Unit 46: Tendering and Estimating in Construction

Unit code: F/600/0397

QCF Level 3: BTEC Nationals

Credit value: 10

Guided learning hours: 60

Aim and purpose

This unit will give learners the opportunity to develop knowledge of the information needed to produce a tender, an understanding of how different types of tender documentation are used, and to develop skills needed to calculate unit rates for an element or trade section of a bill of quantities and produce a tender.

Unit introduction

Successful and profitable construction companies require estimators who are commercially aware, highly skilled and pay close attention to detail. The estimator produces an estimate of project cost to enable the company to submit a tender after the decision has been made on the amount of profit to add to the project. This decision is based on the company's required return whilst taking into account their current workload and advance order book, level of risk associated with the project, the current and future market conditions, and the perceived workload or current order book of competitors who may also tender for the project.

Learners will develop an understanding of tendering procedures from receipt of the tender documentation through to submission of the final tender. This encompasses the initial inspection of the documents, inspection of the site, risk analysis, materials and sub-contract enquiries, calculation of analytical unit rates, pricing of the bill of quantities and the tender adjudication meeting. Learners will become aware of the need to work with great accuracy as any errors could lead to financial losses or an unsuccessful tender.

Estimating is an integral part of the tendering process. It is an extremely vibrant and dynamic field of work that requires the estimator to work to tight deadlines as the tender submission date approaches. Estimators gain great satisfaction and pride from the accuracy of their estimates and their assessment of commercial market conditions. Estimators and quantity surveyors require similar skills and knowledge and, in smaller construction companies, the roles are often combined.

After completing this unit learners will be able to build up analytical unit rates and apply them to tender documentation in order to produce a tender for construction work, taking into account the commercial decisions to be made in arriving at a tender sum.

Learning outcomes

On completion of this unit a learner should:

1 Know the basic information needed to produce a tender

2 Understand how to use different types of tender documentation

3 Be able to calculate unit rates for an element or trade section of a bill of quantities

4 Be able to produce a tender for a specific construction trade or element.

Unit content

1 Know the basic information required to produce a tender

Information: tender documentation; contract terms and conditions eg form of contract, contract period, commencement date, fixed or fluctuating price, liquidated and ascertained damages, retention percentage, defects liability period; type of documentation eg bills of quantities, drawings and specification, design and build, schedule of rates; inspection of drawings; site investigations; information to collect during site visit; materials and sub-contract enquiries; labour constants; coverage rates; standard method of measurement (SMM) coverage rules; all in labour rates; company overheads; desired return; risk factors

2 Understand how to use different types of tender documentation

Tender documentation: types; sections; methods of measurement

Types: bill of quantities; drawings and specification; design and build; schedule of rates

Sections: preliminaries; preambles; measured work; day works; prime cost sums; provisional sums and contingencies

Method of measurement: SMM7; CESMM; measurement and coverage rules

3 Be able to calculate unit rates for an element or trade section of a bill of quantities

Unit rates: material price, delivery or offloading costs; coverage rates; waste allowance; plant hire charges; labour constants and all in labour rates; the addition of the appropriate overhead percentage; checking procedures; use of ICT-based estimating packages (both non-specialist and industry specific)

4 Be able to produce a tender for a specific construction trade or element

Final tender: pricing the bill of quantities measured work sections; pricing of preliminaries; completion of PC and provisional sums; risk, commercial factors and strategies to convert the estimate into a tender sum; procedures used in receiving and opening tenders; post-tender pre-contract procedures

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 describe the information an estimator needs in order to produce a tender [IE1, IE4]	**M1** analyse how contract terms and conditions impact on the estimating process and on tender decisions	
P2 compare the different types of tender documentation used within the construction industry [IE1, IE2, IE4]		
P3 select appropriate data for use in the production of unit rates [IE1, IE6]	**M2** explain why different waste percentages are used in the calculation of unit rates	
P4 produce unit rates for an element or trade section of a bill of quantities [IE4, SM3]	**M3** explain how small errors within the unit rate calculations can lead to much larger errors in the final tender sum	**D1** evaluate the benefits of using standard and specialist software packages for estimating purposes
P5 apply unit rates to the bill of quantities and price preliminary items to make a commercial decision on the final tender sum. [IE1, IE4, IE6, TW5, SM2, SM3, SM4]	**M4** assess the commercial and risk factors that need to be considered when completing a tender.	**D2** evaluate how different types of tender documentation and contract conditions affect the level of commercial risk.

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	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

Tutors delivering this unit have opportunities to use a wide range of techniques. Lectures, discussions, seminar presentations, 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 taught the estimating process from receipt and initial inspection of tender documents through to the final decision on the tender sum, taking into account commercial and risk considerations. A major part of this process will include the development of skills in the 'build up' or production of analytical unit rates from first principles. Learners should be given ample opportunities to practise these skills and receive formative feedback from their tutor.

Learners could use traditional paper-based methods of estimating, or develop spreadsheets using standard ICT packages, to produce the unit rates. Additionally, learners should gain experience in pricing preliminaries and prime cost and provisional sums sections of the bills of quantities.

There are many opportunities for class discussion and role play because initial team meetings, site meetings and tender adjudication meetings could be replicated within the classroom environment. Additionally, potential sites could be visited to consider potential risks and allow group discussions on the relative merits of different sites and the impact on commercial decisions relating to the final tender sum.

In order to engage learners, delivery should, as far as possible, be applied to real-life commercial situations within the construction industry. These situations may refer to ongoing, current construction projects or could be based on contextualised scenarios provided by the tutor. Learners should, wherever possible, be able to examine and evaluate tender documentation from live projects.

Learners should be provided with a database of information including material prices, coverage rates, waste percentages, labour constants, all in labour rates and overhead and profit percentages. As learners are all using the same information, there will be a theoretical 'correct answer' which can be disclosed to learners on completion of their estimate. This will allow them to reflect on and evaluate their experience. The assignment could be developed as a competitive tender between learners adding an element of competition to the completion and submission of the tender.

Group activities are permissible, but tutors will need to ensure that individual learners have equal experiential and assessment opportunities. This could be achieved by breaking down a bill of quantities so that each learner prices a different trade section or element, but each learner would then have to work independently on the pricing of a preliminaries section.

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 unit structure and programme Tutor input – what are estimates and tenders? Independent learner research into the tendering process
Visiting speaker and/or visit to a contractor's office to contextualise the unit
Tutor input – contract terms and conditions and their impact on the tender Individual learner research into standard forms of contract Focused micro-teaching – JCT standard forms of contract Investigation into contract terms and conditions Experiential exercises on forms of contract
Types of tender documentation Tutor input – types of tender documentation Class discussion Experiential exercises on tender documentation
Research and investigation into the information required to produce a tender Focused microteaching as identified with cohort Class discussions Experiential exercises on information
Bills of quantities (BOQ) Examination of bills of quantities Tutor input – methods of measurement Class discussions Experiential exercises on measurement techniques
Assignment 1: Tender Information and Documentation
Calculation of unit rates Tutor input – unit rate production Experiential exercises on unit rates Evaluation of outcomes
Use of ICT Independent guided research Spreadsheet use and development Class discussions Experiential exercises

Topic and suggested assignments/activities and/assessment
Assignment 2: Estimating
Production of a tender Class discussions – commercial risk and other factors Role play – tender adjudication meeting Experiential exercises
Estimating and tendering Calculation of unit rates Completion of the tender
Assignment 3: Producing a Tender
Unit review and assessment feedback

Assessment

Evidence for this unit may be gathered from a variety of sources, including well-planned investigative assignments, case studies and answers to oral questioning.

There are many suitable forms of assessment that could be used and tutors 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 can be assessed directly by the tutor during practical activities. If this approach is used, then suitable evidence would be observation records or witness statements.

The structure of the unit suggests that the grading criteria could be addressed fully by using one integrated assignment covering the tender process from initial inspection of the tender documents through to the final decision on the tender sum, taking into account commercial and risk factors. This can be broken up into three smaller assignments if this helps learners to schedule their workload.

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

For P1, learners must describe the information the estimator needs in order to produce a tender. This should include material prices, waste percentages, coverage rates, labour constants, all in labour rates, overhead and profit percentages, pricing information for preliminary items, site location and layout information, risk analysis and commercial intelligence. Evidence could be in the form of a technical report or a presentation.

For P2, learners must compare the different types of tender documentation used within the construction industry. This should include two of the following: bills of quantities, drawings and specifications, schedule of rates, and design and build. Examples of suitable evidence approaches could be as for P1.

For P3, learners must select appropriate data for use in the production of unit rates. This will be evidenced by the unit rate calculations which require learners to select the correct material price, coverage rates (where applicable), waste percentages, labour constants, all-in labour rates, plant and power tools (where applicable), and apply overheads and profit. The correct selection of data will have an impact on the accuracy of the unit rate calculations.

For P4, learners must produce unit rates for an element or trade section of a bill of quantities. This is evidenced by unit rate calculation sheets or spreadsheets developed by each learner in producing the estimate. The accuracy of the unit rates learners produce can be assessed by comparing them with the unit rates produced by the tutor using the same data as given to learners.

For P5, learners must apply unit rates to the bills of quantities, price preliminary items and make a commercial decision on the final tender sum. Evidence for this will be the completed priced bills of quantities and the final tender sum. Additionally, a brief report or presentation would provide evidence of the commercial decision made before arriving at a final tender sum.

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

For M1, learners must analyse how contract terms and conditions impact on the estimating process and on tender decisions. Learners will need to consider contract terms such as contract period, liquidated and ascertained damages, fixed or fluctuating price, defects liability period, as they impact on the level of commercial risk that applies to the tender decisions. Evidence for this could be a technical report or a presentation.

For M2, learners must explain why different waste percentages are used in the calculation of unit rates. Here learners could consider historical cost data, fragility of materials, amount of cutting required, modularity of materials, potential loss or theft, the impact of minor damage on the potential use of the material, etc. Evidence for this could form part of a technical report or presentation.

For M3, learners must explain how small errors within the unit rate calculations can lead to much larger errors in the final tender sum. Learners will need to consider how the application of coverage rates, addition of percentages for waste, overheads and profit, and the quantities in the bills, can compound small errors and impact on the final tender sum. Evidence for this could form part of a technical report or presentation.

For M4, learners must assess the commercial and risk factors that need to be considered when completing a tender. This could include current workload, capacity, site location, local issues, crime risk, competition, weather, contract terms and conditions, etc. Evidence for this could form part of a technical report or presentation.

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 are required to evaluate the benefits of using both standard and specialist software packages for estimating within the construction industry. Learners will need to conduct independent research and use office visits, or other contact with industry, in order to fully understand and be able to evaluate the use of specialist ICT packages. Evidence for this could form part of a technical report or presentation.

For D2, learners are required to evaluate how different types of tender documentation and contract conditions affect the level of commercial risk. This could build on the evidence provided for M4, as learners evaluate the impact of different forms of tender documentation and contract conditions on commercial risk. Evidence for this could form part of a technical report or presentation.

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, M1, M2	Tender Information and Documentation	As a training officer for a large construction company you have been asked to provide a guide for trainee estimators. This must refer to the information needed to perform estimating and tendering procedures and the documentation used in such procedures.	A manual or guide to estimating and tendering procedures. This should include text, sample documentation and calculations as appropriate.
P4, M3, D1	Estimating	As an estimator you are required to produce unit rates to be used in a bill of quantities.	Completed unit rate calculations Completed bills of quantities.
P5, M4, D2	Producing a Tender	As above but you are required to apply unit rates to the bill of quantities and price preliminary items to make a commercial decision on the final tender sum. This must take into account both commercial and risk factors.	Final tender to include tender decisions and technical reports.

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
		Measuring, Estimating and Tendering Processes in Construction and the Built Environment
		Economics and Finance in Construction and Civil Engineering
		Design Procedures in Construction

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 Construction, Plant and Equipment Management and the Edexcel Level 4 NVQ in Site Inspection. It also has links to the following National Occupational Standards at Level 3:

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

This unit provides a sound basis for study of similar units at Higher National and degree level.

Essential resources

Learners should have access to a library, journals, digests and database material as part of their self/directed study. Access to IT equipment is required for estimating packages.

Employer engagement and vocational contexts

The involvement of industry is essential to the establishment of a real world context within the delivery of the course content. Most medium to large construction companies are actively seeking links with schools and colleges, especially with a view to recruiting trainees and future graduates. Centres should actively seek links with such companies, and establish what form of help they will be able to provide. Links or assistance could include:

- visiting speakers to promote recruitment onto the BTEC programme
- possible sponsorship of the centre's construction programme
- provision of exemplar documentation or resources
- provision of cost data or information
- loan of or assistance with specialist equipment or ICT access
- assistance with the development of links with other sources of help, including material suppliers, architects, clerk of works consultancies, trade associations, consultants, etc.
- sponsorship of individual learners and direct recruitment onto modern apprenticeships and training schemes
- the provision of focused site or office visits and/or sector-related work experience
- access to visiting speakers who will put learning into an industrial context. Specific content level and expected outcomes will need to be discussed in advance
- commentaries on the production of estimates and tenders.

Whilst site and office visits will aid learners' general awareness and perceptions of site and office-based construction activities, it is nevertheless essential that all visits have a specific focus. Preparation and follow-up activities should be prepared and discussed with the company well in advance of the visit. It will probably be necessary to have copies of drawings or other documentation in advance of the visit. Suitable activities could include:

- an investigation into the application of labour constants
- an investigation into the methodologies used for estimating and tendering
- an analysis of the estimating systems used within the organisation
- an investigation into site wastage allowances
- an investigation into the roles and responsibilities of estimators
- an investigation into potential commercial risks and the impact on tender decisions
- the interaction between the estimator and other members of the team, for example buyers, planners and quantity surveyors.

It may be that within one site visit different groups will investigate different elements of the estimating process, and may be able to carry out research and gather information for other BTEC units.

It is essential that centre and LEA guidelines and procedures are strictly adhered to for all visits, and that tutors visit the site in advance to carry out risk assessments and agree specific health and safety requirements with the company's health and safety officer. Learners should be supervised and accompanied at all times during a site visit.

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

Brooke M – *Estimating and Tendering for Construction Work, 4th Edition* (Butterworth Heinemann, 2008) ISBN 978075068616 7

Buchan R D et al – *Estimating for Builders and Surveyors* (Butterworth Heinemann, 2003) ISBN 9780750642712

CIOB – *Code of Estimating Practice, 7th Edition* (Wiley Blackwell, 2009) ISBN 9781405129718

Journals

RICS Construction Journal – RICS

Websites

www.nebpn.org	Institute for Education Business Excellence
www.rics.org	Royal Institute of Chartered Surveyors

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	identifying questions to answer and problems to resolve, planning and carrying out research, appreciating the consequences of decisions, analysing and evaluating information, judging its relevance and value and supporting conclusions, using reasoned arguments and evidence, as they: • investigate data and information sources • analyse contract terms and conditions • compare different types of tender documentation • investigate the use of different waste percentages • examine commercial risk
Team workers	taking responsibility, showing confidence in themselves and their contribution, as they: • make commercial decisions about the final tender sum
Self-managers	working towards goals, showing initiative, commitment and perseverance, organising time and resources, prioritising actions and anticipating, taking and managing risks, as they: • organise their time to meet coursework deadlines • make decisions about commercial risk.

Although PLTS 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	asking questions to extend their thinking and questioning their own and others' assumptions, as they: • compare advantages and disadvantages of different types of tender documentation • develop new methods of working • consider how standard ICT packages can be utilised within the estimating process
Reflective learners	assessing themselves and others, identifying opportunities and achievements, setting goals with success criteria for their development and work, reviewing progress, acting on the outcomes, inviting feedback and dealing positively with praise, setbacks and criticism and evaluating experiences and learning to inform future progress, as they: • participate in formative activities and assessment for learning (AfL) • contribute to and participate in peer assessment • apply checking procedures to their calculations • analyse their tender decisions

Skill	When learners are ...
Team workers	collaborating with others to work towards common goals, reaching agreements and managing discussions to achieve results and adapting their behaviour to suit different roles and situations, including leadership roles, as they: • participate in role plays • contribute to and participate in peer assessment
Effective participators	proposing practical ways forward, breaking these down into manageable steps and identifying improvements that would benefit others as well as themselves, as they: • participate in peer assessment and AfL.

Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using specialist and/or non-specialist software packages to complete construction estimates
Manage information storage to enable efficient retrieval	organising their folders and file storage
Follow and understand the need for safety and security practices	ensuring that estimates are backed-up at the end of each working day
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using the internet and historic cost information to complete assessment tasks selecting appropriate data for use in the production of unit rates
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	using the internet and historic cost information to complete assessment tasks selecting appropriate data for use in the production of unit rates
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	producing technical reports which include digital images and work imported from other software packages producing construction estimates using spreadsheets or other specialised software packages
Bring together information to suit content and purpose	using data from different sources to 'build up' unit rates and complete construction estimates
Present information in ways that are fit for purpose and audience	developing presentations
Evaluate the selection and use of ICT tools and facilities used to present information	evaluating both standard and specialist software packages used for estimating within the construction industry
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	examining the commercial and risk factors that need to be considered when completing a tender
Identify the situation or problem and the mathematical methods needed to tackle it	examining how small errors within the unit rate calculations can lead to much larger errors in the final tender sum
Select and apply a range of skills to find solutions	producing unit rates for an element or trade section of a bill of quantities
Use appropriate checking procedures and evaluate their effectiveness at each stage	using standard checking procedures to verify the accuracy of the tender

Skill	When learners are ...
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	applying unit rates to the bill of quantities and pricing preliminary items
Draw conclusions and provide mathematical justifications	making a commercial decision on the final tender sum
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	presenting their work and participating in question and answer sessions
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	producing technical reports.