

Unit 45: Principles and Applications of Management Techniques in the Construction Industry

Unit code:	L/600/0435
QCF Level 3:	BTEC Nationals
Credit value:	10
Guided learning hours:	60

● Aim and purpose

This unit will enable learners to gain an understanding of the principles and application of site management techniques, and to develop skills in cost management techniques and designing systems for production control.

● Unit introduction

The key to a successful project is a holistic approach to the management of the production phase. This requires an understanding of management principles and their application to a range of activities and operations. Planning, programming, cost control, and the management of sub-contractors and the workforce, are all important aspects of this approach. To do their job successfully and efficiently, and to ensure a satisfactory conclusion to a project, site managers should have knowledge of appropriate tools and techniques and the skills needed to apply these in a variety of situations.

This unit gives learners an introduction to the principles and application of management techniques as they relate to the technical and professional disciplines of construction, civil engineering and building services engineering. Learners will gain an understanding of management principles and the relevance of these principles to managing resources during the production stage of a project. Learners will develop an understanding of the management of construction sites and an appreciation of the interface between management techniques and productivity.

Learners will develop an insight into the importance of management techniques for the overall production process. They will acquire an understanding of the techniques used in quality assurance and workforce and sub-contractor management. Learners will be able to apply cost management techniques and use these techniques to control production.

The unit also provides learners with a sound basis for learning how to manage more complex projects at a higher level of study.

● Learning outcomes

On completion of this unit a learner should:

- 1 Understand modern principles of management
- 2 Understand the application of construction site management techniques
- 3 Be able to apply cost management techniques
- 4 Be able to design systems for production control.

Unit content

1 Understand modern principles of management

Principles of management: forecasting; planning; organising; motivating; controlling; coordinating; communicating; theories of Fayol and McGregor

Applications: site management; progress monitoring; sub-contractor liaison; programmes of work

2 Understand the application of construction site management techniques

Manage sub-contractors: communication; insurances; inspection; supervision; retention of money and remedial works

Assure quality: sampling; testing of materials and workmanship; audit and inspection, statutory liaison

Manage the workforce: recruitment; training and assessment of competence of workforce; equal opportunities; individual and group motivational needs; leadership; concepts of team behaviour

3 Be able to apply cost management techniques

Managing cost: techniques (variance analysis; unit costing; marginal costing); variable costs; estimated costs; target costs; actual costs

Cost information: estimated cost; actual cost; profit; return cost; cash flow

4 Be able to design systems for production control

Measurement of progress: physical progress; financial progress; site returns; payments; claims and variations; review events

Programme of activities: bar charts; linked bar charts; network analysis; precedence diagrams; line of balance; time-change diagrams

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 explain the principles and applications of modern management [IE4, CT5, SM2]	M1 differentiate between the techniques used to manage the workforce and the techniques used to manage sub-contractors	D1 evaluate the techniques used to assure compliance with statutory requirements during the production stage of a project
P2 describe the techniques used to manage sub-contractors during the production stage of a project [IE4, CT5, SM2]		
P3 describe the techniques used to assure quality on a construction site [IE4, CT5, SM2]		
P4 explain the techniques used to manage the workforce during the production stage of a project [IE4, CT5, SM2]		
P5 explain the guidelines for managing cost during the production stage of a project [IE4, CT5, SM2]	M2 compare the usefulness of different forms of costing systems	D2 evaluate how remedial action is implemented in the case of a mismatch between planning and progress.
P6 produce cost information from given data [IE4, CT5, SM2]		

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<p>P7 explain how progress is measured [IE4, CT5, SM2]</p>	<p>M3 compare two different programming techniques in terms of their application and flexibility.</p>	
<p>P8 develop a programme of activities. [IE4, CT5, SM2]</p>		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills which are embedded in the assessment of this unit. By achieving the criteria, learners will have demonstrated effective application of the referenced elements of the skills.

Key	IE – independent enquirers CT – creative thinkers	RL – reflective learners TW – team workers	SM – self-managers EP – effective participators
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Essential guidance for tutors

Delivery

It is recommended that this unit be delivered at a later stage of any programme when learners have completed the unit *Project Management in Construction and the Built Environment*.

Tutors delivering this unit have opportunities to use a wide range of techniques. Lectures, discussions, seminar presentations, site visits, supervised practical activities, research using the internet and/or library resources and use of personal and/or industrial experience are all suitable. Delivery should stimulate, motivate, educate and enthuse learners. Visiting expert speakers could add to the relevance of the subject.

Learners should be encouraged to read an appropriate range of textbooks and library/internet source material relating to the unit content and industry activity. Overall delivery of the unit should be supported by the use of case studies and visual media, where appropriate, including real construction programmes, site data or contractors' annual books, photographs, videos, DVDs and drawings to demonstrate the techniques used in production management.

The first two learning outcomes are interlinked. Learning outcome 1 allows for a range of management 'pioneers' and 'thinkers' to be studied in order to develop underpinning knowledge of the principles of management. Learning outcome 2 develops an understanding of the application of these techniques to manage the workforce and sub-contractors and to assure quality on site. Learners should be encouraged to develop their knowledge and understanding of the recognised management principles and 'thinking'. Case study material should also be available to reinforce management concepts.

Learning outcome 3 is designed to help learners understand and apply cost management techniques. The emphasis should be on the accepted concept that there are no hard and fast rules to managing cost. Industrial practices vary a great deal and it is important for learners to have a deep understanding of techniques and approaches.

Learning outcome 4 is designed to help learners understand programming techniques and how these are used to monitor and control activities or tasks at the production stage. The emphasis should be on fit-for-purpose techniques.

Group activities are permissible, but tutors will need to ensure that individual learners have equal experiential and assessment opportunities.

Health, safety and welfare issues are paramount and should be reinforced through close supervision of all workshops and activity areas, and risk assessments must be undertaken before practical activities are taken. Centres are advised to read the *Delivery approach* section in the specification, and *Annexe H: Provision and Use of Work Equipment Regulations 1998 (PUWER)*.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment

Introduction to the unit

Tutor delivery: introduction and history, management theories (Fayol, McGregor), systems approach, information processing approach

Class discussion: role of manager, leadership and management, how to manage

Tutor delivery: Fayol's principles of management

Class discussion: application to production phase of a project

Learner activity: group presentation on a specific area of application

Class discussion: role of sub-contractors in a project

Tutor delivery: management of sub-contractors, tender lists, selection, communication and specification, management of sub-contractors: insurance requirements, retention money and remedial works

Class discussion: what is quality and quality assurance?

Tutor delivery: quality assurance on site: materials and workmanship, audit and inspection, statutory requirements: environmental issues, notifications under CDM, approvals, liaising with local authorities and others

Class discussion: management of workforce

Tutor exposition: management of workforce: recruitment, equal opportunities, assessment of competence, training and development

Tutor delivery: individual and group motivational needs – Maslow

Learner activity: team behaviour – Belbin's personalities game

Assignment 1: Management Techniques

Introduction to cost management

Tutor delivery: cost management, significance and value, important concepts such as estimated, target and actual costs, profit, return cost and cash flow

Class discussion: sources of cost information

Tutor delivery: use of site and other data to extract cost information

Learner activity: measure cash flow, profit, return cost and value using site or other form of data, techniques and systems: job and process costing, traditional and activity-based costing, variance analysis, unit and marginal costing, variable costs

Learner activity: group presentation on a cost management system and/or technique

Topic and suggested assignments/activities and/assessment

Tutor delivery: introduction to production control

Class discussion: work breakdown structures (WBS)

Tutor delivery: programming techniques: bar charts, linked bar charts, network analysis

Class exercise: bar charts and network analysis

Tutor delivery: programming techniques: precedence diagrams, line of balance, time-change diagrams

Class exercise: precedence diagrams, line of balance and time-change diagrams

Learner activity: group presentations on application of programming techniques

Tutor delivery: progress measurement techniques: physical and financial progress, site returns, payments, claims and variations, review events

Class discussion: mismatch between programme and progress: 'what-if' scenarios (examples from industry) and possible solutions

Assignment 2: Cost Management and Production Control

Review of unit delivery and assessment

Assessment

Evidence for this unit may be gathered from a variety of sources, including well-planned investigative assignments, case studies or reports of practical assignments.

There are many suitable forms of assessment that could be used, and centres are encouraged to consider and adopt these where appropriate. Some example assessment approaches are suggested below. However, these are not intended to be prescriptive or restrictive, and are provided as an illustration of the alternative forms of assessment evidence that would be acceptable.

Some criteria could be assessed directly by the tutor during practical activities. If this approach is used, suitable evidence would be observation records or witness statements. Guidance on the use of these is provided on the Edexcel website

The structure of the unit suggests that the grading criteria could be addressed fully by using two assignments. The first of these would cover P1, P2, P3, P4, M1 and D1 and the second P5, P6, P7, P8, M2, M3 and D2.

To achieve a pass grade learners must meet the eight pass criteria listed in the grading criteria grid.

For P1, learners must explain the principles and applications of modern management. They should investigate management theories of founders and pioneers such as Fayol and McGregor, and provide an overview of their application to modern day practice. Evidence could be in the form of a report.

For P2, learners must describe the techniques used to manage sub-contractors during the production stage of a project. They should demonstrate an understanding of the role of a sub-contractor and appropriate techniques used to manage them. Learners should work on a tutor brief and/or a case study drawn from industry practice. Emphasis should be on a logical presentation of ideas and solutions. Evidence could be in the same format as for P1.

For P3, learners must describe the techniques used to assure quality on a construction site. They should demonstrate an understanding of the concept of quality and statutory obligations. They should also be able to demonstrate how appropriate techniques, such as supervision, audits and inspections, can assure quality of materials and workmanship. Learners should work on a tutor brief and/or a case study drawn from industry practice. Emphasis should be on a logical presentation of ideas and solutions. Evidence could be in the same format as for P1.

For P4, learners must explain the techniques used to manage the workforce during the production stage of a project. They should demonstrate an understanding of the important aspects such as recruitment, equal opportunities, assessment of competence and training/development. They should also be able to demonstrate an understanding of motivational needs, issues with teamwork and how a team leader can overcome these. Learners should work on a tutor brief and/or a case study drawn from industry practice. Emphasis should be on a logical presentation of ideas and solutions. Evidence could be in the same format as for P1.

For P5, learners must explain the guidelines for managing cost during the production stage of a project. They should demonstrate an understanding of the role of the basic concepts and appropriate techniques used to manage cost. Learners should work on a tutor brief and/or a case study drawn from industry practice. Emphasis should be on a logical presentation of ideas and solutions. Evidence could be in the same format as for P1.

For P6, learners must produce cost information from given data. Cost information should include estimated, target and actual costs, profit, return cost and cash flow. Data can be drawn from a number of sources such as site returns and contractors' annual books. Emphasis should be on a logical presentation of the work. Evidence could be in the form of a report supported with calculations and/or annotations.

For P7, learners must explain how progress is measured. They should demonstrate an understanding of the link between physical and financial progress and the tools and/or techniques available to measure these. Learners should work on a tutor brief and/or a case study drawn from industry practice. Emphasis should be on a logical presentation of ideas and solutions.

For P8, learners must develop a programme of activities. This should be carried out using at least two different methods one of which should be precedence diagrams. Learners should work on a tutor brief and/or a case study drawn from industry practice. Emphasis should be on a logical and clear presentation of solutions. Evidence could be in the same format as for P6.

To achieve a merit grade learners must meet all of the pass grade criteria and the three merit grade criteria.

For M1, learners must differentiate between the techniques used to manage the workforce and the techniques used to manage sub-contractors. This should build on the evidence for P2 and P4.

For M2, learners must compare the usefulness of different forms of costing systems. This can be an extension to P5. Learners should work on a tutor brief and/or a case study drawn from industry practice. Emphasis should be on logical and structured presentation of the solutions. Evidence could be in the form of a report referring to the given brief or case study as appropriate.

For M3, learners must compare two different programming techniques in terms of their application and flexibility. The application of techniques can be an extension of P7 while flexibility can be an extension to P8. Emphasis should be on a logical and structured presentation. Evidence can be in the form of a report supported by appropriate examples or case studies.

To achieve a distinction grade learners must meet all of the pass and merit grade criteria and the two distinction grade criteria.

For D1, learners must evaluate the techniques used to assure compliance with statutory requirements during the production stage of a project. These should include requirements relating to the environment, health, safety and welfare, local authorities and others as relevant. Learners should work on a tutor brief and/or a case study drawn from industry practice. Emphasis should be on a logical and structured presentation. Evidence could be in the form of a report referring to the relevant statutory instruments.

For D2, learners must evaluate how remedial action is implemented in the case of a mismatch between planning and progress. This can be an extension to M2. Learners should work on a tutor brief and/or a case study drawn from industry practice. Emphasis should be on a logical and structured presentation of the solutions. Evidence could be in the form of a report referring to the given brief or case study as appropriate.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, P4, M1, D1	Management Techniques	You are working as an assistant contracts manager with a national housing contractor. Your line manager has asked you to produce an induction pack for site management staff so that they can gain understanding and knowledge of the principles and techniques of management.	A report containing a description of management techniques and their application to managing the workforce and sub-contractors and to assuring quality on site.
P5, P6, P7, P8, M2, M3, D2	Cost Management and Production Control	You are working as an assistant quantity surveyor with a national housing contractor. A number of trainee site managers have recently joined the company. You have been asked to extend the work already done on a training pack. This is to include cost management techniques and the programming and progress measurement techniques used in site management.	A report containing a description of the cost management techniques and calculations used to extract cost information from the given data, and the programming and progress measurement techniques in common use on site.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Construction and the Built Environment sector suite. This unit has particular links with the following unit titles in the Construction and the Built Environment suite:

Level 1	Level 2	Level 3
		Health, Safety and Welfare in Construction and the Built Environment
		Construction Technology and Design in Construction and Civil Engineering
		Building Technology in Construction
		Project Management in Construction and the Built Environment

This unit links to the Edexcel Level 3 NVQ in Technical Design (Construction Environment), the Edexcel Level 3 NVQ in Construction, Plant and Equipment Supervision, the Edexcel Level 4 NVQ in Site Inspection and the Edexcel Level 4 NVQ in Construction, Plant and Equipment Management. It also has links to the following National Occupational Standards at Level 3:

- BE Design
- BE Development and Control
- Construction Contracting Operations
- Construction Plant and Equipment Supervision
- Construction Site Supervision
- Surveying, Property and Maintenance
- Transportation.

Essential resources

Learners should have access to a range of industrial data such as site returns and contractors' annual books. They should also be given some real world examples of case management. An input from current practitioners would also reinforce learning.

A set of construction drawings, a site layout plan, a construction programme, cost data and other relevant schedules for a typical project should also be available.

Employer engagement and vocational contexts

The use of vocational contexts is essential in the delivery and assessment of this unit. Much of the work can be set in the context of case studies of local employers. Learning outcomes 3 and 4 lend themselves well to investigating industrial practices.

Support to enable centres to initiate and establish links to industry, and to networks arranging visits to industry and from property practitioners is given below:

- Learning and Skills Network – www.vocationallearning.org.uk
- National Education and Business Partnership Network – www.nebpn.org
- The Royal Institution of Chartered Surveyors – www.rics.org
- Work Experience/Workplace learning frameworks – Centre for Education and Industry (CEI University of Warwick) – www.warwick.ac.uk/wie/cei/

Indicative reading for learners

Textbooks

Cooke B and Williams P – *Construction Planning, Programming and Control* (Wiley Blackwell, 2009)
ISBN 1405183802

Fryer B – *The Practice of Construction Management* (Palgrave Macmillan, 2003) ISBN 0333968786

Harvey R and Ashworth A – *The Construction Industry of Great Britain* (Butterworth-Heinemann, 1993)
ISBN 075060350X

Oxley R and Poskitt J – *Management Techniques Applied to the Construction Industry* (Blackwell Science, 1996)
ISBN 0632038624

Journals

The Builder – Hanley Wood

Construction News – Emap

Website

www.ciob.org.uk Chartered Institute of Building

Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS opportunities that have been included within the assessment criteria of this unit:

Skill	When learners are ...
Independent enquirers	producing cost information by analysing data comparing programming techniques evaluating usefulness of costing systems
Self-managers	organising time and resources and prioritising actions when producing programme of activities
Creative thinkers	trying out alternatives or new solutions and following ideas through when proposing remedial actions due to a mismatch between plan and progress.

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Creative thinkers	connecting their own and others' ideas in application of management techniques
Team workers	doing group presentations
Self-managers	using standard methods to plan and programme .

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	preparing reports and presenting results of their research/analysis
Bring together information to suit content and purpose	producing programme of activities
Present information in ways that are fit for purpose and audience	presenting calculations, proposals and solutions to deal with production issues
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	producing cost information
Identify the situation or problem and the mathematical methods needed to tackle it	evaluating costing systems
Select and apply a range of skills to find solutions	producing a programme of activities
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	discussing leadership and management styles
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	evaluating different forms of costing systems
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	explaining application of management techniques to manage the workforce.