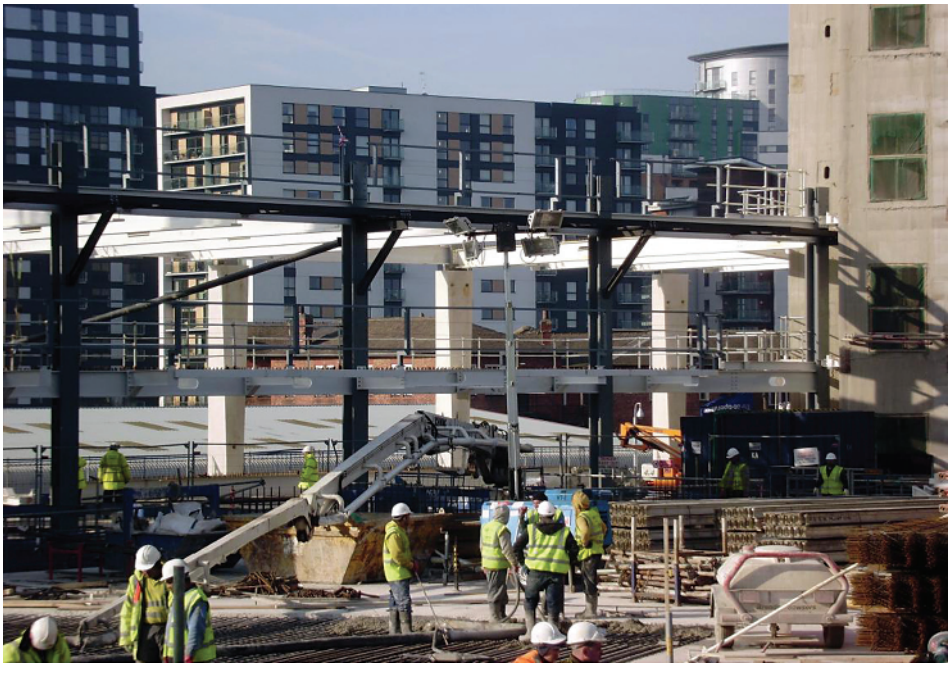
Chapter 1

Organisation of the Construction Process

Contents

Management of Construction Projects, First Edition. Brian Cooke.



1.1 Overview of the size of the companies included in the case studies

The range of construction firms related to the case studies have been categorised as follows, with respect to organisation size.

- Small firm: 1–49 direct employed staff and operatives
- Medium firm: 50–299
- Large firm: 300–1199
- "Big" firm: over 1200

Project 1: Hotel and office – Galliford Try
Project 2: Industrial factory – Pochin Construction
Project 3: Co-operative office – BAM Projects
Project 4: School project – Mansell (Balfour Group)
Project 5: Retail unit / Car Park – Morgan Sindall
Project 6: University refurbishment – Wates Construction
Project 7: Housing project – G. Construction

Company	Direct employees	Project value £M	Size/category
Galliford Try	2500	12.0	Big
Pochin	250	14.0	Medium
BAM	2500	117.0	Big
Mansell	1000	4.0	Large
Morgan Sindall	4000	11.0	Big
Wates Construction	3500	12.0	Big
G. Construction	10	1.0	Small

1.2 Approach to the management of projects included in the case studies

The majority of organisations in the project case studies undertook a functional approach to the management of their projects. BAM, however, indicated in their company data that they have adopted a matrix organisational structure for the management of projects (see later notes on matrix management).

On contracts up to £5 M in value the project manager / site manager was responsible for direct control of the project. They were supported by visiting personnel undertaking the functions of quantity surveying / planning / design team co-ordination and safety management.

On the larger projects, over £10 M in value, all these functions were site based.

A site organisational structure is indicated for each of the projects in the case studies.

The number of permanent site staff is shown, together with the number of visiting personnel.

It is common practice to place a planning engineer and design team co-ordinator on a major project and allow them to service additional smaller projects from the same contract base.

The site planning engineer had often been involved in the project from the tendering stage. Planning responsibilities often include preparation of:

- pre-tender programme
- contract programme
- procurement programme
- programme progress updates during construction
- programming to completion.

In all the programming stages of a contact Power Project or Team Plan was the commercial software package used. Separate notes are included on using linked bar chart software in practice.

In all the case studies, the site based quantity surveyors were under the direct control of a commercial manager based at head office.

On the larger projects, over £10 M, a senior project surveyor and up to two assistant surveyors were engaged on site. The surveying functions undertaken by the team included:

- liaison with the design team co-ordinator
- preparing monthly payment applications
- dealing with variations to contract
- payment to work package contractors
- preparing cost/value reports for senior management (which took at least 10 days per month to report and finalise).

It was noted that project managers were directly involved in the cost/value reconciliation process at each month end. They considered that cost/value analysis was simply a paper exercise to warrant the surveyor's existence. The managers were fully aware that the surveying team would "produce the white rabbit out of the hat" at the appropriate time to save the contract situation. How true this is, from an observer's position!

Headings included on the organisation of the construction process include:

- organisation principles applied to construction firms
- functional relationships and line management
- roles and responsibilities of site management personnel including:
  - project manager
  - site manager
  - planning engineer
  - project surveyor
  - design team co-ordinator
  - site engineer
  - clerk of works

In assessing their roles, consideration has been given to the knowledge requirements and management skills necessary to perform their job successfully.

1.3 Organisation principles applied to construction firms

Cole's *Management Theory and Practice* summarises common forms of organisation structure as being:

- functional organisations
- product based organisations
- geographical/or regional based
- divisional organisations – based on product or regional and having key functions reserved for head office
- matrix organisational structures – see separate example in Section 2.2.

Construction firms often fall into a combination of divisional/regional organisations (with one central head office co-ordinating the regional organisations).

Companies generally operate on a functional basis.

The head office undertakes the following functions, which give support to the various projects:

- estimating (estimating and tendering)
- surveying functions
- administration services
- health and safety function
- human resources services
- contracts (including the planning function)

Construction firms fall into four categories according to the number of direct employees. Government statistics indicate that ninety per cent of firms in the UK fall into the small category (1–49).

An interesting question to pose is to attempt to identify the number of "big construction firms" in your region of the country. Try to identify **ten** construction firms.

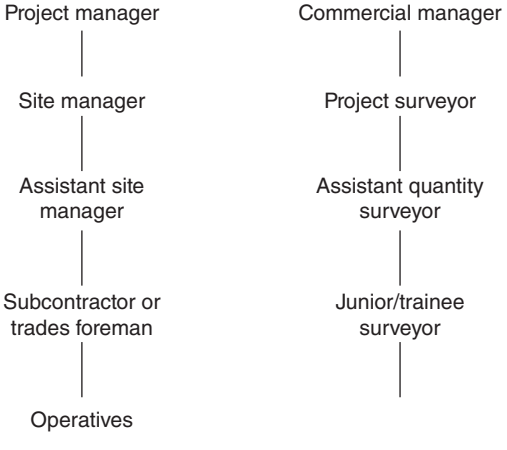
For example, large companies in the North West include:

Laing O'Rouke, Taylor Wimpey, Wates Construction, Bovis, Balfour Beattie, Carillion, Morgan Sindall, Robert MacAlpine.

1.4 Functional relationships and line management

The organisation of a major project is based on functional relationships. Line management allows direct authority over others, which is the essence of a "chain of command" during a construction project. Illustrations and information are passed down the chain and responses communicated back up the chain. Line management provides a two-way communication system.

Examples of line management are illustrated for the site management and surveying functions.



Line management

A construction project is based on controlling site functions such as:

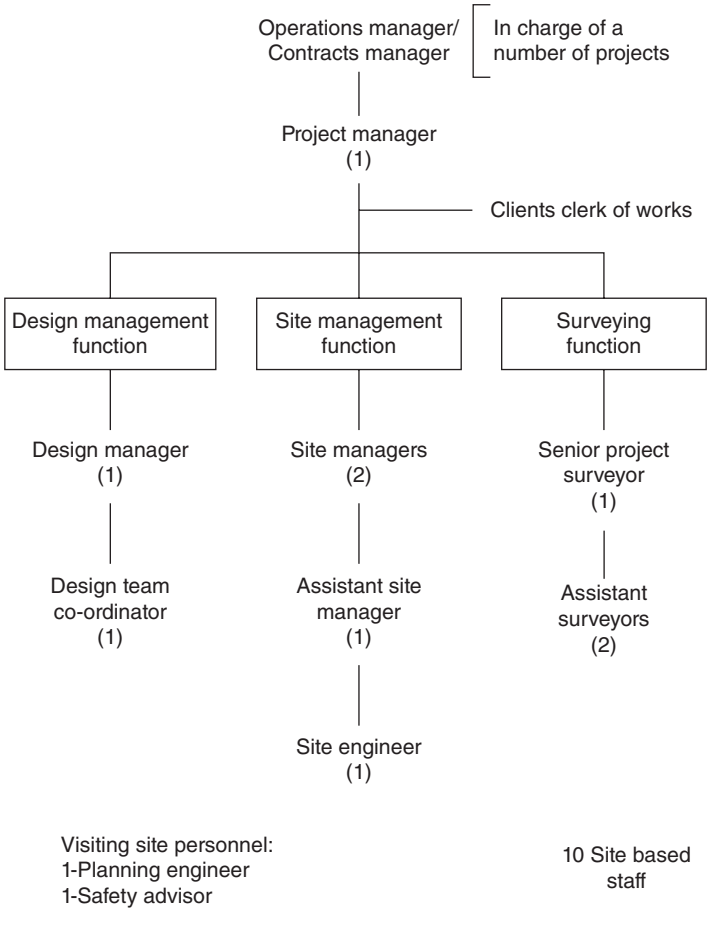
- construction function
- surveying function
- design team function
- planning function.

It is the project manager's role to pull these functions together and develop a competent project team. The development of a united team spirit will often lead to a successful project. Team building within a construction company is essential for the continued success of the business.

Wates Construction aims to develop a team approach to serve specific types of projects and clients.

1.5 Roles and responsibilities of site management personnel

The organisation structure for a £12 M building refurbishment project is shown here. The roles and responsibilities of various site personnel are outlined separately in this section. This will also include the role of the clerk of works. The



three main functions illustrated are design team, site management and surveying. Other functions, such as planning and safety, are provided by visiting site personnel.

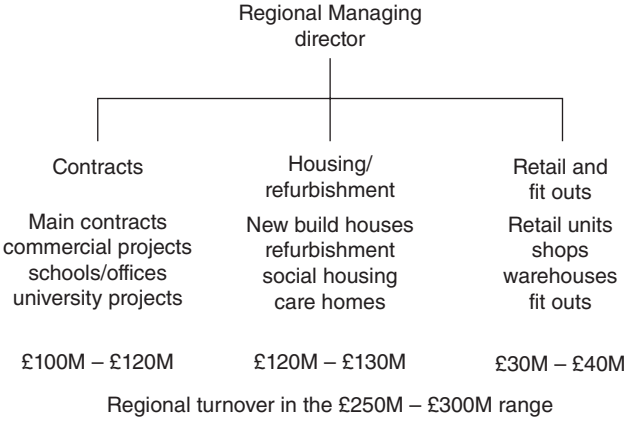
The roles and responsibilities of a range of site management personnel are now outlined.

Organisation structure of a regional contracting organisation

This large organisation is a family-owned business with direct involvement at senior management level. The group incorporates nine regional offices in the UK, including the Midlands, north-west England, Yorkshire and the north-east. The company head office is located in London and has up to 3500 directly employed personnel.

Regional organisation – north-west England

The north-west region operates in three areas of construction activity: main contracting, housing and refurbishment and retailing and interior fit-outs.



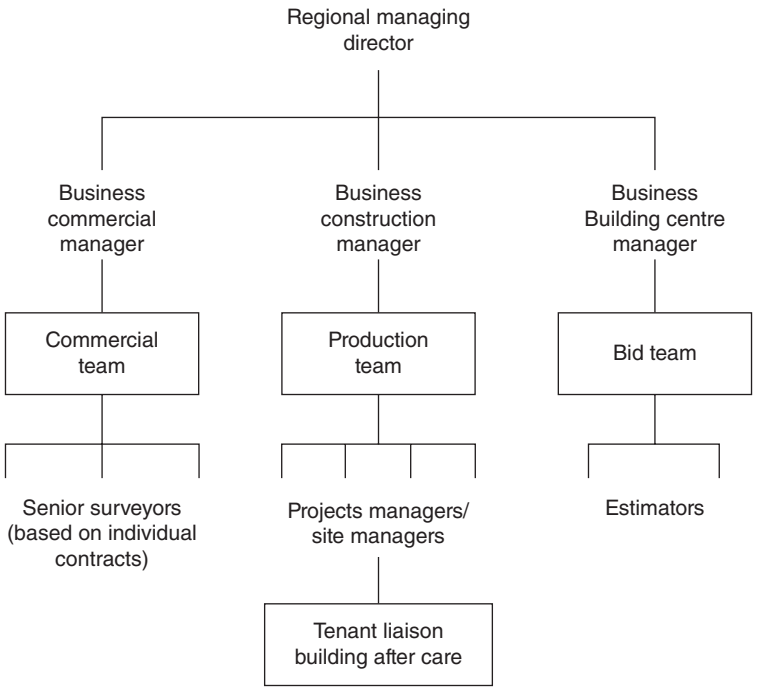
North-west region – overall divisions

Technical services across the region

Estimating and tendering – This is provided within the region as a joint service to each of the three divisions. This is under the control of bid centre manager, and is aimed at tailoring the service to each of the market areas.

Surveying functions – This is under the control of the business commercial manager who allocate an experienced surveying team to each of the specialist areas (main contracts, refurbishment and retail projects).

Likewise the procurement function is managed by a regional procurement manager.



North-west region management structure – refurbishment division

The business construction manager mirrors the role of a contracts manager in a similar organisation (i.e. a manager in charge of a number of contracts or managed by project management personnel.)

The tenant liaison team is necessary on refurbishment projects to liaise with tenants or occupiers and deal with building aftercare, i.e. teething problems after tenants occupy the premises.

Note: This case study is an interesting approach to the management structure of a large contracting organisation operating in three different construction fields within a single region.

The overriding feeling is that it successfully works.

1.6 Background experience and qualifications for construction personnel

Contracts/operations manager

The post of contracts manager is an esteemed position in a contractor's organisation. Dealing fairly with people is an essential feature of their character. Communication skills with clients, senior project managers and site management personnel is essential, but to be liked by **all** is not a trait to admire. Sometimes one has to be feared or disliked to hold the respect of the management.

Project managers

In a construction environment, experience is often more highly regarded than paper qualifications. Routes are available for site and office personnel to join professional institutions such as the Chartered Institute of Building without having studied at a university; this is via the experienced practitioners' routes to membership (MCIOB). Graduate entry is also available after a minimum of three years' experience. Project managers often earn their positions by proof of efficient management on similar value projects. The development of team building is essential for their success in managing projects. Good project managers create construction teams that they carry from one contract to another.

Site managers

Site managers and assistant site managers often have a trade background. "New" site managers with a degree background are usually placed on an in-company training programme. The training programme usually covers a three-year period, after which the manager can apply for MCIOB status (Chartered Building Status).

Site engineers

Many site managers commence their site experience as a site engineer. Background study courses often include an HNC/HND qualification. On completion of a two- or three-year training period, promotion to assistant site manager would be considered the norm.

Project planning engineer

In the role of assistant site manager or site manager, experience is gained in preparing programmes, monitoring progress and writing report. The introduction of computer software based on linked bar charts has revolutionised planning and programming at site level. A manager showing a flair for developing programming skills may ultimately result in the person becoming a planning engineer. An understanding of construction sequences is an essential requirement.

We will now look at the roles and responsibilities of the various levels of management.

1.7 The project manager

Knowledge requirements

- To be familiar with company procedures
- To be familiar with all aspects of the construction process in respect to the management of a project
- To understand the key requirements of the project: planning, controlling and reporting to the contract operations/contracts manager

- To understand the responsibilities to the client or the client's design team and site management personnel
- To have an understanding of the form of contract with respect to the impact of variations, possession, extensions of time and dispute resolution
- To understand procedures when dealing with disputes, especially with regard to subcontractors and suppliers

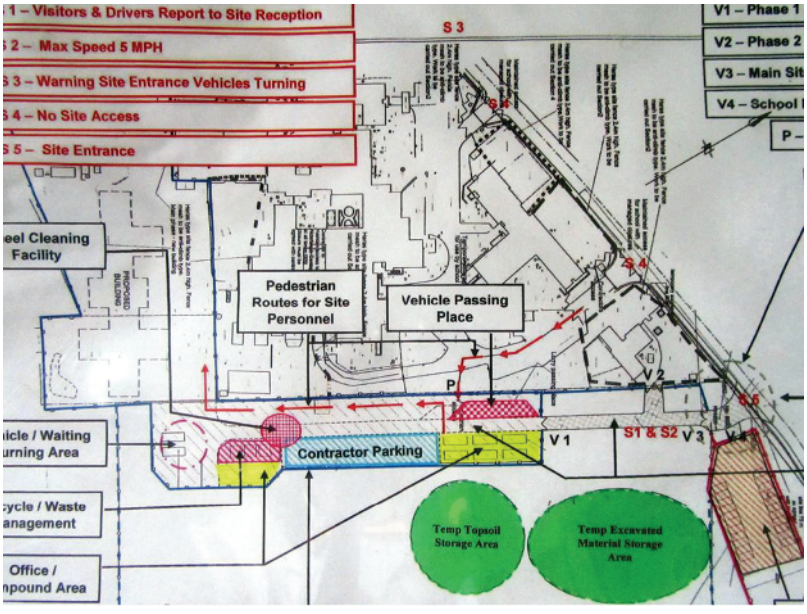
Management skills

- To establish leadership skills when dealing with site management and subcontractor representatives
- To develop a team approach among their site management personnel
- To delegate responsibility to the site management team
- To maintain good site records when reporting on progress and on the contract profitability situation to senior management
- To be proficient in report writing and communications with senior management, site staff, subcontractors and the client
- To implement company procedures and policies
- To act as mentor to immediately subordinate management personnel

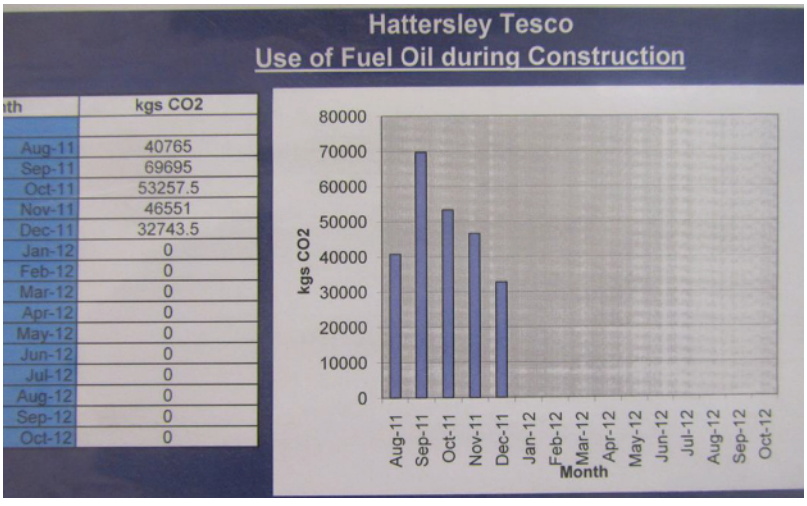
When considering management skills one must consider the application of the seven principles of management: leadership, delegation, organising, communicating, planning, forecasting and control.

Around the project manager's office

Permit board where site personnel can collect daily permits. Display area showing site photographs file and visitors' information.



Site layout plan with key access areas and traffic movement areas. Material storage areas shown.



Environmental display board showing planned and actual water used, electricity and waste management records.

External site progress and photograph area. This is a common feature for a project. Good file management is a necessary requirement of a well-managed office. The use of a daily white-board to highlight key daily tasks.

Office filing system

Daily task whiteboard

DAILY TASK BOARD

MON	TUE	WED	THU	FRI	SAT
Services cut outs - B1.2	Contact P/L S/C	Monthly site meeting	Start drain connection block C	Arrange Tr. lights for monday	Plasterers working
P.M. senior staff meeting	Architect V.Os schedule			Const. director's visit	
Brick delivery sch. required				Building control visit/p.m.	

DAILY HAZARD BOARD

MON	Ready mixed concrete wagons adjacant to lift shaft New safety barriers erected Dismantle south scaffold access tower block B
TUE	Mobile crane unloading steelwork - rear elevation Pedestrian access route changed at S.W. corner of site
WED	Moving plant/lorry access to basement area
THU	Unloading table forms in basement area - moving plant
FRI	

NAME AND SHAME BOARD			
DATE	**LOCATION**	**OCCURANCE**	**SUBCONTRACTOR**
Tue 15th Sept	Drainage work MH 7–9 (rear block 3)	Inadequate support to drainage trenches Barriers failed to be erected at end of day	Evans drainage company
Wed 16th Sept	First floor landing & corridor areas	Work area left in an uncleared state - timber off cuts/ loose timber	B & R joinery
Wed 16th Sept	Perimeter scaffold 2nd floor front elevation	Missing toe boards and handrails to staircase exit (area to be cordoned off) - untill dealt with	HR scaffolding

1.8 The site manager

Knowledge requirements

To be familiar with site procedures.

- To deal with site induction process for own labour and subcontractors and visitors
- To deal with requirements outlined on method statements and risk assessments prior to commencing operations on site
- To keep and maintain site records with respect to progress, contract delays and variations to contract
- To understand contact procedures regarding the issue of permits
- To be computer literate with respect to computerised processes to aid the construction manager – extensive company procedures are transferable from the companies website, e.g. health and safety policy, method statements and risk assessment formats
- To understand basic programme techniques including progress recording

Management skills

- To develop communication skills with operatives and subcontractors when issuing instructions
- To show evidence of computer competency in order to maintain site records and access company procedures
- To show competency in the organisation of subcontractors

- To participate in the planning of work for future site operations, e.g. short-term planning procedures adopted by the company
- To develop leadership skills with reference to assistant site managers and management trainees
- To develop motivation skills by encouraging progression to higher management levels

Site managers are recruited from a wide range of backgrounds. Many will have developed organisational skills at general foreman or supervisor level. Management skills may have been developed by mentoring and by attending in-company training programmes.

1.9 The planning engineer

Knowledge requirements

To develop an understanding of construction sequences and the order of work for various forms of construction, such as concrete frames of steel frames.

- To have an understanding of the various planning and programming techniques used by contractors
- To be familiar with the company's planning software
- To understand the various stages of planning during a project: pre-tender, pre-contract and contract planning stages
- To understand the link between programming and procurement programmes, with respect to work package subcontractors

Note: Planning Engineers normally attend internal company training courses or courses provided by the software specialists, such as Power Project or Asta Developments.

Management skills

- To have good presentation skills
- To assist in the training of others in programming and presentation techniques, including mentoring assistant or trainee planners
- To prepare concise weekly and monthly reports on the contract progress situation
- To have good communication skills with all levels of the management team
- To liaise with the pre-contract team in the programming of work package subcontractors
- To contribute to the meeting when considering project acceleration

The planning engineer may be supervised by a senior planner, and may be responsible for planning and updating programmes on two or more projects . Many planning

departments contain a number of pre-tender planners (dealing with programmes for tenders). Contract planners tend to be located on major large projects and have often been involved in the project since the tender stage.

1.10 The project surveyor

This person is one who has held a similar position on a previous contract. They must be familiar with all aspects of surveying from the tender stage through to the settlement of the final account. Their direct supervisor is the regional commercial manager to whom they are directly responsible, and they are also responsible for reporting directly to the project manager.

Knowledge requirements

- To understand the company's tender, pre-contract and contractual process regarding the appointment of subcontractors and work packages
- To understand the valuation and payment process regarding package contractors and domestic subcontractors
- To be familiar with the company's cost/value reporting process to senior management
- To understand the monthly valuation process
- To be conversant with the form of contract in respect of payment and dispute resolution
- To be familiar with work package subcontractor procedures
- To be familiar with the preparation of dates to subcontractors for an extension of time

Management skills

- To delegate to, and control, the site surveying team
- To co-ordinate with the procurement managers regarding work package contractors and domestic subcontractors
- To provide cost advice to estimators and managers at the tender preparation stage
- To manage the cost/value reconciliation (CVR) process on site
- To report to the project manager and commercial manager on the cost/value position at the end of each month
- To assist in the training programme of their assistant surveyor
- To prepare monthly valuations and manage payments to work package subcontractors

1.11 The procurement manager

The procurement manager may fall under the direction of the project surveyor due to the latter's direct link with the work package subcontractors. As an alternative they may report direct to the project manager.

Knowledge requirements

A knowledge and understanding of

- materials and product availability in the construction market
- types and forms of subcontract
- the interface between work packages
- the tender/bid process
- financial terminology
- warranties, bonds and provisional suns
- the planning process and planning software used by the company
- contract programmes and the effect of delays on work packages

Management skills

- To steer project mangers and commercial staff to correct solutions with regards to work package problems
- To visualise the bigger project picture without getting lost in the detail
- To understand how to analyse market conditions including the marketing business
- To understand business plans
- To negotiate with respect to management skills, tactics and price
- To report to senior management on marketing matters and market trends

The role of the procurement manger differs between the tender, pre-contract and contract stages.

At the tender stage:

- Selection of suppliers and subcontractors to be invited to tender
- Analysis of bids and recommendations to bid manager on suitable subcontractors
- Negotiation with subcontractors to obtain savings and reduce risk
- Evaluation of value engineering options – proposals to reduce price by joint discussion and agreement
- Risk evaluation on the selected subcontractors
- Manage the mid-tender interviews with selected subcontractors
- Check subcontractors' capacity to deliver the packages – consider areas such as current workload
- Consideration to widen the current subcontractors lists and introduce new subcontractors onto tender lists

At the pre-contact stage:

- Final negotiations on cost and value engineering with each subcontract package
- Final subcontract interviews – visit subcontractors' offices and other current projects
- Handover of bid information to operations team, and ensure that any savings and value engineering options are understood by the delivery team

At the contract stage:

- Ensure that all subcontractors are approved by the company
- Promote the company buying code to all subcontractors
- Monitor and track the spending on rebates
- Review and sign off the orders before issuing them to the subcontractor
- Undertake regional overview of subcontractor's performance, and measure and record the key performance index matrix
- Continual review of the robustness of the subcontractor, in terms of financial stability
- Develop the supply chain into new subcontract areas
- Promote the company at "meet the contractor" events throughout the region

1.12 The site engineer

Knowledge requirements

- An understanding of the use and site applications of modern surveying equipment and methods, e.g. electronic distance measuring equipment (EDMs)
- Familiarity with the use of laser levelling equipment
- An ability to read and understand construction drawings
- An understanding of construction sequences: the order of work
- A basic knowledge of construction technology to at least B.Tec or HNC level

Management skills

- To communicate with trades foremen and operatives alike, with respect to setting out procedures
- To maintain accurate site records of setting out procedures by recording data on site layout drawings and in dimension books
- To work as a team with the site manager or foreman and subcontractors on setting out procedures
- To develop organisational skills in the supervision of subcontractors and trade gangs
- To assist in the training of assistant or junior engineers

Many site management trainees commence their site experiences as an engineer or engineer's assistant. The theory and skills they have been taught at a university or technical institution now become a reality – and what a cultural shock it can be.

The site engineer's role

Engineers should be competent at using a wide variety of surveying instruments including those illustrated.

They should understand co-ordinate surveying, which is now the main method of accurate setting out on site.

Familiarity with the engineer's level and laser levelling equipment is necessary. This is in order that he can instruct working foremen how to use the equipment.

They must be capable of keeping the level and dimension book up to date. Their responsibilities often include the training of young inexperienced engineers.

DeWALT laser level

Foreman checking level of foundation concrete/ checking compact stone fill levels using the laser level

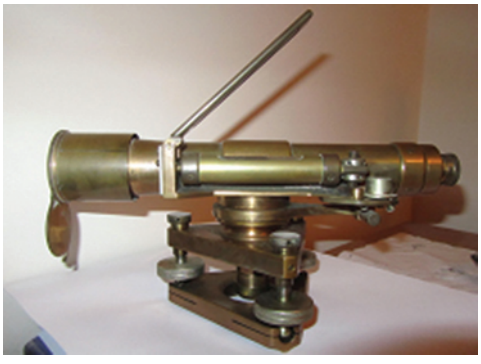
Engineer and foreman setting out pile position from string lines

Freelance engineer setting out on virgin site

Typical surveying equipment

A range of surveying equipment is illustrated. The site engineer must be fully conversant with using the surveyor's electronic level, laser level, theodolite and distance measuring equipment.

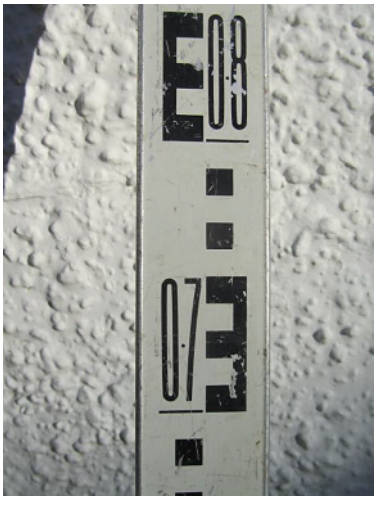
A Pentax laser level in use for foundation work



An original three screw dumpy level

A Leica distance bearing theodolite

A ball and socket quickset level – a Swiss-made Kern instrument



A levelling metric staff

1.13 The clerk of works

These notes have been abstracted from a publication by the Institute of Clerk of Works and Construction Inspectorate – version 2 March 2010.

Main responsibility of the clerk of works

Their main responsibility is to make sure that work is carried out to the client's standards, specification and schedule. In most cases, the specifications are prepared by architects or engineers employed by the client. The clerk of works makes sure that the correct materials and workmanship are used and that the client is given quality work and value for money.

The clerk of works is either on site all the time or at least makes regular visits. They need to be vigilant in their inspections of a large range of technical aspects of the work. This involves:

- becoming familiar with all the relevant drawings and written instructions, checking them and using them as a reference when inspecting the work
- making visual inspections
- taking measurements and samples on site to make sure that the work and the materials meet the specifications and quality standards
- being familiar with legal requirements and checking that the work complies with them
- having a working knowledge of health and safety legislation and highlighting shortfalls observed to the person(s) concerned.

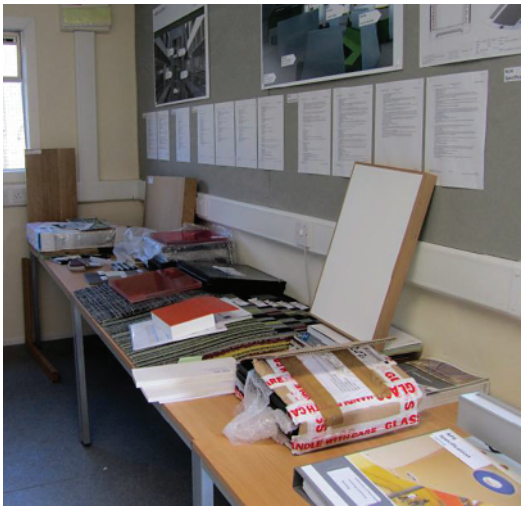
Clerks of works are not only inspectors, but also superintendents. This means that they can advise the contractor about certain aspects of the work, particularly if something has gone wrong. They can also agree to minor changes. However, they cannot give advice that could be interpreted as an instruction, particularly if this would lead to additional expense. Any verbal instructions must be confirmed by the architect.

They keep detailed records of various aspects of the work, which they put together in regular reports to the architect or planner and to the client. Records include details of:

- progress and any delays
- the number and type of workers employed
- weather conditions.

Around the clerk of works office

The clerk of works office is combined with the materials sample display area



Full-scale displays are often provided to indicate the cladding finishes and form of glazing

A wide range of product samples and technical information is on display for reference purposes

Role of the clerk of works

The clerk of works deals with

- visitors to the site
- drawings received
- deliveries
- instructions (see Clause 4 of the JCT Standard Form of Contract)
- details of any significant events, including any serious deficiencies in health or safety performance observed while on site.

The clerk of works liaises closely with contractor's staff. They must, however, maintain their independence, as they are responsible for working in the best interests of their employer or client.

Skills and personal qualities

A clerk of works should:

- have a wide understanding of the building industry, including knowledge of materials, trades, methods and legal requirements
- be physically fit
- have a good head for heights
- be attentive to detail when checking work and materials
- be technically competent
- have good spoken and written communication skills
- be honest and vigilant, to make sure that the work and materials meet the required standard
- be able to establish an appropriate working relationship with the contractor's staff
- be persuasive and diplomatic, while remaining independent
- have good judgement, because they have to decide when to insist on corrections, when to persuade or negotiate and when to compromise
- set an example by acting in a professional manner at all times, including the wearing of personal protective equipment when on a construction site.

Role of the clerk of works

The clerk or works should keep up to date with changes in construction methods and statutory legislation and carry out continuing professional development (CPD)

Member status of the Institute of Clerks of Works is open to those who have successfully achieved one of the following:

- NVQ/SVQ Site Inspection level 4
- A relevant BTEC/SQA higher national award
- A relevant first or higher degree
- Corporate membership by examination of one of the associated professional institutions recognised for exempting qualifications.