

Unit 54: Information and Communication Technology for Construction and the Built Environment

Unit code:	K/600/0443
QCF Level 2:	BTEC Nationals
Credit value:	10
Guided learning hours:	60

● Aim and purpose

This unit will enable learners to develop the skills needed to use computer systems for communicating information, understand e-sources of information, and produce word processed documents and spreadsheets to meet the needs of the construction and the built environment sector.

● Unit introduction

In this unit learners will gain the necessary skills to use computer systems to send, receive and process data electronically. They will find out how to manage data files securely so that, for example, important documents are not lost if a hard drive crashes. Learners will use search engine techniques to find data from websites. However, such data may not be reliable and, need to learners will find out how to check its reliability.

To produce professional documentation for use in construction and the built environment, learners will have the opportunity to process and manipulate data using a word processor. Learners will create templates for documents that are used in the sector, implementing professional layouts and structures. They will enter text and other information into the templates that they have created and learn how to format the text using appropriate styles. Learners will also learn how to check the quality of their documents, an important step before they are published.

Learners will also use spreadsheets for various applications within the construction and built environment sector, for example costing a construction project. Learners will learn how to enter data into a spreadsheet and how to use formulae and functions to manipulate raw data. They will format the spreadsheet to clearly present the raw data in the spreadsheet. Learners will be able to analyse the data and present their results in an appropriate fashion, for example by using charts and graphs.

● Learning outcomes

On completion of this unit a learner should:

- 1 Be able to use computer operations and web-based communication to send, receive and securely manage data files for construction and the built environment
- 2 Understand specialist e-format information sources and safeguards for their use
- 3 Be able to process and manipulate data in word processing applications for construction and the built environment
- 4 Be able to process and manipulate data in spreadsheet applications for construction and the built environment.

Unit content

1 Be able to use computer operations and web-based communication to send, receive and securely manage data files for construction and the built environment

Manage data files: types of file eg DWG/DXF/DWF; specialist management software; workflow tracking and reporting; real time mark-up and reviews; data security (back-up routines; file sharing); server security; Data Protection Act

Operations: boot up routines; accessing and closing standard software programs (email, word processors, spreadsheets); printing routines; standard commands; simple file systems

Web-based communication: ISPs; search engine techniques; emails; download formats eg pdf; intranets; project extranets

2 Understand specialist e-format information sources and safeguards for their use

Specialist information sources: eg construction websites/CDs/DVDs; information portal websites; commercially available online technical libraries; specialist regional and national government websites; local authority weblinks to planning, building control and transport information; research/academic websites

Safeguards: checking the validity of information eg reliability of source, cross-referencing, publication dates; quality of information eg graphics, content, fitness for purpose; firewalls; virus-checkers;

3 Be able to process and manipulate data in word processing applications for construction and the built environment

Enter text: templates (new, existing)

Other information: graphics; spreadsheet data

Editing tools: appropriate to the type of information eg select, copy, cut, paste, drag and drop, undo, redo, find, replace, insert, delete, size, crop, position

Layout and structures: create and alter table structure eg insert and delete cells, rows and columns, merge and split cells; alter table properties eg row height and column width, horizontal and vertical text alignment, cell margins; page layouts eg paper size and type, page orientation, margins, page breaks, section breaks; format header and footer eg page number, date and time; adjust page set up for printing

Format: characters eg font style and size, colour, bold, italic, underline, superscript, subscript; paragraphs eg alignment, justification, bullets, numbering, line spacing, borders, shading, widows and orphans; tabs and indents; columns eg add and delete columns, modify column width, add columns to whole or parts of a page

Quality checking: software tools eg spellcheck, grammar check, print preview, language and dictionary settings; other eg font style and size, hyphenation, page layout, margins, line and page breaks, tables, accuracy, consistency, clarity

Audience types: individuals; groups; context eg business, social

4 Be able to process and manipulate data in spreadsheet applications for construction and the built environment

Enter and edit: entering data into single cells; insert data into multiple cells at once; replicate data; find and replace; absolute and relative cell references; entering data accurately; adding images to spreadsheets; linking cells between different worksheets; use of paste

Formulae: simple mathematical formulae (add, subtract, divide, multiply) eg calculating VAT, totalling columns of figures; complex formulae involving two stage calculations eg calculations of pay based on basic hours and overtime; typical errors eg circular references; techniques used to sort out problems eg use of reveal formulae, formula wizards; use of help systems

Functions: statistical functions eg sum, average, min, max, count, countif

Analyse and manipulate data: totals; sub-totals and summary data; sorting and display order; filter rows and columns; converting spreadsheet data to charts and graphs

Format cells: numbers; currency; percentages; number of decimal places; font; alignment; shading; borders; date and time formats; wrap text

Format rows and columns: height; width; borders; shading; hide; freeze

Presenting information: appropriate data types (text, currency and date); formatting cells (colours, shading, alignment, borders); other formatting eg increasing/decreasing decimal points, merging cells

Charts and graphs: simple chart eg pie, bar, single line graph; complex charts eg area, column, x-y scatter, stock, radar, doughnut, surface

Format charts and graphs: titles (axis and chart); legend; change chart type; move and resize chart

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 how to manage data files securely [SM3]	M1 explain the issues which affect the safe management and control of data	D1 evaluate the use of ICT systems to monitor, manage and control information in complex design and construction projects
P2 use computer operations to send and receive data using web-based communications [SM3, RL3]		
P3 describe the types and formats of specialist ICT information sources used in construction and the built environment [SM3, RL3]		
P4 discuss safeguards for finding and using data in e-format [CT1, RL3]		
P5 enter text and other information into a document [CT1]	M2 create a multi-page document for a defined audience, using a variety of page and section layouts and including textual, graphical and numerical information	D2 justify the tools and techniques used to produce a multi-page document
P6 use editing tools to amend document content [RL3]		
P7 create and modify layout and structures for word processed documents [CT1]		
P8 format and quality check documents for different types of audience [IE4]		

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:
P9 enter and edit spreadsheet data accurately [CT1]	M3 create and check a multi-sheet spreadsheet solution to meet specified user needs that uses a selection of appropriate functions and both simple and complex formulae	D3 evaluate the benefits of a particular spreadsheet solution.
P10 use appropriate formulae and functions to meet calculation requirements [IE4]		
P11 analyse and manipulate the required information [IE4, SM3]		
P12 format spreadsheet cells, rows, columns and worksheets for presenting information [IE4, SM3]		
P13 generate, develop and format charts and graphs. [CT1, IE4, SM3]	M4 compare the use of different types of graph to present the same information.	

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate 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

Data file handling should be practised whenever learners save work. Examples of poorly organised files and folders will illustrate how difficult it can be to find data without structure and sensible naming. As part of file handling, routine maintenance of files and folders – deleting, backing up and archiving – can be introduced. If possible, learners should save their files on both external devices, for example flash pens, and on hard drives or network drives. It may not be appropriate to use all types of storage device but learners should be aware of the alternatives and the pros and cons of using each type. Data security and integrity can be covered at the same time. Learners should be encouraged to keep backup copies of their work and learn how to protect their data from corruption using virus detectors, firewalls, passwords, etc. Whilst data protection should be introduced, it is not necessary to go into the detail of the Data Protection Act, for example videos are available highlighting the different aspects of the act. Copyright and what it is safe to download and store can also be illustrated using video and case study material. Learners must appreciate the necessity of checking the validity of information found on the worldwide web.

This unit recognises that every document has an implicit audience and that the appearance, structure and presentation of information are very important in achieving its purpose.

Documents created in this unit should be as realistic and purposeful as possible, with learners applying layout styles and formatting skills to communicate information effectively.

Learners should be made aware that the recipient/audience determines the style of the document content and that business information content is mainly formal whilst social information content is mainly informal. Many recipients have expectations of information content, structure and formatting and may feel dissatisfied when these expectations are not met.

Learners should be encouraged to use their judgement when creating content, for example, formal/informal, ensuring appropriate sentence length and vocabulary, consistent terminology, appropriate use of bulleted lists, avoidance of sexist or biased language.

Skills in creating documents from both original and combined material from other sources, are considered important in this unit. Material learners created should be sufficient to test formatting and layout skills.

Learners should appreciate that technical and awareness skills are necessary to present information effectively and that there are many facilities available to enhance presentation in. Spreadsheets are an area of expertise that can be developed best through practical activity with regular feedback from the tutor. Examples and activities should focus on spreadsheets that can be related to a real context and take account of user need rather than an isolated set of skills.

It would be unusual if any learner came to this unit without some existing skills or experience in using spreadsheets and it is strongly advised that time is taken before the programme starts to understand each learner's existing level of understanding and skills in order to develop either an action plan or a set of targets. Because of the likelihood of a range of prior experience it is recommended that individual, tracked activity should be a feature of lessons allowing individuals either to develop higher skills quickly or to get the practise and support needed to build the fundamental skills required to pass the unit. There is a place for formal tuition and for group activity but this should not hold back individuals.

It is recommended that a large number of spreadsheets are made available as a resource. Once they are competent, learners will be able to work through spreadsheets quickly and will need both a number of similar sets of spreadsheets to confirm understanding, as well as series of graded, more complex ones to stretch them.

Example spreadsheets should be provided with documentation or/and scenarios that give each some context. Prepared spreadsheets should be documented and presented in a way that sets formatting and presentation standards and provides exemplars for learners to follow when producing assessed work.

In the early developmental stages, learners would benefit from working with incomplete spreadsheets or with spreadsheets which have unidentified problems that need fixing.

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 – tutor explanation and class discussion
Assignment 1: Send, Receive and Manage Data Files Securely
Introduction to computer system – demonstration and exercises
Management of data files – demonstration and exercises
Search engine techniques – demonstration and exercises
Safeguards – tutor explanation and exercises
Specialist information sources – group work
Assignment 2: Word Processors
Entering and amending text in a document – tutor demonstration and exercises
Formatting documents – tutor demonstration and exercises
Creating tables – tutor demonstration and exercises
Templates and page layouts – tutor demonstration and exercises
Combining different types of information – tutor demonstration and exercises
Checking documents – tutor demonstration and exercises
Production of a multi-page document

Topic and suggested assignments/activities and/assessment

Assignment 3: Spreadsheets

Nature of structured data and how it is represented in spreadsheets

Core spreadsheet background and uses of spreadsheets

Core spreadsheet skills (entry, editing, simple formulae, file handling) – routine practise and demonstration of some typical uses

Checking formulae including practise

Formatting information in spreadsheets

Functions, for example statistical

Analytical and manipulative tools – introduction

Analytical and manipulative tools – practice

Graphs and charts

Checking spreadsheet meets needs, error identification and response

Production of a multi-sheet spreadsheet solution

Unit review and assignment feedback

Assessment

Suitable scenarios can be provided that allow learners to meet all the assessment criteria. Examples should be based on contexts related to construction and the built environment.

To achieve a pass grade, learners must achieve all the pass criteria listed in the grading grid. It is not recommended that each criterion is addressed separately as this is likely to lead to over assessment and boredom on the part of the learner. Natural groups of criteria should be collected together and presented in an engaging and coherent way. The assessment of this unit could be set within an holistic scenario but, pragmatically, probably needs to be split into three assignments (please refer to the programme of suggested assignments in the next section).

For P1, learners must clearly describe how to manage data files securely. Learners must make it clear how to manage data files in a logical way. Evidence could be provided, for example, through tutor observation, oral questioning and practical exercise.

For P2, learners will need to use computer operations to send and receive data using web-based communications. Learners should retain printed copies of data that they have sent or received.

For P3, learners must describe the types and formats of specialist ICT information sources used in construction and the built environment. A report would provide evidence for this criterion.

For P4, learners must discuss safeguards for finding and using data in e-format. The discussion could refer to data that was obtained from the internet including, for example, how the data was validated and how the reliability of the source was determined. Evidence could be in the form of a written report.

For P5, learners must enter text and other information into a document. The document should be related to construction and the built environment and could contain a summary of the data learners obtained for P4. 'Other information' must include at least one image and one table. A printed copy of the document would provide evidence of achieving this criterion. The tutor must ensure that the documents produced do not contain text that has been copied from the internet.

For P6, learners must edit a document. They could edit the document that was produced for P5 to improve its appearance and correct errors in the text. A printout of the final document should be annotated to show the changes that were made to improve the document.

For P7, learners must create and modify layout and structures for word processed documents. Learners could set up a template that contains the layout and structures for a particular type of document. They could then produce a modified version of this template to improve it.

For P8, learners must format and quality check documents for different types of audience. The tutor could provide documents that contain grammatical and spelling errors, and that need to be formatted. Each learner should be given a different document to format and check to ensure that learners do not copy electronic version of corrected documents from each other. One or two minor errors in the final document are acceptable. Learners should include the original document and the amended document in their evidence portfolio.

For P9, learners must enter and edit spreadsheet data accurately. In order to prevent copying, it is strongly recommended that learners are given different tasks. The spreadsheet should be set in a construction and built environment context. One or two minor errors in the final spreadsheet are acceptable. A printout of the spreadsheet should be kept as evidence of achieving this criterion.

For P10, learners must use formulae and functions to meet calculation requirements. They could apply formula and perform calculations on the spreadsheet that they produced for P9. They should print out two copies of the spreadsheet – one that shows the formula and equations used, and one that shows the results of applying the formula and calculations.

For P11, learners must analyse and manipulate information. They could develop the spreadsheet that they produced for P10. Several printouts will be necessary to show that learners can analyse and manipulate data in different ways, for example sorting data and filtering data.

For P12, learners must format spreadsheet cells, rows, columns and worksheets for presenting information. Learners should demonstrate that they know how to set cell formats according to the type of data they contain, for example date, currency, and how to set the correct number of decimal places. They should be able to align data and wrap text as appropriate. Learners should show that they can use different fonts as appropriate, use shading to highlight the results of calculations and/or the results of formula, and use borders to produce a well-presented spreadsheet that is easy to understand. They could develop the spreadsheet that they produced for P11.

For P13, learners must generate, develop and format charts and graphs for a spreadsheet. They could develop the spreadsheet that they produced for P12.

For M1, learners must explain the issues which affect the safe management and control of data. Learners must look at this concept in terms of current issues.

For M2, learners must create a multi-page document for a defined audience, using a variety of page and section layouts and including textual, graphical and numerical information. The document created may be based on a document created to meet the pass criteria.

For M3, learners must create and check a multi-sheet spreadsheet solution to meet specified user needs. The spreadsheet should use a selection of appropriate functions and both simple and complex formulae. This could be contextualised by asking learners to create a spreadsheet for the launch of a construction sector product.

For M4, learners must compare the use of different types of graph to present the same information. Evidence for this comparison is most likely to be provided as written statements supported by actual printouts of chosen graphs. Several types of graph are required and continuously varying data could be offered as a bar chart and line graph with appropriate comparisons.

For D1, learners must evaluate the use of ICT systems to monitor, manage and control information in complex design and construction projects. Evidence may follow naturally from the production of any complex documents for M1. Learners could be asked to present their findings to their peers for discussion and feedback.

For D2, learners must justify the tools and techniques used to produce a multi-page document. Evidence may follow naturally from the production of any complex documents for M2. Learners will need to use annotated printouts to show where and why particular tools and techniques have been used. Annotation or the use of logs, blogs and checklists could evidence the tools and techniques used. Alternative forms of evidence could include a verbal review undertaken directly with the tutor, or to their peer group, with accompanying notes and an appropriate observation record completed and signed by the tutor.

For D3, learners must evaluate the benefits of a particular spreadsheet solution. Evidence may follow naturally from the production of any complex documents for M3. Alternative forms of evidence could include a verbal review undertaken directly with the tutor, or a presentation to their peer group, with accompanying notes and an appropriate observation record completed and signed by the tutor.

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, M2, M3, M4, D1, D2, D3	Send, Receive and Manage Data Files Securely	Your office manager asks you to produce a document illustrating how to send, receive and manage secure files for the benefit of other staff.	Document/annotated document, log, blog or checklist to show sending, receiving and managing secure files.
P5, P6, P7, P8	Word Processors	Your company is producing a new information pamphlet. You have been asked to produce a section of this pamphlet.	Document/annotated document showing: relevant tables and areas that have been formatted.
P9, P10, P11, P12, P13	Spreadsheets	To support your company's operations, you have been asked to produce information on a spreadsheet.	Written responses to tasks, product evidence, observation records.

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
		Project Management in Construction and the Built Environment
		Measuring, Estimating and Tendering Processes in Construction and the Built Environment
		Economics and Finance in Construction and Civil Engineering
		Computer Aided Drafting and Design for Construction
		Project in Construction and the Built Environment
		Geographical Information Systems in Construction

This unit links to the Edexcel Level 3 NVQ in Technical Design (Construction Environment). It also relates to Level 3 National Occupational Standards in Surveying, Property and Maintenance.

Essential resources

Centres will need modern computers and software, including word processing and spreadsheet packages.

Employer engagement and vocational contexts

ConstructionSkills is the Sector Skills Council for the construction industry and details of their activity and services can be found at www.cskills.org

There is ample scope for employer engagement within this unit. A company would be unusual if it did not have a number of spreadsheet applications to undertake specific tasks, whether for managing expenses, tracking holiday dates and rotas, or similar. As long as the information they hold is not sensitive, either to the company or individuals, then they would be ideal to demonstrate the use of spreadsheets in a normal working environment. If at all possible, the employee who normally uses the spreadsheet could be asked to describe the purpose and use and invite learners to suggest refinements.

It is likely that the vast majority of examples found in textbooks will derive naturally from a vocational context.

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
- 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

Heathcote P – *Successful ICT Projects in Excel* (Payne-Gallway Publishers, 2002) ISBN 1903112710

Heathcote R – *Further Excel 2000-2003* (Payne-Gallway Publishers, 2004) ISBN 1904467768

Heathcote R – *ICT Projects for GCSE* (Payne-Gallway Publishers, 2002) ISBN 1903112699

Websites

www.bbc.co.uk/schools/gcsebitesize/ict

BBC Bitesize revision for GCSE ICT

www.teach-ict.com

Teach-ICT

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 ...
Creative thinkers	generating ideas and exploring possibilities when creating and modifying documents
Independent Enquiries	judging what content is appropriate when creating documents
Reflective learners	describing any quality problems with documents and responding appropriately so that outcomes meet needs
Self-managers	organising their time and resources when using IT systems for routine tasks .

● 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	
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	checking documents meet needs, using IT tools and making corrections as necessary describing any quality problems with documents responding appropriately to quality problems with documents so that outcomes meet needs
Manage information storage to enable efficient retrieval	storing and retrieving document and template files effectively, in line with local guidelines and conventions where available
Follow and understand the need for safety and security practices	
Troubleshoot	checking documents meet needs, using IT tools and making corrections as necessary describing any quality problems with documents responding appropriately to quality problems with documents so that outcomes meet needs
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	selecting text and other types of information and using appropriate techniques to enter it accurately and efficiently into documents combining or merging information within a document from other software or documents
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	selecting text and other types of information and using appropriate techniques to enter it accurately and efficiently into documents combining or merging information within a document from other software or documents
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 	identifying the document requirements for structure and style selecting text and other types of information and using appropriate techniques to enter it accurately and efficiently into documents combining or merging information within a document from other software or documents creating and modifying columns, tables and forms to organise information

Skill	When learners are ...
Bring together information to suit content and purpose	identifying the document requirements for structure and style selecting text and other types of information and using appropriate techniques to enter it accurately and efficiently into documents combining or merging information within a document from other software or documents creating and modifying columns, tables and forms to organise information
Present information in ways that are fit for purpose and audience	identifying the document requirements for structure and style selecting text and other types of information and using appropriate techniques to enter it accurately and efficiently into documents
Evaluate the selection and use of ICT tools and facilities used to present information	checking documents meet needs, using IT tools and making corrections as necessary describing any quality problems with documents responding appropriately to quality problems with documents so that outcomes meet needs.
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	

Skill	When learners are ...
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	selecting text and other types of information and using appropriate techniques to enter it accurately and efficiently into documents.