QUALIFICATION HANDBOOK

Level 3 NVQ Diploma in Engineering Technical Support (Engineering Software Development) (1786-35)

September 2011 Version 1.0

City & Guilds

Qualification at a glance

Subject area	Engineering Technical Support
City & Guilds number	1786
Age group approved	16+
Entry requirements	None
Assessment	Portfolio of evidence
Automatic approval	Available
Support materials	Centre handbook
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds number	Accreditation number
Level 3 NVQ Diploma in Engineering Technical Support (Engineering Software Development)	1712-35	600/2085/4

Contents

1 Introduction

This document tells you what you need to do to deliver the qualification:

Area	Description
Who is the qualification for?	It is for candidates who work or want to work in engineering technical support - engineering software development in the engineering sector.
What does the qualification cover?	It allows candidates to learn, develop and practise the skills required for employment and/or career progression in the engineering technical support sector.
Is the qualification part of a framework or initiative?	It serves as a competence qualification, in the Engineering Apprenticeship framework.
What opportunities for progression are there?	It allow candidates to progress into employment or to the following City & Guilds qualifications: • Level 3 NVQ Extended Diploma in Engineering Technical Support

Structure

To achieve the **Level 3 NVQ Diploma in Engineering Technical Support (Engineering Software Development)**, learners must achieve **195** credits from the mandatory units and a minimum of **40** credits from the optional units available.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
A/601/5013	201	Complying with statutory regulations and organisational safety requirements	5
Y/601/5102	202	Using and interpreting engineering data and documentation	5
K/601/5055	303	Working efficiently and effectively in engineering	5
D/601/2864	362	Determining engineering software requirements	40
T/601/2871	363	Producing engineering software design	50

F/601/2887	364	Producing engineering software implementation	40
F/601/2890	365	Testing engineering software	50
Optional			
J/601/2891	366	Performing engineering software analysis techniques	50
L/601/2892	367	Measuring engineering software quality	40
Y/601/2894	368	Performing engineering software configuration management	50
D/601/2895	369	Performing engineering software acquisition	40
M/601/2898	370	Performing engineering software safety assessments	40
A/601/2905	371	Performing low level programming for engineering software	50
F/601/2906	372	Performing computer system security assessments for engineering software	40

2 Centre requirements

Approval

Centres currently offering the City & Guilds Level 3 NVQ in Engineering Technical Support (1686) will be automatically approved to run this new qualification.

To offer this qualification new centres will need to gain both centre and qualification approval. Please refer to the ***Centre Manual - Supporting Customer Excellence*** for further information.

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualification before designing a course programme.

Resource requirements

Centre staffing

Staff delivering this qualification must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be occupationally competent or technically knowledgeable in the areas for which they are delivering training and/or have experience of providing training; this knowledge must be to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.

Centre staff may undertake more than one role, e.g. tutor and assessor or internal verifier, but cannot internally verify their own assessments.

Assessors and internal verifier

Assessor Requirements to Demonstrate Effective Assessment Practice

Assessment must be carried out by competent assessors that as a minimum must hold the QCF Level 3 Award in Assessing Competence in the Work Environment**.** Current and operational assessors that hold units D32 and/or D33 or A1 and/or A2 as appropriate for the assessment requirements set out in this Unit Assessment Strategy. However, they will be expected to regularly review their skills, knowledge and understanding and where applicable undertake continuing professional development to ensure that they are carrying out workplace assessment to the most up to date National Occupational Standards (NOS).

Assessor Technical Requirements

Assessors must be able to demonstrate that they have verifiable, relevant and sufficient technical competence to evaluate and judge performance

and knowledge evidence requirements as set out in the relevant QCF unit learning outcomes and associated assessment criteria.

This will be demonstrated either by holding a relevant technical qualification or by proven industrial experience of the technical areas to be assessed. The assessor's competence must, at the very least, be at the same level as that required of the learner(s) in the units being assessed.

Assessors must also be fully conversant with the awarding organisation's assessment recording documentation used for the QCF NVQ units against which the assessments and verification are to be carried out, other relevant documentation and system and procedures to support the QA process.

Verifier Requirements (internal and external)

Internal quality assurance (**Internal Verification**) must be carried out by competent Verifiers that as a minimum must hold the QCF Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practices. Current and operational Internal Verifiers that hold internal verification units V1 or D34 will not be required to achieve the QCF Level 4 Award as they are still appropriate for the verification requirements set out in this Unit Assessment Strategy. Verifiers must be familiar with, and preferably hold, either the nationally recognised assessor units D32 and/or D33 or A1 and/or A2 or the QCF Level 3 Award in Assessing Competence in the Work Environment.

External quality assurance **(External Verification)** must be carried out by competent External Verifiers that as a minimum must hold the QCF Level 4 Award in the External Quality Assurance of Assessment Processes and Practices**.** Current and operational External Verifiers that hold external verification units V2 or D35 will not be required to achieve the QCF Level 4 Award as they are still appropriate for the verification requirements set out in this Unit Assessment Strategy. Verifiers must be familiar with, and preferably hold, either the nationally recognised Assessor units D32 and/or D33 or A1 and/or A2 or the QCF Level 3 Award in Assessing Competence in the Work Environment.

External and Internal Verifiers will be expected to regularly review their skills, knowledge and understanding and where applicable undertake continuing professional development to ensure that they are carrying out workplace Quality Assurance (verification) of Assessment Processes and Practices to the most up to date National Occupational Standards (NOS) Verifiers, both Internal and External, will also be expected to be fully conversant with the terminology used in the QCF NVQ units against which the assessments and verification are to be carried out, the appropriate Regulatory Body's systems and procedures and the relevant Awarding Organisation's documentation.

Continuing Professional Development (CPD)

Centres must support their staff to ensure that they have current knowledge of the occupational area, that delivery, mentoring, training, assessment and verification is in line with best practice, and that it takes account of any national or legislative developments.

Candidate entry requirements

City & Guilds does not set entry requirements for this qualification. However, centres must ensure that candidates have the potential and opportunity to gain the qualification successfully so should have the opportunity to gather work based evidence.

The SEMTA Engineering Manufacture apprenticeship framework suggests that employers would be interested in candidates that:

- Are keen and motivated to work in an engineering environment
- Are willing to undertake a course of training both on-the-job and off-the-job and apply this learning in the workplace
- Have previous work experience or employment in the sector
- Have completed a 14 to 19 Diploma in Engineering or Manufacturing
- Have completed a Young Apprenticeship in Engineering or other related area
- Have GCSEs in English, Maths and Science
- Have completed tests in basic numeracy, literacy and communication skills and have spatial awareness.

As a guide, the Engineering Manufacturing framework is suitable for applicants who have five GCSEs grades D to E in English, Maths and Science. The selection process on behalf of employers may include initial assessment where applicants will be asked if they have any qualifications or experience that can be accredited against the requirements of the apprenticeship. They may also be required to take tests in basic numeracy and literacy, communications skills and spatial awareness. There may also be an interview to ensure applicants have selected the right occupational sector and are motivated to become an apprentice, as undertaking an apprenticeship is a major commitment for both the individual and the employer.

Assessment Environment (extract from SEMTA QCF Unit Assessment Strategy 1 January 2011)

The evidence put forward for this qualification can only be regarded valid, reliable, sufficient and authentic if achieved and obtained in the working environment and be clearly attributable to the learner. However, in certain circumstances, simulation/replication of work activities may be acceptable. The use of high quality, realistic simulations/replication that impose pressures consistent with workplace expectations should only be used in relation to the assessment of the following:

- rare or dangerous occurrences, such as those associated with health, safety and the environment issues, emergency scenarios and rare operations at work;
- the response to faults and problems for which no opportunity has presented for the use of naturally occurring workplace evidence of learners competence;
- aspects of working relationships and communications for which no opportunity has presented for the use of naturally occurring workplace evidence of learners competence.

Simulations/replications will require prior approval from centres' City & Guilds external verifier/qualification consultant and should be designed in relation to the following parameters:

- the environment in which simulations take place must be designed to match the characteristics of the working environment
- competencies achieved via simulation/replication must be transferable to the working environment
- simulations which are designed to assess competence in dealing with emergencies, accidents and incidents must be verified as complying with relevant health, safety and environmental legislation by a competent health and safety/environmental control officer before being used
- simulated activities should place learners under the same pressures of time, access to resources and access to information as would be expected if the activity was real
- simulated activities should require learners to demonstrate their competence using plant and/or equipment used in the working environment
- simulated activities which require interaction with colleagues and contacts should require the learner to use the communication media that would be expected at the workplace
- for health and safety reason simulations need not involve the use of genuine substances/materials. Any simulations which require the learner to handle or otherwise deal with materials substances/should ensure that the substitute takes the same form as in the workplace.

Age restrictions

City & Guilds cannot accept any registrations for candidates under 16 as this qualification is not approved for under 16s.

Legal restrictions apply to candidates under the age of 18 working unsupervised with children. Centres and candidates should be fully aware of minimum age requirements in their home nation and any implications for completing assessments.

3 Delivering the qualification

Initial assessment and induction

An initial assessment of each candidate should be made before the start of their programme to identify:

- if the candidate has any specific training needs
- support and guidance they may need when working towards their qualification
- any units they have already completed, or credit they have accumulated which is relevant to the qualification
- the appropriate type and level of qualification.

We recommend that centres provide an induction programme so the candidate fully understands the requirements of the qualification, their responsibilities as a candidate, and the responsibilities of the centre. This information can be recorded on a learning contract.

Recommended delivery strategies

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualifications before designing a course programme.

Centres may design course programmes of study in any way which:

- best meets the needs and capabilities of their candidates
- satisfies the requirements of the qualifications.

When designing and delivering the course programme, centres might wish to incorporate other teaching and learning that is not assessed as part of the qualifications. This might include the following:

- literacy, language and/or numeracy
- personal learning and thinking
- personal and social development
- employability.

Where applicable, this could involve enabling the candidate to access relevant qualifications covering these skills.

Recording documents

Candidates and centres may decide to use a paper-based or electronic method of recording evidence.

City & Guilds endorses several ePortfolio systems, including our own, **Learning Assistant**, an easy-to-use and secure online tool to support and evidence learners' progress towards achieving qualifications. Further details are available at: **www.cityandguilds.com/eportfolios**.

City & Guilds has developed a set of *Recording forms* including examples of completed forms, for new and existing centres to use as appropriate. *Recording forms* are available on the City & Guilds website.

Although new centres are expected to use these forms, centres may devise or customise alternative forms, which must be approved for use by the external verifier, before they are used by candidates and assessors at the centre. Amendable (MS Word) versions of the forms are available on the City & Guilds website.

4 Assessment

Assessment of the qualification

Candidates must have a completed portfolio of evidence for each unit chosen.

Evidence requirements

Carrying Out Assessments
The NVQ units were specifically developed to cover a wide range of activities. The evidence produced for the units will, therefore, depend on the learners choice of "bulleted items" listed in the unit assessment criteria. Where the assessment criteria gives a choice of bulleted items (for example 'any three from five'), assessors should note that learners do not need to provide evidence of the other items to complete the unit (in this example, two) items, particularly where these additional items may relate to other activities or methods that are not part of the learners normal workplace activity or area of expertise.

Minimum Performance Evidence Requirements
Performance evidence must be the main form of evidence gathered. In order to demonstrate consistent, competent performance for a unit, a minimum of three different examples of performance must be provided, and must be sufficient to show that the assessment criteria have been achieved to the prescribed standards. It is possible that some of the bulleted items in the assessment criteria may be covered more than once. The assessor and learner need to devise an assessment plan to ensure that performance evidence is sufficient to cover all the specified assessment criteria and which maximises the opportunities to gather evidence. Where applicable, performance evidence may be used for more than one unit.

The most effective way of assessing competence, is through direct observation of the learner. Assessors must make sure that the evidence provided reflects the learner's competence and not just the achievement of a training programme.

Evidence that has been produced from team activities, for example, maintenance or installation activities is only valid when it clearly relates to the learners specific and individual contribution to the activity, and not to the general outcome(s).

Each example of performance evidence will often contain features that apply to more than one unit, and can be used as evidence in any unit where appropriate.

Performance evidence must be a combination of:

- outputs of the learner's work, such as items that have been manufactured, installed, maintained, designed, planned or quality assured, and documents produced as part of a work activity

- evidence of the way the learner carried out the activities such as witness testimonies, assessor observations or authenticated learner reports, records or photographs of the work/activity carried out, etc.

Competent performance is more than just carrying out a series of individual set tasks. Many of the units contain statements that require the learner to provide evidence that proves they are capable of combining the various features and techniques. Where this is the case, separate fragments of evidence would not provide this combination of features and techniques and will not, therefore, be acceptable as demonstrating competent performance.

If there is any doubt as to what constitutes valid, authentic and reliable evidence, the internal and/or external verifier (qualifications consultant) should be consulted.

Assessing knowledge and understanding
Knowledge and understanding are key components of competent performance, but it is unlikely that performance evidence alone will provide enough evidence in this area. Where the learner's knowledge and understanding (and the handling of contingency situations) is not apparent from performance evidence, it must be assessed by other means and be supported by suitable evidence.

Knowledge and understanding can be demonstrated in a number of different ways. Semta (the Sector Skills Council) expects oral questioning and practical demonstrations to be used, as these are considered the most appropriate for these units. Assessors should ask enough questions to make sure that the learner has an appropriate level of knowledge and understanding, as required by the unit.

Evidence of knowledge and understanding will **not** be required for those bulleted items in the assessment criteria that have not been selected by the learner.

The achievement of the specific knowledge and understanding requirements of the units cannot simply be inferred by the results of tests or assignments from other units, qualifications or training programmes. Where evidence is submitted from these sources, the assessor must, as with any assessment, make sure the evidence is valid, reliable, authentic, directly attributable to the learner, and meets the full knowledge and understanding requirements of the unit. Where oral questioning is used the assessor must retain a record of the questions asked, together with the learner's answers.

Witness testimony
Where observation is used to obtain performance evidence, this must be carried out against the unit assessment criteria. Best practice would require that such observation is carried out by a qualified assessor. If this is not practicable, then alternative sources of evidence may be used.

For example, the observation may be carried out against the assessment criteria by someone else that is in close contact with the learner. This could be a team leader, supervisor, mentor or line manager who may be regarded as a suitable witness to the learner's competency. However, the witness must be technically competent in the process or skills that they are providing testimony for, to at least the same level of expertise as that

required of the learner. It will be the responsibility of the assessor to make sure that any witness testimonies accepted as evidence of the learner's competency are reliable, auditable and technically valid.

Recognition of Prior Learning (RPL)

Recognition of prior learning means using a person's previous experience or qualifications which have already been achieved to contribute to a new qualification. RPL is allowed and is also sector specific.

5 Units

Availability of units

The following units can also be obtained from The Register of Regulated Qualifications: **http://registerofqual.gov.uk/Unit**

Structure of units

These units each have the following:

- City & Guilds unit number
- Title
- Unit Accreditation Number (UAN)
- Level
- Credit value
- Recommended Guided Learning Hours (GLH)
- Relationship to National Occupational Standards (NOS), other qualifications and frameworks
- Endorsement by a sector or other appropriate body
- Unit aim(s)
- Learning outcomes which are comprised of a number of assessment criteria.

Unit 201 Complying with statutory regulations and organisational safety requirements

UAN:	A/601/5013
Level:	2
Credit value:	5
GLH:	35
Relationship to NOS:	This unit has been derived from national occupational standard: Complying with statutory regulations and organisational safety requirements (Suite 2).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to deal with statutory regulations and organisational safety requirements. It does not deal with specific safety regulations or detailed requirements, it does, however, cover the more general health and safety requirements that apply to working in an industrial environment. The learner will be expected to comply with all relevant regulations that apply to their area of work, as well as their general responsibilities as defined in the Health and Safety at Work Act. The learner will need to be able to identify the relevant qualified first aiders and know the location of the first aid facilities. The learner will have a knowledge and understanding of the procedures to be adopted in the case of accidents involving injury and in situations where there are dangerous occurrences or hazardous malfunctions of equipment, processes or machinery. The learner will also need to be fully conversant with their organisation's procedures for fire alerts and the evacuation of premises. The learner will also be required to identify the hazards and risks that are associated with their job. Typically, these

will focus on their working environment, the tools and equipment that they use, the materials and substances that they use, any working practices that do not follow laid-down procedures, and manual lifting and carrying techniques.

The learner's responsibilities will require them to comply with all relevant statutory and organisational policy and procedures for health and safety in the workplace. The learner must act in a responsible and safe manner at all times, and present themselves in the workplace suitably prepared for the activities to be undertaken. The learner will be expected to report any problems with health and safety issues, to the relevant authority.

The learner's knowledge will provide a good understanding of the relevant statutory regulations and organisational requirements associated with their work, and will provide an informed approach to the procedures used. The learner will need to understand their organisation's health and safety requirements and their application, in adequate depth to provide a sound basis for carrying out their activities in a safe and competent manner.

Learning outcome
The learner will: 1. comply with statutory regulations and organisational safety requirements
Assessment criteria
The learner can: 1.1 comply with their duties and obligations as defined in the Health and Safety at Work Act 1.2 demonstrate their understanding of their duties and obligations to health and safety by: • applying in principle their duties and responsibilities as an individual under the Health and Safety at Work Act • identifying, within their organisation, appropriate sources of information and guidance on health and safety issues, such as: o eye protection and Personal Protective Equipment (PPE) o COSHH regulations o risk assessments • identifying the warning signs and labels of the main groups of hazardous or dangerous substances • complying with the appropriate statutory regulations at all times 1.3 present themselves in the workplace suitably prepared for the

activities to be undertaken

1.4 follow organisational accident and emergency procedures

1.5 comply with emergency requirements, to include:

- identifying the appropriate qualified first aiders and the location of first aid facilities
- identifying the procedures to be followed in the event of injury to themselves or others
- following organisational procedures in the event of fire and the evacuation of premises
- identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions of equipment

1.6 recognise and control hazards in the workplace

1.7 identify the hazards and risks that are associated with the following:

- their working environment
- the equipment that they use
- materials and substances (where appropriate) that they use
- working practices that do not follow laid-down procedures

1.8 use correct manual lifting and carrying techniques

1.9 demonstrate one of the following methods of manual lifting and carrying:

- lifting alone
- with assistance of others
- with mechanical assistance

1.10 apply safe working practices and procedures to include:

- maintaining a tidy workplace, with exits and gangways free from obstruction
- using equipment safely and only for the purpose intended
- observing organisational safety rules, signs and hazard warnings
- taking measures to protect others from any harm resulting from the work that they are carrying out.

Learning outcome
The learner will: 2. know how to comply with statutory regulations and organisational safety requirements
Assessment criteria
The learner can: 2.1 describe the roles and responsibilities of themselves and others under the Health and Safety at Work Act, and other current legislation (such as The Management of Health and Safety at Work regulations, Workplace Health and Safety and Welfare regulations, Personal Protective Equipment at Work regulations, Manual Handling Operations regulations, Provision and Use of Work Equipment regulations, Display Screen at Work regulations, Reporting of Injuries, Diseases and Dangerous Occurrences regulations) 2.2 describe the specific regulations and safe working practices and procedures that apply to their work activities

2.3 describe the warning signs for the seven main groups of hazardous substances defined by Classification, Packaging and Labelling of Dangerous Substances regulations

2.4 explain how to locate relevant health and safety information for their tasks, and the sources of expert assistance when help is needed

2.5 explain what constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, poorly placed equipment, dust and fumes, handling and transporting, contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile, flammable or toxic materials, unshielded processes, working in confined spaces)

2.6 describe their responsibilities for identifying and dealing with hazards and reducing risks in the workplace

2.7 describe the risks associated with their working environment (such as the tools, materials and equipment that they use, spillages of oil, chemicals and other substances, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures)

2.8 describe the processes and procedures that are used to identify and rate the level of risk (such as safety inspections, the use of hazard checklists, carrying out risk assessments, COSHH assessments)

2.9 describe the first aid facilities that exist within their work area and within the organisation in general; the procedures to be followed in the case of accidents involving injury

2.10 explain what constitute dangerous occurrences and hazardous malfunctions, and why these must be reported even if no-one is injured

2.11 describe the procedures for sounding the emergency alarms, evacuation procedures and escape routes to be used, and the need to report their presence at the appropriate assembly point

2.12 describe the organisational policy with regard to fire fighting procedures; the common causes of fire and what they can do to help prevent them

2.13 describe the protective clothing and equipment that is available for their areas of activity

2.14 explain how to safely lift and carry loads, and the manual and mechanical aids available

2.15 explain how to prepare and maintain safe working areas; the standards and procedures to ensure good housekeeping

2.16 describe the importance of safe storage of tools, equipment, materials and products

2.17 describe the extent of their own authority, and to whom they should report in the event of problems that they cannot resolve.

Unit 202 Using and interpreting engineering data and documentation

UAN:	Y/601/5102
Level:	2
Credit value:	5
GLH:	25
Relationship to NOS:	This unit has been derived from national occupational standard: Using and interpreting engineering data and documentation (Suite 2).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to make effective use of text, numeric and graphical information, by interpreting and using technical information extracted from documents such as engineering drawings, technical manuals, reference tables, specifications, technical sales/marketing documentation, charts or electronic displays, in accordance with approved procedures. The learner will be required to extract the necessary information from the various documents, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted. The learner's responsibilities will require them to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. They will be expected to report any problems with the use and interpretation of the documents that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions if necessary, with an appropriate level of supervision or as a member of a team, and take personal responsibility for their own actions and for the quality and accuracy of

the work that they carry out.

The learner's underpinning knowledge will provide a good understanding of the types of documentation used, and will provide an informed approach to applying instructions and procedures. They will be able to read and interpret the documentation used and will know about the conventions, symbols and abbreviations, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learning outcome
The learner will: 1. use and interpret engineering data and documentation
Assessment criteria
The learner can: 1.1 use the approved source to obtain the required data and documentation 1.2 use the data and documentation and carry out all of the following: • check the currency and validity of the data and documentation used • exercise care and control over the documents at all times • correctly extract all necessary data in order to carry out the required tasks • seek out additional information where there are gaps or deficiencies in the information obtained • deal with or report any problems found with the data and documentation • make valid decisions based on the evaluation of the engineering information extracted from the documents • return all documents to the approved location on completion of the work • complete all necessary work related documentation such as production documentation, installation documentation, maintenance documentation, planning documentation 1.3 correctly identify, interpret and extract the required information 1.4 extract information that includes three of the following: • materials or components required • dimensions • tolerances • build quality • installation requirements • customer requirements • time scales • financial information • operating parameters • surface texture requirements

- location/orientation of parts
- process or treatments required
- dismantling/assembly sequence
- inspection/testing requirements
- number/volumes required
- repair/service methods
- method of manufacture
- weld type and size
- operations required
- connections to be made
- surface finish required
- shape or profiles
- fault finding procedures
- safety/risk factors
- environmental controls
- specific data (such as component data, maintenance data, electrical data, fluid data)
- resources (such as tools, equipment, personnel)
- utility supply details (such as electricity, water, gas, air)
- location of services, including standby and emergency backup systems
- circuit characteristics (such as pressure, flow, current, voltage, speed)
- protective arrangements and equipment (such as containment, environmental controls, warning and evacuation systems and equipment)
- other specific related information

1.5 use the information obtained to ensure that work output meets the specification

1.6 use information extracted from documents to include one from the following:

- drawings (such as component drawings, assembly drawings, modification drawings, repair drawings, welding/fabrication drawings, distribution and installation drawings)
- diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit diagrams)
- manufacturers manuals/drawings
- approved sketches
- technical illustrations
- photographic representations
- visual display screen information
- technical sales/marketing documentation
- contractual documentation
- other specific drawings/documents

1.7 use information extracted from related documentation, to include two from the following:

- instructions (such as job instructions, drawing instructions, manufacturers instructions)

- specifications (such as material, finish, process, contractual, calibration)
- reference materials (such as manuals, tables, charts, guides, notes)
- schedules
- operation sheets
- service/test information
- planning documentation
- quality control documents
- company specific technical instructions
- national, international and organisational standards
- health and safety standards relating to the activity (such as COSHH)
- other specific related documentation

1.8 deal promptly and effectively with any problems within their control and report those which cannot be solved

1.9 report any inaccuracies or discrepancies in documentation and specifications.

Learning outcome
The learner will: 2. know how to use and interpret engineering data and documentation
Assessment criteria
The learner can: 2.1 explain what information sources are used for the data and documentation that they use in their work activities 2.2 explain how documents are obtained, and how to check that they are current and valid 2.3 explain the basic principles of confidentiality (including what information should be available and to whom) 2.4 describe the different ways/formats that data and documentation can be presented (such as such as drawings, job instructions product data sheets, manufacturers' manuals, financial spreadsheets, production schedules, inspection and calibration requirements, customer information) 2.5 explain how to use other sources of information to support the data (such as electronic component pin configuration specifications, reference charts, standards, bend allowances required for material thickness, electrical conditions required for specific welding rods, mixing ratios for bonding and finishing materials, metal specifications and inspection requirements, health and safety documentation) 2.6 describe the importance of differentiating fact from opinion when reviewing data and documentation 2.7 describe the importance of analysing all available data and documentation before decisions are made 2.8 describe the different ways of storing and organising data and documentation to ensure easy access 2.9 describe the procedures for reporting discrepancies in the data or documentation, and for reporting lost or damaged documents 2.10 describe the importance of keeping all data and documentation up

to date during the work activity, and the implications of this not being done

2.11 explain the care and control procedures for the documents, and how damage or graffiti on documents can lead to scrapped work

2.12 explain the importance of returning documents to the designated location on completion of the work activities

2.13 explain what basic drawing conventions are used and why there needs to be different types of drawings (such as isometric and orthographic, first and third angle, assembly drawings, circuit and wiring diagrams, block and schematic diagrams

2.14 explain what types of documentation are used and how they interrelate (such as production drawings, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)

2.15 explain the imperial and metric systems of measurement; tolerancing and fixed reference points

2.16 describe the meaning of the different symbols and abbreviations found on the documents that they use (such as surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure and flow characteristics)

2.17 describe the extent of their own responsibility, when to act on their own initiative to find, clarify and evaluate information, and to whom they should report if they have problems that they cannot resolve.

Unit 303 Working efficiently and effectively in engineering

UAN:	K/601/5055
Level:	3
Credit value:	5
GLH:	25
Relationship to NOS:	This unit has been derived from national occupational standard: Working efficiently and effectively in engineering (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to work efficiently and effectively in the workplace, in accordance with approved procedures and practices. Prior to undertaking the engineering activity, the learner will be required to carry out all necessary preparations within the scope of their responsibility. This may include preparing the work area and ensuring that it is in a safe condition to carry out the intended activities, ensuring they have the appropriate job specifications and instructions and that any tools, equipment, materials and other resources required are available and in a safe and usable condition. On completion of the engineering activity, the learner will be required to return their immediate work area to an acceptable condition before recommencing further work requirements. This may involve placing completed work in the correct location, returning and/or storing any tools and equipment in the correct area, identifying any waste and/or scrapped materials and arranging for their disposal, and reporting any defects or damage to tools and equipment used. In order to be efficient and effective in the workplace, the learner will also be required to demonstrate that they can create and maintain effective working relationships with colleagues and line management. The

learner will also be expected to review objectives and targets for their personal development and make recommendations to, and communicate any opportunities for, improvements that could be made to working practices and procedures.

The learner's responsibilities will require them to comply with organisational policy and procedures for the engineering activities undertaken, and to report any problems with the activities, or the tools and equipment that are used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to working efficiently and effectively in an engineering environment. The learner will understand the need to work efficiently and effectively, and will know about the areas they need to consider when preparing and tidying up the work area, how to contribute to improvements, deal with problems, maintain effective working relationships and agree their development objectives and targets, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

The learner will understand the safety precautions required when carrying out engineering activities. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. work efficiently and effectively in engineering
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare the work area to carry out the engineering activity 1.3 prepare to carry out the engineering activity, taking into consideration all of the following, as applicable to the work to be

undertaken:

- the work area is free from hazards and is suitably prepared for the activities to be undertaken
- any required safety procedures are implemented
- any necessary personal protection equipment is obtained and is in a usable condition
- tools and equipment required are obtained and checked that they are in a safe and useable condition
- all necessary drawings, specifications and associated documentation is obtained
- job instructions are obtained and understood
- the correct materials or components are obtained
- storage arrangements for work are appropriate
- appropriate authorisation to carry out the work is obtained

1.4 check that there are sufficient supplies of materials and/or consumables and that they meet work requirements

1.5 ensure that completed products or resources are stored in the appropriate location on completion of the activities

1.6 complete work activities, to include all of the following:

- completing all necessary documentation accurately and legibly
- returning tools and equipment
- returning drawings and work instructions
- identifying, where appropriate, any unusable tools, equipment or components
- arranging for disposal of waste materials

1.7 tidy up the work area on completion of the engineering activity

1.8 deal promptly and effectively with problems within their control and report those that cannot be resolved

1.9 deal with problems affecting the engineering process, to include two of the following:

- materials
- tools and equipment
- drawings
- job specification
- quality
- people
- timescales
- safety
- activities or procedures

1.10 contribute to and communicate opportunities for improvement to working practices and procedures

1.11 make recommendations for improving to two of the following:

- working practices
- working methods
- quality
- safety
- tools and equipment

- supplier relationships
- internal communication
- customer service
- training and development
- teamwork
- other

1.12 maintain effective working relationships with colleagues to include two of the following:

- colleagues within own working group
- colleagues outside normal working group
- line management
- external contacts

1.13 review personal training and development as appropriate to the job role

1.14 review personal development objectives and targets to include one of the following:

- dual or multi-skilling
- training on new equipment / technology
- increased responsibility
- understanding of company working practices, procedures, plans and policies
- other specific requirements.

Learning outcome
The learner will: 2. Know how to work efficiently and effectively in engineering
Assessment criteria
The learner can: 2.1 describe the safe working practices and procedures to be followed whilst preparing and tidying up their work area 2.2 describe the correct use of any equipment used to protect the health and safety of themselves and their colleagues 2.3 describe the procedure for ensuring that all documentation relating to the work being carried out is available and current, prior to starting the activity 2.4 describe the action that should be taken if documentation received is incomplete and/or incorrect 2.5 describe the procedure for ensuring that all tools and equipment are available prior to undertaking the activity 2.6 describe the checks to be carried out to ensure that tools and equipment are in full working order, prior to undertaking the activity 2.7 describe the action that should be taken if tools and equipment are not in full working order 2.8 describe the checks to be carried out to ensure that all materials required are correct and complete, prior to undertaking the activity 2.9 describe the action that should be taken if materials do not meet the requirements of the activity 2.10 explain whom to inform when the work activity has been completed

2.11	describe the information and/or documentation required to confirm that the activity has been completed
2.12	explain what materials, equipment and tools can be reused
2.13	explain how any waste materials and/or products are transferred, stored and disposed of
2.14	explain where tools and equipment should be stored and located
2.15	describe the importance of making recommendations for improving working practices
2.16	describe the procedure and format for making suggestions for improvements
2.17	describe the benefits to organisations if improvements can be identified
2.18	describe the importance of maintaining effective working relationships within the workplace
2.19	describe the procedures to deal with and report any problems that can affect working relationships
2.20	describe the difficulties that can occur in working relationships
2.21	describe the regulations that affect how they should be treated at work (such as Equal Opportunities Act, Race and Sex Discrimination, working Time Directive)
2.22	describe the benefits of continuous personal development
2.23	describe the training opportunities that are available in the workplace
2.24	describe the importance of reviewing their training and development
2.25	explain with whom to discuss training and development issues
2.26	describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.

Unit 362 Determining engineering software requirements

UAN:	D/601/2864
Level:	3
Credit value:	40
GLH:	71
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 62: Determining engineering software requirements (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to model the requirements for software as part of the product definition activity, in accordance with approved procedures. The learner will be required to construct a detailed brief or a request for change/modification order, containing sufficient information to define the expected contribution of the software component(s) to the product attributes (such as functionality, safety, performance). The learner will be required to define these requirements and to elicit all necessary information in order to carry out the software requirements definition. The source information will include requested enhancements, requests for rectification of erroneous functionality or the elimination of undesirable side-effect behaviour. The learner will need to select the appropriate software requirements expression tool to use, based on the type and complexity of the software functions to be developed. The learner will be expected to use current British, European, international and company standards to produce software requirements, which must have unique identities, date of creation/modification and other relevant information. where abstract, high level requirements are progressively refined into more detailed specific requirements, the requirements definition must provide a mechanism for tracing these relationships

between the requirements.

The learner's responsibilities will require them to comply with organisational policy and procedures for working in the software requirements team. The learner will be required to propose solutions to any problems with the computer hardware, software or procedures, for consideration by the relevant people in the software requirements authorisation organisation. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying software requirements procedures. The learner will understand the computer system and software used, and its application, and will know about the various tools and techniques used to produce the software requirements, in adequate depth to provide a sound basis for carrying out the activities to define the requirements specification.

The learner will understand the safety precautions required when working in the software development team. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. determine engineering software requirements
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 plan the software requirement modelling activities before they start them 1.3 prepare for the software requirements definition activities, by carrying out all of the following: • check that the working environment is in a safe and appropriate condition and that all working equipment is in a safe and usable condition (such as cables undamaged, correctly connected, safely routed)

- open the appropriate requirements modelling software
- set up the modelling environment and select a suitable template/folder
- identify relevant software requirements to be implemented
- identify the required standards and all relevant sources (such as enhancement requests, problem reports and the baseline requirements set)

1.4 use appropriate sources to obtain the required information for the requirements model to be created

1.5 use three of the following to obtain the necessary data to produce the required model:

- new model brief/request
- change order/modification request
- technical publications
- calculations
- software problem reports
- standards reference documents (such as Universal Modelling Language (UML))
- technical notes (such as meetings/discussions, e-mail)
- specifications (such as software acceptance tests)
- regulations
- previous models/designs
- other available data

1.6 take account of seven of the following, as appropriate to the model being produced:

- function
- quality
- testing method
- resources (such as memory, performance and bandwidth)
- cost
- lifetime of the product
- accuracy
- ease of modification of model
- operating environment
- interfaces
- safety

1.7 carry out all of the following before producing the software requirements model:

- ensure that the data and information they have is complete and accurate
- analyse the data and information to identify the model requirements
- recognise and deal with problems (such as technical issues and lack of, or incorrect information)

1.8 access and use the correct requirements modelling software

1.9 use appropriate techniques to create the requirement models

1.10 use codes and other references that follow the required conventions

1.11 use one of the following modelling methodologies to produce the

software requirements:

- object orientated requirements (such as Universal Modelling language (UML))
- state based automata requirements modelling tools (such as Statemate)
- formal mathematical requirements expression methods (such as Z, Vienna Development Method (VDM))
- functional requirements elicitation and refinement methods (such as Controlled Requirements Expression (CORE))

1.12 create/modify the software requirements using four of the following:

- functions
- change requests
- state machine representations
- classes
- interfaces
- static structure
- accuracies
- performance
- sequence diagrams

1.13 produce the finished models, with sufficient detail to allow implementation

1.14 make sure that models are checked and approved by the appropriate person

1.15 check the software requirements for all of the following:

- completeness
- consistency
- coherence
- traceability
- accuracy

1.16 save and store the software requirements model in appropriate locations, to include carrying out all of the following:

- check that the model is correctly titled, referenced and annotated
- ensure that their model has been checked and that it complies with the company procedures
- save the model to an appropriate location (such as storage device, configuration database)
- register and store the model in the company information system (where appropriate)
- record and store any changes to the model in the appropriate company information system
- ensure that a separate backup copy is created and placed in safe storage

1.17 produce models which comply with one of the following:

- company standards and procedures
- customer standards and requirements
- statutory regulations and codes of practice
- software standards

- BS, ISO or BSEN standards and procedures
- other international standards

1.18 deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve.

Learning outcome

The learner will:

2. know how to determine engineering software requirements

Assessment criteria

The learner can:

2.1 explain the specific safety precautions to be taken when working with software development environment hardware (to include such things as safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections)

2.2 explain the importance of good housekeeping arrangements (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

2.3 describe the relevant sources and methods for obtaining any required technical information relevant to the model being produced (such as new model brief/request, specification sheets, request for changes or modifications to models; technical publications, calculations)

2.4 describe the identification of the correct version of software tool, and the various techniques that are supported by the tool

2.5 explain how to access the specific software requirements model to be used

2.6 explain the basic software requirements definitions

2.7 explain the types of representation that may be produced by the modelling software (such as static structure, sequence diagrams, state machine representations)

2.8 explain the national, international and organisational standards and conventions that are used for the models/drawings

2.9 describe the application and use of modelling tools (such as Statemate, CORE, Artisan)

2.10 describe how to access, recognise and use a wide range of standard components and symbol libraries from the modelling tools

2.11 explain the need for document control (such as ensuring that completed models are approved, labelled and stored on a suitable storage device)

2.12 explain why it is necessary to be able to recall previous issues of modified models

2.13 describe when to act on their own initiative and when to seek help and advice from others.

Unit 363 Producing engineering software design

UAN:	T/601/2871
Level:	3
Credit value:	50
GLH:	99
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 63: Producing engineering software design (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to create a software design as part of the product definition activity, in accordance with approved procedures. The learner will be given a detailed brief or a request for change/modification order, and they will be required to access these requirements and to extract all necessary information in order to carry out the software design activity. The learner will need to select the appropriate software design tool to use, based on the type and complexity of the software functions to be developed. The learner will be expected to use current British, European, international and company standards to produce a software design, which must include the identity of the appropriate design elements, date of software modification and other relevant information. The learner's responsibilities will require them to comply with organisational policy and procedures for working in the software development team. The learner will be required to report any problems with the computer hardware, software or procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility

for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying software design procedures. The learner will understand the computer system and software used, and its application, and will know about the various tools and techniques used to produce the software design, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working in the software development team. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. produce engineering software design
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 plan the software design modelling activities before you start them 1.3 prepare for the software design activities, by carrying out all of the following: • check that the working environment is in a safe and appropriate condition and that all working equipment is in a safe and usable condition (such as cables undamaged, correctly connected, safely routed) • open the appropriate design modelling software • set up the software design modelling environment and select a suitable template/folder • identify relevant software design requirements to be implemented • identify the required standards and all relevant sources (such as software requirements and existing design) 1.4 use appropriate sources to obtain the required information for the software design model to be created 1.5 use three of the following to obtain the necessary data to produce the required design model: • new model brief/request • change order/modification request • technical publications • calculations

- software requirements
- standards reference documents (such as Universal Modelling Language (UML))
- notes from meetings/discussions
- specifications (such as software acceptance tests)
- regulations
- previous models/designs
- other available data

1.6 access and use the correct design modelling software

1.7 take into account seven of the following, as appropriate to the design model being produced:

- function
- quality
- testing method
- resources (such as memory, performance and bandwidth)
- cost
- lifetime of the product
- accuracy
- design structure
- operating environment
- interfaces
- safety
- ease of modification of design

1.8 use appropriate techniques to create software design models

1.9 use codes and other references that follow the required conventions

1.10 carry out all of the following before producing the software design model:

- ensure that the data and information they have is complete and accurate
- analyse the data and information to identify the model requirements
- recognise and deal with problems (such as technical issues and lack of, or incorrect information)

1.11 produce the finished software design models, with sufficient detail to allow implementation

1.12 use one of the following modelling methodologies to produce the software design:

- object orientated design (such as UML)
- functional design (such as Modular Approach to Software Construction Operation and Test (MASCOT)

1.13 create/modify the software design elements using four of the following:

- objects
- functions
- change requests
- classes
- procedures
- sequence diagrams

- types
- data

1.14 make sure that design models are checked and approved by the appropriate person

1.15 check the software design model for all of the following:

- completeness
- coupling and cohesion
- coherence
- traceability
- accuracy

1.16 save and store the software design model in appropriate locations, to include carrying out all of the following:

- check that the design model is correctly titled, referenced and annotated
- ensure that the software design model has been checked and that it complies to company procedures
- save the design model to an appropriate location (such as storage device, configuration database)
- register and store the design models in the appropriate company information system (where appropriate)
- record and store any changes to the design models in the appropriate company information system
- ensure that a separate backup copy is created and placed in safe storage

1.17 produce software design models which comply with one of the following:

- company standards and procedures
- customer standards and requirements
- statutory regulations and codes of practice
- software standards
- BS, ISO or BSEN standards and procedures
- other international standards

1.18 deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve.

Learning outcome
The learner will: 2. know how to produce engineering software design
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with software development environment hardware (to include such things as safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections) 2.2 explain the importance of good housekeeping arrangements (such

as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

2.3 describe the relevant sources and methods for obtaining any required technical information relevant to the model being produced (such as drawing briefs, specification sheets, request for changes or modifications to models; technical publications; calculations; software requirements)

2.4 explain the identification of the correct version of software tool, and the various design techniques that are supported by the tool

2.5 explain how to access the specific software design model to be used

2.6 explain the basic principles of software design and how to apply them to the work being undertaken

2.7 explain the types of representation that may be produced by the modelling software (such as static structure, sequence diagrams)

2.8 explain the national, international and organisational standards and conventions that are used for the models/drawings

2.9 explain the application and use of design modelling tools for either functional or object orientated methods

2.10 explain how to access, recognise and use a wide range of standard components and symbol libraries from the modelling tools

2.11 explain the need for document control (such as ensuring that completed models are approved, labelled and stored on a suitable storage device)

2.12 explain why it is necessary to be able to recall previous issues of modified models

2.13 describe when to act on their own initiative and when to seek help and advice from others.

Unit 364 Producing engineering software implementation

UAN:	F/601/2887
Level:	3
Credit value:	40
GLH:	71
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 64: Producing engineering software implementation (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to create a software implementation as part of the product definition activity, in accordance with approved procedures. The learner will be given a detailed brief or a request for change/modification order, and they will be required to access these requirements and to extract all necessary information in order to carry out the production of the software implementation. The learner will need to select the appropriate software development tool to use, based on the type and complexity of the software functions to be developed. The learner will be expected to use current British, European, international and company standards to produce the software implementation. The learner's responsibilities will require them to comply with organisational policy and procedures for working in the software development team. The learner will be required to report any problems with the computer hardware, software or procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying software development procedures. The learner will understand the system and software used, and its application, and will know about the various tools and techniques used to produce the software implementation, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working in the software development team. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. produce engineering software implementation
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 plan the software implementation activities before they start them 1.3 prepare for the software implementation activities, by carrying out all of the following: • check that all the software development environment hardware is in a safe and usable working condition (such as cables undamaged, correctly connected, safely routed) • start the software development environment • set up the development environment and select a suitable template/folder • identify relevant software requirements/design artefact/software code to be implemented/modified • identify the required standards and all relevant sources (such as software requirements, existing design and naming convention) 1.4 use appropriate sources to obtain the required information for the executable to be created 1.5 use three of the following to obtain the necessary data to produce the required software implementation: • new software implementation request • change order/modification request • technical publications • calculations • software design

- regulations
- previous software code
- standards reference documents
- technical notes (such as meetings/discussions, e-mail)
- other available data

1.6 demonstrate how the software implementation takes account of five of the following:
- function
- testing method
- resources (such as memory, performance and bandwidth)
- cost
- lifetime of the product
- algorithm accuracy
- software architecture
- operating environment
- interfaces (such as interrupts)
- safety
- coding standards

1.7 access and use the correct software development environment

1.8 carry out all of the following before producing the software implementation:
- ensure that the data and information they have is complete and accurate
- analyse the data and information to identify the requirements of the task
- recognise and deal with problems (such as technical issues and lack of, or incorrect information)

1.9 identify and use the required coding standards, as defined by company procedures

1.10 produce the software code with sufficient detail to allow compilation and execution

1.11 create/modify the software source code using four of the following:
- design objects
- requirements functionality
- change requests
- classes
- procedures
- functions
- parameters
- control structures
- types
- data

1.12 make sure that the software code produced is checked and approved by the appropriate person

1.13 check the software source code for all of the following:
- complexity
- coherence
- readability

- traceability
- accuracy

1.14 create the software executable using one of the following:
- compiler tool (such as integrated development tool)
- build scripts
- translator

1.15 save and store software source code files, source code review evidence and executable in appropriate locations, to include carrying out all of the following:
- ensure that their software code/code review evidence/executable has been checked to their company procedure
- check that the code/code review evidence/executable is correctly titled, referenced and annotated
- save the code/code review evidence/executable to an appropriate location (such as storage device, configuration database)
- create a separate backup copy, and place it in safe storage (where appropriate)
- register and store the software code/code review evidence/executable in the appropriate company information system (where appropriate)
- record and store any changes to the software code/code review evidence/executable in the appropriate company information system

1.16 produce software code/executable which complies with one of the following:
- company standards and procedures
- customer standards and requirements
- statutory regulations and codes of practice
- software standards
- BS, ISO or BSEN standards and procedures
- other international standards

1.17 deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve.

Learning outcome
The learner will: 2. know how to produce engineering software implementation
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with software development environment hardware (to include such things as safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections) 2.2 explain the importance of good housekeeping arrangements (such

as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

2.3 describe the relevant sources and methods for obtaining any required technical information (such as drawing briefs, specification sheets, request for changes or modifications to models; technical information)

2.4 describe the identification of the correct version of software tools, and the coding techniques that are supported by the tool

2.5 explain how to access the specific software code to be used

2.6 describe the documentation required for the software code (such as new request, change order/modification request, technical publications, calculations, software requirements)

2.7 explain the national, international and organisational standards and conventions that are used for the models/drawings

2.8 explain the application and use of development tools (including compilers, translators or build scripts)

2.9 explain how to access, recognise and use a wide range of standard components from the development tools

2.10 explain the need for document control (such as ensuring that completed executables are approved, labelled and stored on a suitable storage device)

2.11 explain why it is necessary to be able to recall previous issues of modified code

2.12 explain when to act on their own initiative and when to seek help and advice from others.

Unit 365 Testing engineering software

UAN:	F/601/2890
Level:	3
Credit value:	50
GLH:	99
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 65: testing engineering software (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to test software as part of the product definition activity, in accordance with approved procedures. The learner will be given a detailed brief and will be required to assess these requirements and to extract all necessary information in order to carry out the software test activity. The learner will need to select the appropriate software test method to use, based on the type and complexity of the software functions/software design/requirements to be tested. The learner will be expected to use current British, European, international and company standards to test the software. The learner's responsibilities will require them to comply with organisational policy and procedures for working in the software development team. The learner will be required to report any problems with the computer hardware, software or procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying software

test procedures. The learner will understand the computer system and software used, and its application, and will know about the various tools and techniques used to test the software, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working in the software development team. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. test engineering software
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 plan the software testing activities before they start them 1.3 prepare for the software testing activities, by carrying out all of the following: • check that the working environment is in a safe and appropriate condition and that all working equipment is in a safe and usable condition (such as cables undamaged, correctly connected, safely routed) • start the appropriate software test tool • set up the testing environment and select a suitable template/folder • identify relevant software requirements/design to be tested against • identify the required standards and all relevant sources (such as software requirements, design and software test methods) 1.4 use appropriate sources to obtain the required information for the software testing activity 1.5 use three of the following to obtain the necessary data to produce the required test script/case: • change order/modification request • technical publications • calculations • software requirements • technical notes (such as meetings/discussions, e-mail) • standards reference documents • specifications • regulations • software design

- other available data

1.6 demonstrate how the software testing takes account of six of the following:
- function
- quality
- testing method
- resources (such as memory, performance and bandwidth)
- cost
- lifetime of the product
- accuracy
- design structure
- run time sequencing
- operating environment
- interfaces
- safety
- software requirements
- system/software safety requirements

1.7 carry out all of the following before producing the software test script/case:
- ensure that the data and information they have is complete and accurate
- analyse the data and information to identify the test script/case requirements
- recognise and deal with problems (such as technical issues and lack of, or incorrect information)

1.8 use one of the following modelling methodologies to produce the software test script/case:
- black box
- white box

1.9 create/modify the software test script/case using four of the following:
- objects
- functions
- change requests
- classes
- procedures
- test rigs specifications
- types
- data

1.10 access and use the correct software test tools

1.11 use appropriate techniques to create the software tests

1.12 use references that follow the required conventions

1.13 run the test script using one of the following:
- target simulator environment
- host environment
- target environment

1.14 produce the finished test script/case, with sufficient detail to allow execution

1.15 make sure that the test script/case is checked and approved by the appropriate person

1.16 check the test script/case for all of the following:

- completeness
- sequencing
- traceability
- coverage
- accuracy

1.17 save and store the test script/case and results in appropriate locations, to include carrying out all of the following:

- check that the test script/case and results are correctly titled, referenced and annotated
- ensure that their test script/case and results have been checked and comply with company procedures
- save the test script/case and results to an appropriate location (such as storage device, configuration database)
- register and store the test script/case and results in the company information system (where appropriate)
- record and store any changes to the test script/case and results in the appropriate company information system
- ensure that a separate backup copy is created and placed in safe storage

1.18 execute a test script/case and record the results

1.19 review the results of the test script/case

1.20 produce a test script/case which complies with one of the following:

- company standards and procedures
- customer standards and requirements
- statutory regulations and codes of practice
- software standards
- BS, ISO or BSEN standards and procedures
- other international standards

1.21 deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve.

Learning outcome
The learner will: 2. know how to test engineering software
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with software development environment hardware (to include such things as safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections) 2.2 explain the importance of good housekeeping arrangements (such as cleaning down work surfaces; putting disks, manuals and

unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

2.3 describe the relevant sources and methods for obtaining any required technical information relevant to the test script/case being produced (such as new model brief/request, drawing briefs, specification sheets, request for changes or modifications to code; technical publications, calculations, software requirements)

2.4 explain test methodologies and national, international and relevant company software test procedures (such as black box, white box testing)

2.5 describe the identification of the correct version of software tool, and the various testing techniques that are supported by the tool

2.6 explain how to use and configure the testing environment (such as target, host and target simulator)

2.7 explain the basic principles of software testing, and how to create suitable tests for the particular application

2.8 explain how to access the specific software requirements, design model and code to be tested

2.9 explain the national, international and organisational standards and conventions that are used for the test script/case and results

2.10 explain the application and use of software testing tools

2.11 explain how to access, recognise and use a wide range of standard components and symbol libraries from the testing tools

2.12 explain the need for configuration control on all test artefacts (such as ensuring that completed test script/case and results are approved, labelled and stored on a suitable storage device)

2.13 explain why it is necessary to be able to recall previous issues of test script/case and results

2.14 explain when to act on their own initiative and when to seek help and advice from others.

Unit 366 Performing engineering software analysis techniques

UAN:	J/601/2891
Level:	3
Credit value:	50
GLH:	99
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 66: Performing engineering software analysis techniques (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to analyse software, in accordance with approved procedures, in order to demonstrate that the software is free from structural defects. The learner will be given a detailed brief on specific analysis techniques, and will be required to perform and report on the specific software analysis. The learner will need to select the appropriate software analytical method to use, based on the type and complexity of the software functions. The learner will be expected to use current British, European, international and company standards to analyse the software. The learner's responsibilities will require them to comply with organisational policy and procedures for working in the software development team. The learner will be required to report any problems with the computer hardware, software or procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good understanding of their work, and will provide

an informed approach to applying software analysis procedures. The learner will understand the computer system and software used, and its application, and will know, in adequate depth, about the various tools and techniques used to analyse the software.

The learner will understand the safety precautions required when working in the software development team. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. perform engineering software analysis techniques
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 plan the software analysis activities before they start them 1.3 prepare for the software analysis, by carrying out all of the following: • check that the working environment is in a safe and appropriate condition and that all working equipment is in a safe and usable condition (such as cables undamaged, correctly connected, safely routed) • start the appropriate software analysis tool • set up the analysis environment and select a suitable template/folder • identify relevant software to be analysed • identify the required standards and all relevant sources (such as software requirements, design and software coding standards) 1.4 use appropriate sources to obtain the required information for the analysis activity 1.5 access and use the correct software analysis tool 1.6 use two of the following to obtain the necessary data to analyse correctly the software code: • technical publications • calculations • software requirements • quality requirements • technical notes (such as meetings/discussions, e-mail) • standards reference documents • specifications • regulations • software design

- other available data

1.7 carry out all of the following before performing the software analysis:
- ensure that the data and information they have is complete and accurate
- analyse the data and information to identify requirements of the analysis to be preformed
- recognise and deal with problems (such as technical issues and lack of, or incorrect information)

1.8 use references that follow the required conventions

1.9 configure the software analysis tools to analyse the code, using three of the following:
- data flow
- control flow
- code language subsets
- metrics analysis
- information flow
- semantic analysis
- execution time measurement
- execution time analysis
- test coverage analysis

1.10 perform the software analysis using one of the following:
- software analysis tool
- code review
- manual analysis

1.11 check the analysis results for both of the following
- completeness
- completion

1.12 save and store the results in appropriate locations, to include carrying out all of the following:
- check that the results are correctly titled, referenced and annotated
- ensure that the results have been checked and comply with company procedures
- save the results to an appropriate location (such as storage device, configuration database)
- register and store the results in the appropriate company information system (where appropriate)
- ensure that a separate backup copy is created and placed in safe storage

1.13 review the findings of the analysis, using one of the following:
- formal report
- software quality report
- metrics report
- vendor software assessment
- analysis tool generated report

1.14 deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve.

Learning outcome
The learner will: 2. know how to perform engineering software analysis techniques
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with software development environment hardware (to include such things as safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections) 2.2 explain the importance of good housekeeping arrangements (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition) 2.3 describe the relevant sources and methods for obtaining any required technical information relevant to the software analysis (such as new model brief/request, drawing briefs, specification sheets, request for changes or modifications to code; technical publications; calculations; software requirements) 2.4 explain the software analysis methodologies, and national, international and relevant company software analysis procedures (such as software analysis tool, code review, manual analysis) 2.5 describe the identification of the correct version of the software analysis tool, and the various techniques that are supported by the tool 2.6 explain the application and use of the software analysis tools 2.7 explain how to use and configure the software analysis tool 2.8 explain how to access the specific code to be analysed 2.9 explain how to analyse software code using the correct tools/methods 2.10 explain how to access, recognise and use a wide range of standard components and symbol libraries from the tools 2.11 explain the need for configuration control on all artefacts (such as ensuring that completed results are approved, labelled and stored on a suitable storage device) 2.12 explain why it is necessary to be able to recall previous issues of analysis results 2.13 describe when to act on their own initiative and when to seek help and advice from others.

Unit 367 Measuring engineering software quality

UAN:	L/601/2892
Level:	3
Credit value:	40
GLH:	71
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 67: measuring engineering software quality (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to measure software quality as part of the product definition activity, in accordance with approved procedures. The learner will be given a detailed brief, and will be required to assess these requirements and to extract all necessary information in order to carry out this activity. The learner will need to select the appropriate software method to use, based on the project requirements. The learner will be expected to use current British, European, international and company standards to measure the software quality. The learner's responsibilities will require them to comply with organisational policy and procedures for working in the software development team. The learner will be required to report any problems with the computer hardware, software or procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to measuring

software quality. The learner will understand the computer system and software used, and its application, and will know about the various tools and techniques used to measure all aspects of software quality.

The learner will understand the safety precautions required when working in the software development team. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. measure engineering software quality
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 plan the software quality measurement activities before they start them 1.3 prepare for the software quality measurement activities by carrying out all of the following: • check that the working environment is in a safe and suitable condition and that all working equipment is in a safe and usable condition (such as cables undamaged, correctly connected, safely routed) • identify an appropriate software metric (such as lines of code, software test coverage) • set up the analysis environment • identify the relevant software code to be analysed • identify the relevant software process to be reviewed • identify the required standards and all relevant sources (such as software requirements, design and software coding standards) 1.4 use appropriate sources to obtain the required information for the measurement activities 1.5 use two of the following as sources of data to collect software metrics: • change order/modification requests • process and quality documents • software requirements • standards reference documents • testing tools • technical notes • software design • software analysis • code

1.6 access and use the correct software components
1.7 use appropriate techniques to create the software tests
1.8 use references that follow the required conventions
1.9 carry out all of the following before measuring software quality:
- ensure that the data and information they have is complete and accurate
- analyse the data and information to identify requirements of the quality analysis to be preformed
- recognise and deal with problems (such as technical issues and lack of, or incorrect, information)

1.10 check the output from the quality reviews
1.11 collect metrics, as required by one of the following:
- BS or ISO 9000 standards and procedures
- other accepted international standards
- customer (contractual) standards and requirements
- company standards and procedures
- recognised compliance agency/body's standards

1.12 save and store the results in appropriate locations, to include carrying out all of the following:
- check that the results are correctly titled, referenced and annotated
- ensure that the results have been checked and that they comply with the company procedure
- save the results to an appropriate location (such as storage device, configuration database)
- ensure that a separate backup copy is created and placed in safe storage

1.13 review the quality metrics for all of the following:
- completeness
- traceability
- accuracy

1.14 review the findings of the software analysis, using one of the following:
- formal report
- software quality report
- metrics report
- software vendor code assessment

1.15 deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve.

Learning outcome
The learner will: 2. know how to measure engineering software quality
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working in a software quality measuring environment (to include such things as safety guidance relating to the use of Visual Display Unit (VDU)

equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections)

2.2 explain the importance of good housekeeping arrangements (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

2.3 describe the relevant sources and methods for obtaining any required technical information relevant to the software quality measurement (such as new model brief/request, drawing briefs, specification sheets, request for changes or modifications to code; technical publications; calculations; software requirements; audit reports)

2.4 explain software quality standards and levels

2.5 explain software quality methodologies: national, international and relevant company software procedures

2.6 explain software quality measurements

2.7 explain the collection and use of software metrics

2.8 explain the need for configuration control on all components (such as ensuring that completed results are approved, labelled and stored on a suitable storage device)

2.9 explain why it is necessary to liaise with other engineers to establish software qualities

2.10 describe when to act on their own initiative, and when to seek help and advice from others.

Unit 368 Performing engineering software configuration management

UAN:	Y/601/2894
level:	Level 3
Credit value:	50
GLH:	99
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 68: Performing engineering software configuration management (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to perform software configuration management activities, from initial product definition until product disposal, in accordance with approved procedures. The learner will be given a detailed brief which includes all necessary information, in order to carry out the software configuration management activity. The learner will need to select the appropriate software configuration method to use, based on the type of data configured. The learner will be expected to use current British, European, international and company standards. The learner's responsibilities will require them to comply with organisational policy and procedures for working in the software configuration team. The learner will be required to report any problems with the computer hardware, software or procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying software configuration management procedures. The learner will understand the computer system and software used, and the various configuration tools used. The learner will demonstrate and adequate knowledge and use of configuration and change control techniques.

The learner will understand the safety precautions required when working in the software development team. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. perform engineering software configuration management
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 use appropriate sources to obtain the required information for the software configuration/change control activity 1.3 prepare for the software configuration management, by carrying out all of the following: • check that the working environment is in a safe and appropriate condition and that all working equipment is in a safe and usable condition (such as cables undamaged, correctly connected, safely routed) • start the appropriate software configuration/change control tool • set up the environment and select a suitable template/folder • identify the relevant item(s) to be configured • identify the required standards and all relevant sources (such as software requirements, design and software coding standards) 1.4 use one of the following to obtain the necessary data to apply correctly the software configuration/change control tasks: • change order/modification request • technical notes (such as meetings/discussions, e-mail) • change control board minutes • build request • regulations • other available data • backup initiation and recovery requests 1.5 access and use the correct software components that require

configuration/change control tasks

1.6 carry out all of the following before performing the software configuration/change control activities:
- ensure that the data and information they have is complete and accurate
- analyse the data and information to identify the correct items to be configured
- recognise and deal with problems (such as technical issues and lack of, or incorrect, information)

1.7 correctly perform change control activities within a software configuration framework, using one of the following techniques:
- baselines
- build management
- formal reviews
- problem reports
- change requests
- change boards

1.8 use references that follow the required conventions

1.9 perform the software configuration/change control tasks

1.10 check the output from the software configuration/change control tasks

1.11 check the change control and configuration for all of the following:
- completeness
- identification
- traceability
- accuracy

1.12 save and store the results in appropriate locations, to include carrying out all of the following:
- check that the results are correctly titled, referenced and annotated
- ensure that their results have been checked and that they comply with company procedures
- save the results to an appropriate location (such as storage device, configuration database)
- ensure that a separate backup copy is created and placed in safe storage
- register and store the results in the appropriate company information system (where appropriate)

1.13 deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve

1.14 demonstrate an ability to retrieve and re-establish a configured baseline.

Learning outcome
The learner will: 2. know how to perform engineering software configuration management
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with software development environment hardware (to include such things as safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections) 2.2 explain the importance of good housekeeping arrangements (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition) 2.3 describe the relevant sources and methods for obtaining any required technical information relevant to the software configuration and change control (such as new model brief/request; drawing briefs; specification sheet; request for changes or modifications to code; technical publications; calculations; software requirements) 2.4 explain the basic principles of software configuration/change control management 2.5 describe the software configuration and change control methods, and national, international and relevant company software configuration management procedures 2.6 explain the identification of the correct version of software tool, and the various techniques that are supported by the tool 2.7 explain how to set up and use the software configuration and change control tools 2.8 explain how to access the specific items under software configuration and change control 2.9 explain the need for configuration control on all artefacts (such as ensuring that completed results are approved, labelled and stored on a suitable storage device) 2.10 explain why it is necessary to be able to recall previous issues of configuration items 2.11 describe when to act on their own initiative, and when to seek help and advice from others.

Unit 369 Performing engineering software acquisition

UAN:	D/601/2895
Level:	3
Credit value:	40
GLH:	71
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 69: Performing engineering software acquisition (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to perform software acquisition. Software acquisition is to provide supporting evidence to the suitability for use of acquired software. The learner will be given a detailed brief, and will be required to assess these requirements and to extract all necessary information in order to carry out the software acquisition activity. The learner will need to select the appropriate software acquisition method to use, based on the selected or potential software supplier. The learner will be expected to use current British, European, international and company standards. The learner's responsibilities will require them to comply with organisational policy and procedures for working in the software acquisition team. The learner will be required to report any problems with the computer hardware, software or procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good understanding of their work, and will provide

an informed approach to applying software acquisition procedures. The learner will understand the various version, configuration and change control techniques, and supporting software, to an adequate depth.

The learner will understand the safety precautions required when working in the software development team. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace. The learner will be required to understand the requirements placed on the software supplier, as part of demonstrating that the delivered system will be safe during operational use.

Learning outcome
The learner will: 1. perform engineering software acquisition
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 plan the software acquisition activities before they start them 1.3 prepare for the software acquisition tasks, by carrying out all of the following: • check that the working environment is in a safe and appropriate condition and that all working equipment is in a safe and usable condition (such as cables undamaged, correctly connected, safely routed) • identify suitable software vendors • identify the required standards and all relevant sources (such as software requirements, design and software coding standards) 1.4 use appropriate sources to obtain the required information for the software acquisition activity 1.5 use one of the following to obtain the necessary data for the software acquisition tasks: • software vendor documents • software vendor audits • software vendor assessments • software user manuals • software help desks • Supplier Service Level Agreements (SSLA) 1.6 assess the software vendor, using established methods (such as process documents, tool documentation, vendor audit) 1.7 carry out all of the following before performing the software acquisition tasks:

- ensure that the data and information they have is complete, coherent and accurate
- analyse the information to identify issues that need to be resolved
- recognise and deal with problems (such as technical issues and lack of, or incorrect, information)

1.8 assess the data sent from a supplier, using two of the following sources:

- delivered baselines
- tool performance assessments
- SSLA performance reports
- licensing constraints
- project documents
- self assessments
- user manuals
- vendor audits
- software audits

1.9 use references to establish current practices against the supplied software

1.10 ensure that the software to be supplied is in line with current practices, using two of the following methods:

- tool conventions
- user feedback
- user manuals
- historical evidence
- user forums

1.11 report on the software to be acquired, using one of the following methods:

- audit reports
- software assessments

1.12 save and store the results in appropriate locations, to include carrying out all of the following:

- check that the results are correctly titled, referenced and annotated
- ensure that the results have been checked and that they comply with the company procedure
- save the results to an appropriate location (such as storage device, configuration database)
- ensure that a separate backup copy is created and placed in safe storage

1.13 deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve.

Learning outcome
The learner will: 2. know how to perform engineering software acquisition
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with software development environment hardware (to include such things as safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections) 2.2 explain the importance of good housekeeping arrangements (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition) 2.3 describe the relevant sources and methods for obtaining any required technical information relevant to the software acquisition tasks (such as new model brief/request; drawing briefs; specification sheets; request for changes or modifications to code; technical publications; calculations; software requirements) 2.4 explain the application and use of software acquisition procedures 2.5 explain software acquisition methods, and national, international and relevant company software acquisition tasks and procedures 2.6 explain the need for configuration control on all artefacts (such as ensuring that completed results are approved, labelled and stored on a suitable storage device) 2.7 explain why it is necessary to be able to recall previous issues of acquisition analysis results 2.8 explain when to act on their own initiative, and when to seek help and advice from others.

Unit 370 Performing engineering software safety assessments

UAN:	M/601/2898
Level:	3
Credit value:	40
GLH:	71
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 70: Performing engineering software safety assessments (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to perform a software safety assessment as part of the product definition activity, in accordance with approved procedures. The learner will be given a detailed brief, and will be required to assess these requirements and to extract all necessary information in order to carry out the software safety assessment. The learner will need to select the appropriate software safety assessment method to use, based on the safety criticality of the software functions. The learner will be expected to use current British, European, international and company standards to analyse the software. The learner's responsibilities will require them to comply with organisational policy and procedures for software safety assessment. The learner will be required to report any problems with computer hardware, software or procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. The learner's knowledge will provide a good understanding of their work, and will provide

an informed approach to applying software safety assessment procedures. The learner will understand the computer system and the safety assessment software used, and its application, and will know about the various tools and techniques used to assess whether the software integrity is sufficient for its intended role within a defined operational environment.

The learner will understand the safety precautions required when working in the software development team. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. perform engineering software safety assessments
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 plan the software safety assessment activities before they start them 1.3 prepare for the software safety assessment, by carrying out all of the following: • check that the working environment is in a safe and appropriate condition and that all working equipment is in a safe and usable condition (such as cables undamaged, correctly connected, safely routed) • identify all potential hazards to which the software can contribute • identify the severity of each hazard (such as catastrophic, severe, minor, negligible) • identify the software's worst case contribution to the hazard (such as direct cause, cause in conjunction with other failure, one of several independent contributors, no contribution) • identify the required standards and all relevant sources (such as customer (contractual) standards and requirements, recognised compliance agency/body's standards, software safety requirements, software design and code standards) 1.4 use appropriate sources to obtain the required information for the safety assessment activity 1.5 review four of the following to obtain sources of data to assess correctly the software safety: • change order/modification request • hazard identification and analysis documentation • Failure Modes and Effects Analysis (FMEA) documentation • software safety requirements • software design

- software process definition documentation
- software test and analysis reports
- standards reference documents

1.6 use references that follow the required conventions

1.7 determine the evidence required to achieve the necessary level of software integrity

1.8 carry out all of the following before performing the software safety assessment:

- ensure that the data and information they have is current, complete and under configuration control
- confirm that the system level hazard identification and analysis have been performed
- recognise and deal with problems (such as technical issues and lack of, or incorrect, information)

1.9 perform software safety assessment using four of the following:

- change order/modification request
- hazard identification and analysis documentation
- Failure Modes and Effects Analysis (FMEA) documentation
- software safety requirements
- software design
- software process definition documentation
- software test and analysis reports
- standards reference documents

1.10 review and report on a sample of the software safety related evidence for all of the following:

- completeness
- accuracy
- traceability
- adequacy

1.11 report their findings on the safety assessment performed

1.12 save and store the results in appropriate locations, to include carrying out all of the following:

- check that the results are correctly titled, referenced and annotated
- ensure that the results have been checked and that they comply with the company procedure
- save the results to an appropriate location (such as storage device, configuration database)
- ensure that a separate backup copy is created and placed in safe storage

1.13 deal promptly and effectively with problems within your control, and seek help and guidance from the relevant people if you have problems that you cannot resolve.

Learning outcome
The learner will: 2. know how to perform engineering software safety assessments
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with software development environment hardware (to include such things as safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections) 2.2 explain the importance of good housekeeping arrangements (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition) 2.3 describe the documentation required for the software safety analysis (such as hazard identification analysis documentation, FMEA documentation, software safety requirements, software test and analysis reports) 2.4 explain the basic principles of software safety assessments 2.5 describe the system hazard analysis methodologies, and national, international and relevant company software development procedures, methods and tools 2.6 explain the identification of the correct version of software tool, and the various techniques that are supported by the tool 2.7 explain how to use and configure the software safety analysis tools 2.8 explain how to access the specific code analysis results 2.9 explain how to access, recognise and use a wide range of standard components and symbol libraries from the tools 2.10 explain the need for configuration control on all components (such as ensuring that completed results are approved, labelled and stored on a suitable storage device) 2.11 explain why it is necessary to be able to recall previous issues of analysis results 2.12 describe when to act on their own initiative, and when to seek help and advice from others.

Unit 371 Performing low level programming for engineering software

UAN:	A/601/2905
Level:	3
Credit value:	50
GLH:	99
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 71: Performing low level programming for engineering software (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to develop the specialist software which directly interacts with the hardware. These software functions can be provided singly (such as a specific driver for a particular piece of hardware), as a group of related software functions (such as a library of common drivers), or as part of an operating system, which provides a low level functionality to software applications (such as synchronisation, scheduling, memory management and file handling). The learner will be given a detailed brief on the hardware, and will be required to assess these requirements and to extract all necessary information in order to develop software, which exploits the capabilities of the hardware. The learner will need to select the appropriate implementation method (such as machine code, assembler, hardware specific implementation) to use, based on the size and complexity of the software functions. The learner will be expected to use current British, European, international and company standards to produce the software.

The learner's responsibilities will require them to comply with organisational policy and procedures for software development. The learner will be required to report any problems with computer hardware, software or procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying software development procedures. The learner will understand the computer system and software used, and its application, and will know about the various tools and techniques used to program, test and analyse the software under development, and to ensure that they are sufficient for the intended role within a defined operational environment.

The learner will understand the safety precautions required when working in the software development team. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. perform low level programming for engineering software
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 plan the programming activities before they start them 1.3 prepare for software development, by carrying out all of the following: • check that all software development environment hardware is in a safe and usable working condition (such as cables undamaged, correctly connected, safely routed) • identify the required standards and all relevant sources (such as Defence Standards, other sector specific software standards, software requirements, software design and code standards) • identify the evidence required to allow software to be released to the users

- identify all test and diagnostic tools being used as part of the development (such as In-Circuit-Emulation (ICE), data-bus analysers and temporal execution time measurement devices)

1.4 use appropriate sources to obtain the required information for the hardware being programmed

1.5 use three of the following to obtain the necessary data to program the low level code:

- software design
- change order/modification request
- software safety requirements
- quality requirements
- specifications (hardware and software)
- regulations
- software development process definition documentation

1.6 select an appropriate implementation method

1.7 ensure the correct utilisation of the development tools being used to produce the software

1.8 carry out both of the following before commencing the low level programming:

- ensure that the data and information they have is current, complete and under configuration control
- check that all equipment being used is calibrated and tested for electrical safety, as per company standards and procedures

1.9 produce and execute the software, using two of the following:

- target processor
- target emulator
- representative development environment

1.10 produce evidence of correct operation

1.11 test the software on two of the following:

- target processor
- target emulator
- representative development environment

1.12 using two of the following:

- performance analysis tool
- in circuit emulation
- hardware probes
- instrumented code

1.13 check the test results for all of the following:

- completeness
- traceability
- accuracy

1.14 save and store the results in appropriate locations, to include carrying out all of the following:

- ensure that their results have been checked and that they comply with their company procedure
- check that the results are correctly titled, referenced and annotated
- save the results to an appropriate location (such as storage

device, configuration database)
- ensure that a separate backup copy is created and placed in safe storage
- register and store the results in the appropriate company information system

1.15 review and report their findings on the developed software (such as defects, limitations on use, dependencies on other software/hardware)

1.16 deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve.

Learning outcome

The learner will:

2. know how to perform low level programming for engineering software

Assessment criteria

The learner can:

2.1 explain the specific safety precautions to be taken when working with software development environment hardware (to include such things as safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections)

2.2 explain the importance of good housekeeping arrangements (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

2.3 describe the relevant sources and methods for obtaining any required technical information relevant to the low level programming (such as hardware data sheets, specification sheets, request for changes or modifications to code; technical information)

2.4 explain the specialist software development methods and tools used for low level programming (such as national, international and relevant company software development procedures, methods and tools)

2.5 explain the identification of the correct version of software tool, and the various techniques that are supported by the tool

2.6 explain the developing low level software

2.7 describe testing low level software

2.8 explain how to use and configure the tools

2.9 explain why it is necessary to be able to recall previous issues of test results

2.10 explain how to access, recognise and use a wide range of standard components and symbol libraries from the tools

2.11 explain the need for configuration control on all artefacts (such as ensuring that completed results are approved, labelled and stored on a suitable storage device)

2.12 describe when to act on their own initiative, and when to seek help and advice from others.

Unit 372 Performing computer system security assessments for engineering software

UAN:	F/601/2906
Level:	3
Credit value:	40
GLH:	71
Relationship to NOS:	This unit has been derived from national occupational standard engineering technical support Unit No 72: Performing computer system security assessments for engineering software (Suite 3).
Endorsement by a sector or other appropriate body:	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	This unit covers the skills and knowledge needed to prove the competences required to perform a computer system security assessment, in accordance with approved procedures. The learner will be given a detailed brief, and will be required to assess these requirements and to extract all necessary information in order to carry out the security assessment. The learner will need to select the appropriate computer systems security assessment methods to use, based on the type of computer application. The learner will be expected to use current British, European, international and company standards where appropriate. The learner's responsibilities will require them to comply with organisational policy and procedures for computer and information security. The learner will be required to report any problems with the computer hardware, software, security or procedures that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work to verbal/written instructions and draft specifications, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying computer security assessment procedures. The learner will understand the computer system and software used, and its application, and will know about the various tools and techniques used to assess whether the computer integrity is sufficient for its intended role within a defined operational environment.

The learner will understand the safety precautions required when performing the security assessment. The learner will be required to demonstrate safe and secure working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. perform computer system security assessments for engineering software
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 plan the computer system security assessment activities before they start them 1.3 prepare for the computer system security assessment, by carrying out all of the following: • check that the working environment is in a safe and suitable condition and that all working equipment is in a safe and usable condition (such as cables undamaged, correctly connected, safely routed) • identify all potential vulnerabilities which the computer system may have • identify the severity of each vulnerability (such as catastrophic, severe, minor, negligible) • identify the computer's worst case contribution to the vulnerability (such as direct cause, cause in conjunction with other failure, one of several independent contributors, no contribution) • identify the required standards and all relevant sources (such as customer (contractual) standards and requirements, recognised compliance agency/body's standards, corporate information security policy, industry best practice in secure computer operation) 1.4 use appropriate analysis tools to obtain the required information for the analysis activity 1.5 use references that follow the required conventions 1.6 determine the evidence required to achieve the necessary level of

computer and information security

1.7 review four of the following to obtain sources of data to assess correctly the computer system security:
- computer network connectivity configuration
- computer software version numbers and applied updates
- computer service start-up configuration
- computer peripheral connections
- computer system malware scan
- computer system vulnerability sweep
- computer system usage logs
- standards reference documents

1.8 perform the computer system security assessment, using four of the following:
- security analyser (such as base level security analyser)
- installed virus scanner
- malware and spyware scanning results
- computer usage logs
- server and gateway access logs
- record of connected devices (such as USB sticks)
- system vulnerability scanning tool
- standards reference documents

1.9 carry out all of the following before performing the computer system security assessment:
- ensure that the data and information they have is current, complete and under configuration control
- confirm that the system level security identification and analysis have been performed
- recognise and deal with problems (such as technical issues and lack of, or incorrect, information)

1.10 review and report on a sample of the security related evidence for all of the following:
- completeness
- traceability
- accuracy
- adequacy

1.11 report their findings on the assessment performed

1.12 save and store the results in appropriate locations, to include carrying out all of the following:
- check that the results are correctly titled, referenced and annotated
- ensure that the results have been checked and that they comply with the company procedure
- save the results to an appropriate location (such as storage device, configuration database)
- ensure that a separate backup copy is created and placed in safe storage

1.13 deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve.

Learning outcome
The learner will: 2. know how to perform computer system security assessments for engineering software
Assessment criteria
The learner can: 2.1 explain the specific safety precautions to be taken when working with software development environment hardware (to include such things as safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment such as lighting, seating, positioning of equipment; Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections) 2.2 explain the importance of good housekeeping arrangements (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition) 2.3 describe the documentation required for the computer system security analysis (such as scanner analysis reports, base level security reports, relevant log extracts and other analysis reports) 2.4 describe the computer system security analysis tools, and national, international and relevant company security policies, procedures, methods and tools 2.5 explain the identification of the correct version of software tool, and the various techniques that are supported by the tool 2.6 explain how to use and configure the computer security analysis tools 2.7 explain how to recognise specific security vulnerabilities (such as denial of service, attacks) 2.8 explain how to access the specific security and vulnerability results 2.9 explain how to access, recognise and use a wide range of standard vulnerability libraries from the tools 2.10 explain the need for configuration control on all components (such as ensuring that completed results are verified, labelled and stored on a suitable storage device) 2.11 explain why it is necessary to be able to recall previous issues of analysis results 2.12 describe when to act on their own initiative and when to seek help and advice from others.

Appendix 1 Relationships to other qualifications

Links to other qualifications

Mapping is provided as guidance and suggests areas of commonality between the qualifications. It does not imply that candidates completing units in one qualification have automatically covered all of the content of another.

Centres are responsible for checking the different requirements of all qualifications they are delivering and ensuring that candidates meet requirements of all units/qualifications.

This qualification has connections to the Level 3 NVQ in Engineering Technical Support (1686).

Literacy, language, numeracy and ICT skills development

This qualification can develop skills that can be used in the following qualifications:

- Functional Skills (England) – see **www.cityandguilds.com/functionalskills**
- Essential Skills (Northern Ireland) – see **www.cityandguilds.com/essentialskillsni**
- Essential Skills Wales – see **www.cityandguilds.com/esw**

Appendix 2 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on **www.cityandguilds.com**.

Centre Manual - Supporting Customer Excellence contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification, as well as updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document includes sections on:

- The centre and qualification approval process
- Assessment, internal quality assurance and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal quality assurance
- External quality assurance

Our Quality Assurance Requirements encompasses all of the relevant requirements of key regulatory documents such as:

- Regulatory Arrangements for the Qualifications and Credit Framework (2008)
- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

Access to Assessment & Qualifications provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information such on such things as:

- **Walled Garden:** how to register and certificate candidates on line
- **Qualifications and Credit Framework (QCF)**: general guidance about the QCF and how qualifications will change, as well as information on the IT systems needed and FAQs
- **Events**: dates and information on the latest Centre events
- **Online assessment**: how to register for e-assessments

Useful contacts

UK learners General qualification information	T: +44 (0)844 543 0033 E: **learnersupport@cityandguilds.com**
International learners General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: **intcg@cityandguilds.com**
Centres Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **centresupport@cityandguilds.com**
Single subject qualifications Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 F: +44 (0)20 7294 2404 (BB forms) E: **singlesubjects@cityandguilds.com**
International awards Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **intops@cityandguilds.com**
Walled Garden Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **walledgarden@cityandguilds.com**
Employer Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 E: **business@cityandguilds.com**
Publications Logbooks, Centre documents, Forms, Free literature	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413

If you have a complaint, or any suggestions for improvement about any of the services that we provide, email: **feedbackandcomplaints@cityandguilds.com**

About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. We offer over 500 qualifications across 28 industries through 8500 centres worldwide and award around two million certificates every year. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group operates from three major hubs: London (servicing Europe, the Caribbean and Americas), Johannesburg (servicing Africa), and Singapore (servicing Asia, Australia and New Zealand). The Group also includes the Institute of Leadership & Management (management and leadership qualifications), City & Guilds Land Based Services (land-based qualifications), the Centre for Skills Development (CSD works to improve the policy and practice of vocational education and training worldwide) and Learning Assistant (an online e-portfolio).

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