place at the right time

- Ability to organise work packages to deliver good safety and productivity

- Ability to consistently ensure quality standards are maintained (which reduces risk by avoiding unnecessary re-work).

## Site Workforce

The people on the ground are instrumental in delivering safe and successful projects. They have a responsibility to work positively in the interests of success, but cannot do so unless they are provided with the right environment in which all employees can perform to the best of their ability. Setting clear standards and creating a positive working environment encourages effective behaviours and commitment to the project's goals.

Critical to this approach, in respect of both health and safety and commercial success, are:

- Investment and participation in training (including development of a good behavioural culture)

- Developing a culture of looking out for conditions that might give rise to concern and reporting unsafe conditions, unsafe acts or near-misses

- Supporting the maintenance of good standards and well organised welfare facilities (see also *Section 4.5* - 'Welfare Facilities')

- Promoting best practice in the use or maintenance of plant.

All involved in the works on the site should also actively communicate on a regular basis in a two-way engagement process, including:

- Holding regular and meaningful briefings and performance reviews

- Providing clear and honest feedback.

All employees should feel confident in being able to report issues to Management, participate in feedback in tool box meetings, as well as taking individual responsibility where necessary.

## 7.2 Implementing Quality Standards

Research has shown repeatedly that the cost of defects or failures in constructed facilities can be extremely high. Even with minor defects, re-work may be required and facility operations impaired, resulting in increased costs and delays. In the worst case scenario, failures may cause personal injuries or fatalities. Indirect costs of insurance, inspection and regulation are increasing rapidly and the imperative for a robust quality management system has never been greater to ensure the job is done right the first time.

The importance of delivering appropriate quality standards to reduce or eliminate this barrier to productivity cannot be over-emphasised.

### Employing Standards to Maximum Effect

Quality standards should be implemented throughout all construction operations to ensure the appropriate level of quality and that operations are done 'right first time', without the need for re-work. Standards should be employed to maximum effect to ensure increased productivity.

To facilitate this, it is critical that full information is available at the very beginning of the works, including all necessary documentation and installation drawings. It is also important to consider the implications for handover and commissioning strategy at this early stage.

### Robust Quality Management

The benefits of robust quality management depend for their delivery on well-documented quality management systems and processes. It is recommended that a Quality Control Management system is effectively applied before commencement of works.

The following are also recommended:

- Quality reviews, including quality assurance audits and quality control reports

- Test and Inspection schedule, with a detailed Work Breakdown Structure identifying all activities and progress reporting for each activity

- Appropriate commissioning strategy and programme developed at an early stage

- Defined handover responsibilities, with a specific person identified to monitor and collate handover information, and provide regular updates to the Site/Construction Manager

- Review of lessons learned from previous projects and a process of continuous improvement within the current project.

## 7.3 Maximising Resources

Goals should be set for minimising waste and optimising the capabilities of Management and the Workforce. The aim should be to achieve the most productive approach and avoid unnecessary costs and wasteful activities.

Consideration should be given to:

- Packaging of plant and materials
- Logistics
- Prefabrication.

All works activities should be subject to a process of continuous improvement. Prior to commencing an activity, other projects should be reviewed in relation to what is to be done, to see if it could be done better. By reviewing lessons learned from other projects, solutions can be implemented and fed back into the wider business decisions, enabling the adoption of appropriate and innovative approaches.

### Work Preparation

Full information for each activity should be available and the work area should also be ready. Plant and materials should be delivered and available, with appropriate Risk Assessments in place.

Prior to commencement of work, the following should be in place:

- Concise Risk Assessments and, wherever possible, full installation drawings for all areas, and these should be understood by the Supervisor
- Plant/scaffold ready and available
- Materials packaged appropriately for doing all the job (minimising waste) and delivered.

### Logistics

The Logistics Team should give careful attention to materials and plant, assessing the management of day-to-day logistical activities executed at site level, and ensuring these are performed effectively and efficiently.

Consideration should be given to the following in particular:

- Organising availability of work materials and plant, in sufficient quantities, at the workface before work starts, so as to keep the labour force working productively
- Having a dedicated Logistics Controller
- Arranging good access to store cabins from the site and for deliveries
- Planning carefully for site logistics involving transport to the site and to the workface so as to minimise walking and avoid double handling
- Carrying out installation activities in a way that limits the risk of damage to equipment.

There are a number of best practices which can deliver these benefits, which include utilising bulk call off orders, maintaining clean and tidy stores and utilising stock control systems.

# 7.4 Implementing Supervision Duties in the Field

The prime functions of the Field Supervisor are to supervise and motivate the Team under their charge and to encourage good morale and lead by example; the Field Supervisor is at the focal point of driving productive work practices in the field. Supervisors need to be mobilised onto the works as early as practicable, continue through the execution of each phase and be dedicated to the successful conclusion of works.

There are many benefits that can be delivered from early mobilisation of Supervision and their post completion involvement. This section summarises best practice and the benefits that arise from a Field Supervisor joining the works as a dedicated Supervisor and remaining as such throughout the duration of the project.

## Early Mobilisation

Many benefits result from early mobilisation of Supervision including, but not limited to, their input to:

- Activity scheduling and labour scheduling

- Compiling upfront installation work and job packs

- Installing facilities and setting up supporting/control systems

- Material and plant and equipment procurement and co-ordination

- Risk Assessments and Method Statements

- Inspection Test Plans

- Permit system training and awareness

- Attendance, time-keeping and recording systems

- Site transport requirements and parking arrangements.

## Post Completion – Continuing Involvement

Many benefits result from post completion involvement of Supervision including, but not limited to, their input to:

- Overseeing completion of punch lists/snag lists/butt lists/remedial lists, together with relevant completion and handover certification and documentation

- Production of close-out and handover reports

- Assistance with project documentation and final contractual/commercial negotiations.

## Team Motivation

For a Team to be successful, mutual targets, practices and actions must be defined at an early stage.

A Field Supervisor is a key person in building an effective and motivated Team, where it is important to avoid at all costs any 'Them and Us' situations from arising, and where success can be achieved.

The following acronym sums up this approach:

- **T** = **T**ogetherness at all times (no 'them and us' situations)
- **E** = **E**nsure it is always 'we' as there is no 'i' or 'u' in the word 'Team'
- **A** = **A**ll parties working and thinking as a Team
- **M** = **M**y problems and your problems do not exist. They are 'our' joint challenges.

Team building is important, and it is essential that a Field Supervisor quickly gets to know the members of their Team, including identifying strengths and weaknesses of each Team member, and wherever possible allocating tasks to suit an individual's particular experience, skills and ability.

A good Team spirit can be developed within both formal and informal situations, with this greatly contributing to a safer, more harmonious, happy and effective working environment and, ultimately, a successful Team.

## Ratio of Supervision to Field Personnel

To avoid Supervision becoming ineffective and over stretched, a suitable ratio of Supervision to Field Personnel must be maintained, depending on the work site and the works being undertaken.

## Communication

Good communication is essential in conveying objectives and expectations for all members of the Project Team and Workforce.

Appropriate attitudes towards engagement and information management should be developed and acted on. Newsletters, events and tool box talks can assist with this objective.

Project Management should also update employees on a regular basis to keep them informed of work related issues and project progress. The visibility of such communication from Management is crucial to ensuring the process of two-way communication and engagement in the course of the works.

## Industrial Relations

It is of vital importance for Supervision to be in the forefront of working towards achieving and managing harmonious Industrial Relations on a project. Managers and Supervision should be trained to ensure that they fully understand how to achieve, manage and maintain good Industrial Relations and how best to avoid disputes and grievances, along with ensuring compliance with all policies and procedures.

It is important that both Managers and Supervision duly recognise that problems and issues affecting other Employers on the same project (that are outside their direct influence and control) can adversely impact on their own activities. This exposure can be minimised by regular and on-going dialogue and communications between Employers, in addition to having regular meetings to foster awareness of and keep abreast of events on the project.

## 7.5 Ensuring an Engaged Workforce

| NOTE: | *See Best Practice Guide 2 – Workforce Engagement.* |
|-------|-----------------------------------------------------|

To ensure an engaged and committed Workforce, it is important to pick the right people for the job and provide appropriate inductions with regular two way engagement. Individuals need to feel involved and valued and that their skills are being fully utilised to achieve maximum productivity on a project.

### Induction

It is important that a complete Induction Programme for new people is developed, allowing enough time to cover all key issues. In particular, competency for specific tasks should be confirmed. The induction process must be comprehensive enough to ensure that the Workforce understands all aspects of the project and the arrangements in place for it.

Safety inductions should be undertaken on a regular basis, as the works progress, to ensure that all members of the Site Team are aware of the changing state of the project.

### Individual Employee Development

Developing specific improvement paths for individuals can contribute to personal growth and enhance a productive contribution to the project.

A culture of continuous improvement depends on feedback from all members of the Workforce, sharing mistakes and learning lessons where appropriate. (See also *Section 8*.)

| NOTE: | *See Best Practice Guide 2 – Workforce Engagement, Section 6.* |
|-------|----------------------------------------------------------------|

## 7.6 Best Practice

| CO-ORDINATION OF SITE ACTIVITIES | |
|---|---|
| **Ensuring a safe site** | ■ Establish a strong behavioural safety culture on-site<br><br>■ Develop, communicate and review safety plans in detail<br><br>■ Have Risk Assessments in place to identify risks early<br><br>■ Ensure relevant safety documentation is provided<br><br>■ Review Risk Assessments and Method Statements regularly<br><br>■ Provide appropriate training for all site employees. |
| **Implementing appropriate quality standards** | ■ Develop a right first time culture<br><br>■ Provide well-documented quality management systems and processes<br><br>■ Develop Quality Reviews, including Test and Inspection<br><br>■ Consider methods of assessing competencies<br><br>■ Develop a Quality Control Management manual<br><br>■ Make use of an appropriate commissioning strategy and Programme at an early stage<br><br>■ Clearly define handover responsibilities<br><br>■ Review lessons learned. |
| **Maximising resources** | ■ Provide complete detailed design and installation documents, packages and drawings for all areas<br><br>■ Ensure plant/scaffold/materials are ready and available<br><br>■ Ensure the Logistics Team plans and manages access to storage and welfare areas, as well as access and egress points. |

| CO-ORDINATION OF SITE ACTIVITIES | |
|---|---|
| **Implementing supervision duties in the field** | **For Management:**<br>■ Mobilise dedicated and empowered Supervision early and seek to retain their service status until project completion<br>■ Invest in training for Supervisors, particularly in the fields of Industrial Relations and people management.<br>**For Supervisors:**<br>■ Supervise effectively and lead by example<br>■ Build an effective, cohesive and motivated Team<br>■ Establish and communicate a clear reporting structure with responsibilities assigned and agreed. |
| **Ensuring an engaged Workforce** | ■ Select suitably qualified and experienced people for the job and provide appropriate inductions<br>■ Confirm competency for specific tasks<br>■ Provide opportunities for individual development to enhance productive contribution to a project<br>■ Encourage feedback from all Team members to ensure lessons are learned. |

# 8. Continuous Performance Review

| What is the purpose of continuous performance review? | Measuring actual against planned performance on the project | Section 8 describes the main aims of project performance review and how to approach and get the best out of review meetings |
|---|---|---|

This section provides guidelines for how to approach continuous performance review.

There are four key activities in this phase. These are shown in the diagram below:

**Review project performance** • **Assess shared contributions** • **Identify best practice** • **Apply lessons learned** •

**Continuous Performance Review**

## 8.1 Reviewing Project Performance

It must be remembered that the prime purpose of reviewing project performance is to improve that performance.

The best way of identifying and capturing lessons learned is to create a blame free culture in which lessons can be openly shared; this is a key feature of the 'one site; one team' culture. Such lessons learned should be captured and cascaded to best improve performance on the current and any future projects the participants are involved with.

## 8.2 Assessing Shared Contributions

Consideration should be given to maximising the value of contributions, and this can only be done if all parties buy in to the process. Buy-in can only be achieved through good communication and engagement that emphasises the benefits to all of participating in the review process. It should be made clear that the review is looking for objective comments based on fact, and not as a result of personal and/or emotive score settling.

It is likely that the value of contributions will be enhanced through the participation of the greatest number of parties, particularly the Client.

A good Chairperson, who is a respected facilitator, can help ensure balanced contributions from all parties.

## 8.3 Identifying Best Practice

Best practice should be identified and captured so as to create a Project Record that will form the basis of the Project Close-Out Report, which will then enable lessons learned to be shared.

Best practice should be identified at the time and re-evaluated later on in the perspective of how the site works have developed. Clearly this would be extremely difficult to do at the end of the project so it is recommended that a project diary or record of monthly meetings (e.g. PJCs) is kept; in this way the consensus views will be recorded as they are agreed, so removing the possibility of disagreement from recollection later on.

The person appointed by the Contractor as the facilitator of the review process should be responsible for ensuring that these project records are represented in the Project Close-Out Report

## 8.4 Applying Lessons Learned

If the lessons learned are not applied, all the effort put into the review process is wasted. It is imperative therefore that ideas/practices that are agreed to be 'best practice' are implemented.

Equally if the lessons learned are not effectively communicated to all parties, their effectiveness will be diminished. In communicating out lessons learned to all parties, they should be recognised as opportunities to create future success. Post project completion, they will form a fundamental part of the Project Close-Out Report and may be used to enhance reputations, secure further work and offer opportunities to improve the wider Engineering Construction Industry.

| NOTE: | *See Best Practice Guide 1 – Industrial Relations, Section 12.* |
|-------|----------------------------------------------------------------|

## 8.5 Best Practice

| CONTINUOUS PERFORMANCE REVIEW | |
|---|---|
| **Reviewing project performance** | ■ Create a blame free culture of sharing<br>■ Remember that the aim is to improve project performance. |
| **Assessing shared contributions** | ■ Invite all parties to contribute, including the Client<br>■ Ensure buy-in by focusing only on objective factual comments. |
| **Identifying best practice** | ■ Identify, evaluate and subsequently re-evaluate best practice<br>■ Record promptly and review periodically. |
| **Applying lessons learned** | ■ Do implement and do communicate lessons learned<br>■ Apply best practice guides and share experiences<br>■ Build the Project Close-Out Report around the lessons learned. |

# 9. Conclusions

| What are our conclusions? | Summary of recommendations for implementation of best practice Planning and Operations strategy | Section 9 describes the conclusions for a good Planning and Operations strategy and includes a summary of recommendations |
| --- | --- | --- |

## 9.1 Strategy for Planning and Operations

To further the aim of good Planning and Operations strategy, this document contains guidelines and best practice recommendations *(see Section 9.3)* to facilitate the sharing and utilisation of relevant knowledge.

The document has built on the Engineering Construction Forum's conclusion[3] that *"The NAECI and its major project Supplementary Project Agreements provide both a framework and a stable and structured environment for project execution."* with the aim of looking at ways to *"establish and encourage the adoption of practices by clients that would promote a strong, productive and harmonious UK Engineering Construction Industry"*.

For Engineering Construction works, checklists contained in *Appendix A* should be utilised to assess the extent of the implementation of best practice; there is an individual checklist for each main section covered in the document.

The recommendations contained in this Guide are designed to encourage a proactive approach to capturing lessons learned and implementing best practice. The overall objective should be to ensure that a continuous improvement process is followed so as to increase the performance and competitiveness of the UK Engineering Construction Industry.

All stakeholders, **especially Supervisors**, have a key role to play in achieving these goals.

## 9.2 Planning a Best Practice Culture

In conclusion, there are three essential steps in planning for a best practice culture and this Guide seeks to illustrate the activities and behaviours associated with each step.

- Firstly, the aims must be established. These identify and crystallise the end goal of the Employer/Management Team and the works themselves. Aims are most likely to be achieved if set during early engagement and clearly communicated to all stakeholders.

- Secondly, the aims must be lived. The right attitudes and behaviours must be exhibited by all stakeholders and this can only happen if they are set from the early engagement phase by the most Senior Management and cascaded down through the organisation and across the project.

- Thirdly, drivers must be developed which will encourage and maintain the attitudes and behaviours that underpin the culture on-site. They must be realistic, fair and consistent with the aims. Again, they must be clearly communicated, as should the fact that they are expectations, not suggestions.

[3] *ECF Report in response to 'Changing to Compete – Review of Productivity and Skills in UK Engineering Construction' February 2012*

## Aims

It is important on all projects to foster a 'one site; one team' ethos. A critical part of achieving this is to strive to set a challenging but positive and proactive culture within all work environments.

This type of environment supports free and open communications regarding project information and encourages a fundamental belief in full transparency. These behaviours improve works execution.

## Right Attitudes and Behaviours

In terms of behaviour and attitude, all parties should:

- Do the right thing, even when no one is watching
- Work to establish among all parties the behaviours needed to be successful in mutually shared goals
- Ensure respect, integrity, communication and excellence in all dealings with each other
- Maintain a supportive and collaborative environment
- Demonstrate and inspire positive and professional attitudes.

## Key Drivers to Best Practice

The working group identified that the main drivers for successful Planning and Operations revolve around developing a healthy 'one site; one team' culture, which puts the needs of the project first.

Success depends on early and meaningful engagement with all stakeholders, adopting a mind-set of challenging all barriers to productivity with the aim of eliminating them and of recognising that the Field Supervisor is at the focal point of driving productive working.

The following best practices are recommended for achieving such a culture:

- All are obligated and encouraged to raise potential issues as they become known so that prompt action can be taken to mitigate risk. Timely identification of issues aids rapid resolution, which always enhances productivity.

- The raising of issues should occur throughout all organisations and projects. Disagreements are not uncommon in the Engineering Construction Industry and can be healthy if handled properly. How each organisation handles these issues and concerns illustrates how transparent and effective that organisation is in practice.

- Everyone should adopt the principle that 'You are entitled to be heard, we want to hear you, and everyone needs to take issues and concerns seriously'. Organisations should provide a facility for an independent 'Speak Up Programme' for anonymous feedback.

- All should be committed to fully and seriously considering all issues and concerns. There may not always be agreement, but honest feedback should always be valued.

## 9.3 Summary of Recommendations

A summary of the Guide's recommendations follows but the fundamental activities for removing the barriers to productivity within Planning and Operations can be summarised as:

- Engaging early
- Developing a best practice culture
- Communicating clearly
- Investing in Supervision.

| RECOMMENDATIONS | |
|---|---|
| **Planning and Operations - Introduction** | **Project Management – Initial Processes**<br><br>- Develop a Project Mission Statement<br>- Develop a Risk Management Strategy<br>- Hold a Risk Management Meeting and identify mitigation measures<br>- Develop a SMART, frequent progress report<br>- Define and formalise a Project Execution Plan<br>- Define roles and responsibilities<br>- Identify training needs. |
| **Activity planning** | **Pre-Contract Engagement Stage**<br><br>- Plan for early engagement.<br><br>**Tender Stage**<br><br>- Define project scope<br>- Select appropriate planning software tools<br>- Create a draft Activity Programme.<br><br>**Post Contract Award Stage**<br><br>- Adopt a collaborative approach<br>- Establish Industrial Relations policy<br>- Create a detailed Activity Programme.<br><br>**Execution and Delivery Stage**<br><br>- Implement the Activity Programme, with clear works milestones<br>- Monitor and review Programme data. |

| RECOMMENDATIONS | |
|---|---|
| **Resource planning** | ■ Plan work sequences<br><br>■ Plan good quality welfare facilities, with good access and egress<br><br>■ Plan and implement recruitment strategy<br><br>■ Instigate daily meetings to ensure good lines of communication<br><br>■ Implement suitable time recording system. |
| **Preparing for productive construction**<br>*(continued overleaf)* | **HS&E Planning**<br><br>■ Plan for Health, Safety & Environment needs before work starts<br><br>■ Be proactive, consistent and communicate effectively<br><br>■ Prioritise risks according to level of potential severity.<br><br>**Activity Programme Review**<br><br>■ Review Activity Programme and revise as necessary<br><br>■ Make realistic allowances for downtime stoppages<br><br>■ Utilise graphic representation of data (e.g. Manpower Histogram).<br><br>**Engineering Construction & Quality**<br><br>■ Consider the use of shared service provision<br><br>■ Develop a Constructability Improvement Log<br><br>■ Define and document system limits and test packs<br><br>■ Develop a Quality Programme.<br><br>**Enabling Productivity**<br><br>■ Complete detailed daily allocation sheets recording work done<br><br>■ Include daily/weekly progress in the periodic reporting. |

| RECOMMENDATIONS | |
|---|---|
| **Preparing for productive construction**<br>*(continued from previous page)* | **Preparing for Success**<br>■ Organise and integrate the site and facilities to achieve maximum efficiency<br>■ Ensure a balanced and integrated Project Team<br>■ Ensure collaborative planning with all other trades and Contractors<br>■ Report progress accurately. |
| **Co-ordination of site activities**<br>*(continued overleaf)* | **Ensuring a Safe Site**<br>■ Good behavioural culture<br>■ Targeted safety plans and Risk Assessments<br>■ Review of Risk Assessments and Method Statements<br>■ Appropriate training.<br><br>**Implementing Appropriate Quality Standards**<br>■ Well-documented quality management systems and processes<br>■ Regular quality reviews, including Test and Inspection schedule<br>■ Definition of handover responsibilities.<br><br>**Maximising Resources**<br>■ Availability of documentation, plant and materials<br>■ Access and transport.<br><br>**Implementing Supervision Duties in the Field**<br>■ Effective supervision, leading by example<br>■ Early mobilisation of Supervision<br>■ Building an effective, cohesive and motivated Team<br>■ Establishing a well-communicated reporting structure<br>■ Ensuring good Industrial Relations and people management. |

## RECOMMENDATIONS

| | |
|---|---|
| **Co-ordination of site activities** *(continued from previous page)* | **Ensuring an Engaged Workforce**<br>■ 'One team' philosophy<br>■ Right people for the job<br>■ Good supervision and communication<br>■ Clearly established objectives and expectations. |
| **Continuous performance review** | ■ Review project performance, with the Client where relevant<br>■ Assess shared contributions from all parties<br>■ Identify best practice as a result of lessons learned<br>■ Apply lessons learned in future projects. |

# A. Checklists for Planning and Operations

## A.1. Planning and Operations - Introduction

- ☐ Has a Project Mission Statement been developed?
- ☐ Has a Risk Management Strategy been developed?
- ☐ Has a progress report been developed to SMART principles?
- ☐ Has a Project Execution Plan been defined and formalised?
- ☐ Are roles and responsibilities clearly defined?
- ☐ Have training needs been identified?

## A.2. Activity Planning

- ☐ Has an appropriate engagement methodology been decided on?
- ☐ Has the project scope been defined?
- ☐ Have appropriate planning software tools been selected?
- ☐ Has an Activity Programme been created?
- ☐ Is there a clear Industrial Relations policy?
- ☐ When implementing the Activity Programme, are there clear milestones defined?
- ☐ Have plans been made to monitor and review project data during implementation?

## A.3. Resource Planning

☐ Have work sequences been planned, including breakdown of task activities and supply of materials/equipment?

☐ Have appropriate welfare facilities been planned and resourced?

☐ Has a recruitment strategy been planned, including lead time and procedures for interview and selection?

☐ Are plans in place to ensure clear and effective lines of communication?

☐ Has a suitable time recording system been decided on?

## A.4. Preparing for Productive Construction

☐ Is there clear understanding of the main principles of the Health, Safety and Environment requirements?

☐ Is the Activity Programme accurate and reflective of current circumstances?

☐ Has a Manpower Histogram been developed?

☐ Have Engineering Construction and Quality been appropriately planned for?

☐ Has a Constructability Improvement Log been developed?

☐ Are there complete detailed allocation sheets showing a record of work to be undertaken against plan?

☐ Have the site and facilities been organised and integrated to achieve maximum efficiency?

☐ Is there a balanced and integrated Project Team?

☐ Are there measures in place for reporting progress accurately?

## A.5. Co-ordination of Site Activities

- ☐ Are there detailed site safety plans, Risk Assessments and Method Statements in place? Are they communicated out effectively?

- ☐ Are there well-documented quality management systems and processes, with appropriate manuals? Are they communicated out effectively?

- ☐ Is there a Quality Control Management manual?

- ☐ Are documents/plant/materials ready and available?

- ☐ Is there good site access and transport?

- ☐ Have plans been made for early mobilisation of Supervision?

- ☐ Has consideration been given to ensuring harmonious Industrial Relations?

- ☐ Are there appropriate mechanisms in place to ensure an engaged Workforce?

## A.6. Continuous Performance Review

- ☐ Has a detailed project review been carried out, with the attendance of the Client?

- ☐ Have shared contributions been assessed, analysed and documented?

- ☐ Have best practices been identified?

- ☐ Has a strategy been devised for applying lessons learned?

- ☐ Have the lessons learned been communicated out?

# B. Programme Level Definitions

This appendix explains the different Programme levels (1, 2, 3 and beyond) referred to in the main part of the document.

The picture below gives a view of the main three levels and their meaning:

## Programme Levels



## B.1. Level 1 Programme

Consists of a document containing the project's major activities/deliverables and major milestones, time bound by a start and finish date only.

This document often is only one page and gives a very high level overview of the project. It is usually produced by the Client and often accompanies the tender documentation. It is used by Management and the Client to monitor all aspects of the project.

## B.2. Level 2 Programme

This is an enhanced version of Level 1, usually sufficiently detailed to enable identification of the critical path and critical project interfaces and giving key project dates.

Individual major components of the project deliverables are identified and the stages outlined, e.g. Engineering, Procurement and Construction.

Usually produced by the Contractor and shared with the Client, it is a very useful tool for estimating. Best practice is that this level is jointly owned by the stakeholders and used to reach agreements as to durations and any refinements to scope.

## B.3. Level 3 Programme

All project activities, required resources and costs are identified at individual work package level. (This is often known as a Work Breakdown Structure (WBS).)

All activities are linked, demonstrating inter-dependence and with any float between activities visible.

This is usually produced by the Contractor/s but shared with the Client. In multiple party contracts a master schedule is often held by the Client, with individual contract stakeholders updating their portion on a regular basis. This level is used to monitor progress and identify both short and longer term interfaces and upcoming critical path activities; in most cases it enables contract stakeholders to identify various on-going success criteria (for example, burn rate of resource hours/spend against achieved milestones).

## B.4. Level 4 & 5 Programmes

Sometimes there is a requirement for even higher levels of detail, where Level 4 and Level 5 can be used (for example, short term look-ahead programmes to manage safety interfaces), but this is more often the exception than the rule.

# C. Manpower Histogram

The following picture shows a typical Manpower Histogram, based on number of operatives and duration in weeks.
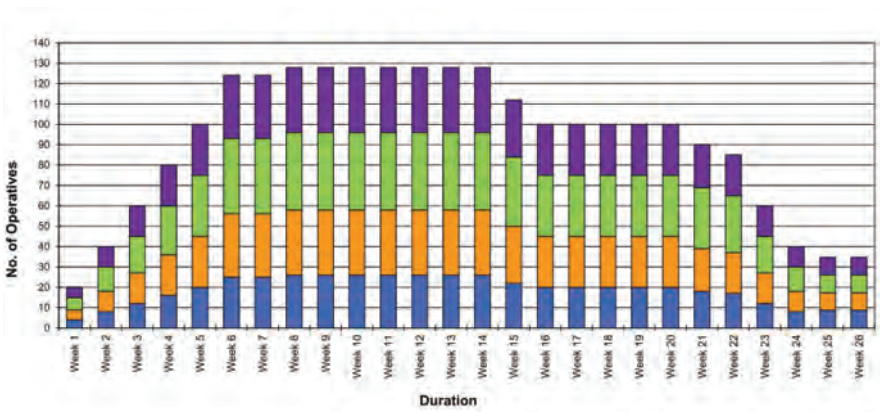


**Note:** The different colours used in the diagram above represent the different trades/activities.

# D. Abbreviations and Acronyms

| Abbreviation | Description |
|---|---|
| CDM | Construction Design and Management |
| CV | Curriculum Vitae |
| ECF | Engineering Construction Forum |
| ECI | Engineering Construction Industry |
| ECIA | Engineering Construction Industry Association |
| EPC | Engineering Procurement and Construction |
| EPIC | ECIA Productivity Improvement Committee |
| HS&E | Health, Safety & Environment |
| IBA | Incentive Bonus Arrangement |
| IR | Industrial Relations |
| ITT | Invitation to Tender |
| KPI | Key Performance Indicator |
| NAECI | National Agreement for the Engineering Construction Industry |
| NCR | Non Conformance Report |
| NDE | Non Destructive Examination |
| PJC | Project Joint Council |
| PPE | Personal Protective Equipment |
| QA | Quality Assurance |
| R&M | Repair & Maintenance |
| REX | Return on Experience |
| SMART | Specific, Measurable, Achievable, Realistic & Timely |
| SPA | Supplementary Project Agreement |
| WBS | Work Breakdown Structure |

# Your Notes

**Acknowledgements**

References to and quotations from relevant sources are included in this document. All quotations are shown in italics and within quotation marks.

**Disclaimer**

Please be aware that nothing contained with this Best Practice Guide should be considered as superseding the National Agreement for the Engineering Construction Industry (NAECI).

ECIA