

Level 3 NVQ Diploma in Engineering Technical Support (Technical Services) (1786-34)

August 2013 Version 1.1



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 (Technical Services)	1786-34	600/2085/4

Version and date	Change detail	Section
1.1 August 2013	Wording of rules of combination	Structure (page 5)



Contents

1	Introduction	5
	Structure	5
2	Centre requirements	7
	Approval	7
	Resource requirements	7
	Candidate entry requirements	9
3	Delivering the qualification	11
	Initial assessment and induction	11
	Recommended delivery strategies	11
	Recording documents	11
4	Assessment	13
	Assessment of the qualification	13
	Recognition of Prior Learning (RPL)	15
5	Units	16
Unit 201	Complying with statutory regulations and organisational safety requirements	17
Unit 202	Using and interpreting engineering data and documentation	21
Unit 303	Working efficiently and effectively in engineering	26
Unit 343	Resolving engineering problems	31
Unit 344	Planning engineering activities	37
Unit 345	Implementing engineering activities	43
Unit 346	Monitoring engineering activities	48
Unit 347	Producing technical information for engineering activities	53
Unit 348	Obtaining resources for engineering activities	58
Unit 349	Obtaining and controlling materials for engineering activities	63
Unit 350	Providing technical sales and marketing support for engineering activities	69
Unit 351	Implementing quality control systems and procedures in an engineering environment	74
Unit 352	Scheduling engineering activities	79
Unit 353	Determining engineering requirements for the supply of products or services	86
Unit 354	Carrying out condition monitoring of engineering plant and equipment	91
Unit 355	Carrying out fault diagnosis on engineering plant and equipment	96

Unit 356	Providing technical advice and guidance on engineering activities	102
Unit 357	Carrying out project management of engineering activities	106
Unit 358	Developing and maintaining effective customer relationships	112
Unit 359	Handing over and exchanging responsibility for control of engineering activities	116
Unit 360	Carrying out health and safety risk assessments on engineering activities	121
Unit 361	Producing contractual arrangements to supply or procure goods or services for engineering activities	127
Appendix 1	Relationships to other qualifications	133
Appendix 2	Sources of general information	134



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 - technical services 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: <ul style="list-style-type: none"> Level 3 NVQ Extended Diploma in Engineering Technical Support

Structure

To achieve the **Level 3 NVQ Diploma in Engineering Technical Support (Technical Services)**, learners must achieve:

- **55** credits from the mandatory units, and
- a minimum of **39** credits from optional group 1, and
- a minimum of **40** credits from at least 2 units from optional groups 1 and 2

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

K/600/5755	343	Resolving engineering problems	40
Optional unit group 1			
T/600/5760	344	Planning engineering activities	40
J/600/5763	345	Implementing engineering activities	40
D/600/5767	346	Monitoring engineering activities	40
K/600/5772	347	Producing technical information for engineering activities	40
A/600/5775	348	Obtaining resources for engineering activities	40
R/600/5779	349	Obtaining and controlling materials for engineering activities	40
R/600/5782	350	Providing technical sales and marketing support for engineering activities	40
H/600/5785	351	Implementing quality control systems and procedures in an engineering environment	40
A/600/5789	352	Scheduling engineering activities	40
F/600/5793	353	Determining engineering requirements for the supply of products or services	40
R/600/5796	354	Carrying out condition monitoring of engineering plant and equipment	39
D/600/5798	355	Carrying out fault diagnosis on engineering Plant and equipment	50
Optional unit group 2			
R/600/5801	356	Providing technical advice and guidance on engineering activities	40
Y/600/5802	357	Carrying out project management of engineering activities	40
D/600/5803	358	Developing and maintaining effective customer relationships	20
H/600/5804	359	Handing over and exchanging responsibility for control of engineering activities	20
K/600/5805	360	Carrying out health and safety risk assessments on engineering activities	40
M/600/5806	361	Producing contractual arrangements to supply or procure goods or services for engineering activities	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: <ul style="list-style-type: none">• 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:<ul style="list-style-type: none">○ eye protection and Personal Protective Equipment (PPE)○ COSHH regulations○ 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

<p>activities to be undertaken</p> <p>1.4 follow organisational accident and emergency procedures</p> <p>1.5 comply with emergency requirements, to include:</p> <ul style="list-style-type: none"> • 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 <p>1.6 recognise and control hazards in the workplace</p> <p>1.7 identify the hazards and risks that are associated with the following:</p> <ul style="list-style-type: none"> • 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 <p>1.8 use correct manual lifting and carrying techniques</p> <p>1.9 demonstrate one of the following methods of manual lifting and carrying:</p> <ul style="list-style-type: none"> • lifting alone • with assistance of others • with mechanical assistance <p>1.10 apply safe working practices and procedures to include:</p> <ul style="list-style-type: none"> • 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.

<p>Learning outcome</p> <p>The learner will:</p> <p>2. know how to comply with statutory regulations and organisational safety requirements</p>
<p>Assessment criteria</p> <p>The learner can:</p> <p>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)</p> <p>2.2 describe the specific regulations and safe working practices and procedures that apply to their work activities</p>

- 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:	<p>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.</p>

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: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• 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)

<ul style="list-style-type: none"> • 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 <p>1.8 deal promptly and effectively with any problems within their control and report those which cannot be solved</p> <p>1.9 report any inaccuracies or discrepancies in documentation and specifications.</p>
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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 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 is linked to 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:	<p>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.</p> <p>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.</p> <p>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</p>

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

<ul style="list-style-type: none"> • supplier relationships • internal communication • customer service • training and development • teamwork • other <p>1.12 maintain effective working relationships with colleagues to include two of the following:</p> <ul style="list-style-type: none"> • colleagues within own working group • colleagues outside normal working group • line management • external contacts <p>1.13 review personal training and development as appropriate to the job role</p> <p>1.14 review personal development objectives and targets to include one of the following:</p> <ul style="list-style-type: none"> • 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 343

Resolving engineering problems

UAN:	K/600/5755
Level:	3
Credit value:	40
GLH:	96
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 43: Resolving engineering problems (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to resolve engineering problems, in accordance with approved procedures. The learner will be required to investigate the problems, obtaining all the necessary information from the relevant sources to enable them to establish a clear picture of the situation, to identify and evaluate potential corrective actions, and to select the most appropriate and effective solution. The learner's proposed solution will take into account the effects on both the engineering process and on the people involved.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures during the rectification of the engineering problem, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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.</p> <p>The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying problem solving techniques and procedures to engineering situations. The learner will understand the relevant engineering process, and will know about the company</p>

procedures and systems of operation, in adequate depth to provide a sound basis for carrying out the activities to the required standard.

The learner will be aware of any company/customer, legislative or regulatory health, safety and environmental requirements applicable to the engineering activities being investigated. The learner will understand the specific safety precautions required when carrying out the investigation, especially those for isolating equipment and for taking the necessary safeguards to protect themselves and others in the work area. 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. resolve engineering problems
Assessment criteria
The learner can: 1.1 take prompt action to diagnose and rectify the operational problems and keep all relevant people informed of progress 1.2 communicate the solution to appropriate people, using the following methods: <ul style="list-style-type: none">• specific company documentation• plus one more from the following:<ul style="list-style-type: none">○ written or typed report○ verbal report○ electronic mail○ computer based presentation 1.3 obtain all relevant information relating to the problems 1.4 use information obtained from three of the following sources to help evaluate the problem: <ul style="list-style-type: none">• statistical data• historical records• quality audits• external sources• feedback from user/customer• condition monitoring• fault diagnostics• operational procedures/manufacturing manuals• health and safety information• environmental documents• development tests

- manufacturer's data
- 1.5 identify correctly the nature and extent of the problems
- 1.6 carry out all of the following during the problem solving activity:
- discuss/consult with the relevant people about the extent of the problem and its impact on the engineering activity
 - gather all appropriate information to help identify or clarify the problem
 - evaluate possible solutions, considering temporary, short term and long term solutions
 - consider cost implications for each solution
 - select the most appropriate solution to rectify the problem
 - communicate the proposed solution to the relevant people, obtaining feedback where appropriate
 - prepare a plan of action for implementation of the agreed solution
 - ensure that the agreed solution is implemented correctly and promptly
 - monitor outcomes of the rectification activity, and make any necessary revisions to the plan of action
 - ensure that the problem is rectified to the agreed level of acceptability
 - ensure that all information is documented to provide an audit trail
 - identify the root cause of the problem, using a standard technique
 - implement preventive measures, where applicable, to ensure that there is no recurrence of the problem
- 1.7 evaluate all realistic engineering solutions to rectify the problems
- 1.8 identify the most effective engineering solution for rectifying the problems
- 1.9 resolve engineering problems associated with one of the following engineering disciplines:
- drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)
 - manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
 - material processing activities (such as heat treatment, casting, injection moulding, purification)
 - composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
 - finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
 - assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
 - installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
 - plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
 - equipment capability studies/performance measurement
 - movement of materials, components or finished goods

- business improvement activities
 - engineering safety audits or risk assessments
 - quality control/quality assurance
 - maintenance activities
 - testing and trialling
 - modification and repair activities
 - research and development
 - commissioning/decommissioning
 - engineering support services
- 1.10 rectify engineering problems arising from two of the following:
- component/assembly failure
 - equipment malfunction
 - design related
 - quality related
 - scheduling/planning
 - product over budget
 - project slippage
 - ergonomically related
 - production control
 - contractor related
 - safety related
 - customer request
 - deviation from component/product specification
 - material handling devices
 - utilities supply (gas, electricity, water, air, etc)
 - product/service over lead time
 - lack of resources/materials
 - environmental/compatibility
 - deviation from departmental procedure(s)
 - other specific situations
- 1.11 ensure that engineering solutions are implemented correctly and promptly
- 1.12 determine and implement the solution for two of the following:
- temporary (interim solution)
 - short term (will require further action)
 - long term (permanent solution)
- taking into account both of the following:
- safety/environmental considerations
 - associated costs
- 1.13 ensure that the rectification complies with all relevant regulations and guidelines from all of the following, as appropriate:
- organisational guidelines and codes of practice
 - equipment manufacturer's operation specification/range
 - recognised compliance agency/body's standards
 - customer standards and requirements
 - BS and/or ISO standards

- health, safety and environmental requirements.

Learning outcome

The learner will:

2. know how to resolve engineering problems

Assessment criteria

The learner can:

- 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities or work area in which the problem exists
- 2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines when determining solutions to the engineering problems
- 2.3 explain how to obtain information on the engineering requirements, and the type of information that is available (such as customer requirements and instructions, quality control requirements, product specification, manufacturing methods)
- 2.4 explain how to access and use the appropriate information and documentation systems
- 2.5 explain how to obtain and interpret drawings, charts, specifications, manufacturers' manuals, history/maintenance reports and other documents needed in the problem solving process
- 2.6 describe the company engineering operation procedures where the problem exists
- 2.7 describe the business need for problem identification and removal
- 2.8 describe the effects of engineering problems on associated activities
- 2.9 describe the communication techniques used to obtain information
- 2.10 describe the principles of effective problem solving, the main problem solving methods and techniques in use, and how to apply them
- 2.11 describe the benefits of adopting a formalised problem solving process
- 2.12 explain how to involve the user/customer in the problem solving process
- 2.13 describe the importance of collecting as much relevant information as possible, and of collating such information in a way which facilitates decision making, and the methods to achieve this
- 2.14 describe the action planning (to include risk analysis, testing decisions, determining time-scales and protecting the user/customer)
- 2.15 describe the importance of analysing problems from a variety of perspectives
- 2.16 explain how to define and verify root cause of a problem
- 2.17 describe the importance of involving a range of relevant people in generating possible solutions
- 2.18 describe the importance of developing a range of possible options in solving problems
- 2.19 describe the factors to be taken into account when resolving problems and determining suitable solutions (especially those covering working conditions and safety)
- 2.20 describe the methods and techniques for evaluating information
- 2.21 explain how to present possible solutions in a way which helps

- relevant people to reach an informed and realistic judgement
- 2.22 explain how to determine and select permanent corrective actions (to include decision making, assessing the criteria and determining the risks, costs and generating alternatives)
 - 2.23 describe the process used in the organisation to validate the solution to the engineering problem
 - 2.24 explain how to prevent recurrence of the problems (to include proposed changes to management systems, operating systems and procedures, and identification of opportunities for improvements)
 - 2.25 describe the importance of customer care and satisfaction
 - 2.26 describe the importance of maintaining records of the problem solving activities; what needs to be recorded, and where records are kept
 - 2.27 describe the company procedures that apply to the rectification of problems
 - 2.28 describe the company reporting procedures, documentation and their application
 - 2.29 describe the different ways in which the solutions can be reported back
 - 2.30 identify whom to inform of actions taken, and by what means
 - 2.31 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
 - 2.32 describe the sources of technical expertise if they have problems that they cannot resolve.

Unit 344

Planning engineering activities

UAN:	T/600/5760
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 44: Planning engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to plan engineering activities, in accordance with approved procedures. The learner will need to produce plans for significant engineering activities requiring multiple stages in their execution, and this will cover such things as component/product manufacturing, assembly activities, installation, materials processing and finishing, testing and trialling, commissioning, planned maintenance, lifting, moving and transporting of goods or materials, and plans for capability studies or equipment replacement programs. The learner will also be required to establish the activities that must be carried out, the methods and resources to be used, and to produce a detailed plan of operation. The learner will be required to complete the work within agreed timescales, whilst ensuring that the activities within their control conform to organisational and legal requirements.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for planning the engineering activities, and to report any problems with the activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility</p>

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 the techniques and procedures used when planning engineering activities. The learner will understand the engineering activities within their area of responsibility, including the availability of resources, in adequate depth to provide a sound basis for carrying out the planning process to the required standard. The learner will understand their organisation's methods of operation, in sufficient detail to enable them to make informed decisions.

The learner will be aware of any health, safety and environmental requirements applicable to their area of responsibility. 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. plan engineering activities
Assessment criteria
The learner can: 1.1 carry out all of the following when determining and producing the engineering plans: <ul style="list-style-type: none">• use the correct issue of company information• check that all essential information and data needed to produce the plans is available• collect relevant information on the engineering requirements, operations, methods and resources• determine the availability of resources required• ensure that the activities to be carried out fall within budget constraints• ensure that health and safety regulations and safe working practices are taken into account• ensure that the influence of working conditions is recognised and included in the plans• present the engineering plans in the appropriate formats 1.2 collect the information needed to prepare the plan 1.3 identify health and safety issues and safe working practices and procedures that must be followed 1.4 ensure that the plans include any relevant regulations, standards and guidelines from all of the following, as appropriate: <ul style="list-style-type: none">• organisational guidelines and codes of practice

- equipment manufacturer's operation specification/range
 - health, safety and environmental requirements
 - recognised compliance agency/body's standards
 - customer standards and requirements
 - BS and/or ISO standards
- 1.5 identify the operations to be carried out and determine their sequence
- 1.6 establish which methods are required and what resources are to be used
- 1.7 identify any special requirements and incorporate them in the plan
- 1.8 estimate timescales required
- 1.9 prepare and record the plan
- 1.10 prepare plans that include details for six of the following:
- description of the activities to be carried out
 - the sequence in which the activities will take place
 - the documentation to be used (such as drawings, specifications, quality assurance, surveys)
 - people required who have the necessary skills and knowledge
 - the raw materials required (such as type of material, form of material, amount of material)
 - consumable materials required (such as welding accessories, masking mediums, oil)
 - bought-in standard components (such as bearings, electrical or electronic components, fluid power components, mechanical fasteners)
 - equipment required (such as hand tools, power tools, machinery, lifting and handling equipment)
 - measuring or test equipment (such as mechanical measuring, electrical measuring)
 - any outside support services required (such as material treatments, specialist lifting and moving equipment)
 - any special environmental/legislative requirements that must be met
 - special/specific safety equipment required (such as fume extraction, fire equipment)
 - space required
 - financial considerations
 - the timescales to be met
 - utilities required
- 1.11 produce engineering plans for one of the following:
- drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)
 - manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
 - material processing activities (such as heat treatment, casting, injection moulding, purification)
 - composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
 - finishing activities (such as stripping finishes, painting, plating,

<p>anodising, veneering, lacquering)</p> <ul style="list-style-type: none"> • assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking) • installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment) • plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement) • equipment capability studies/performance measurement • movement of materials, components or finished goods • business improvement activities • engineering safety audits or risk assessments • quality control/quality assurance • maintenance activities • testing and trialling • modification and repair activities • research and development • commissioning/decommissioning • engineering support services <p>1.12 Inform the appropriate people when the plan is completed</p> <p>1.13 record and present the plans to the appropriate people, using the following methods:</p> <ul style="list-style-type: none"> • specific company documentation <p>plus one more method from the following:</p> <ul style="list-style-type: none"> • written or typed report • verbal report • electronic mail • computer based presentation <p>1.14 carry out all of the following on completion of the planning activities:</p> <ul style="list-style-type: none"> • validation and evaluation of the planning systems and procedures used • suggested improvements to their process of planning • recommendations for improvements or changes to the engineering activities that were planned <p>1.15 deal effectively with problems within their control and report those that cannot be solved.</p>

Learning outcome
The learner will: 2. know how to plan engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be used and plans being produced 2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines when producing the engineering plans

- 2.3 explain how to obtain information on the engineering requirements, and the type of information that is available (such as customer order requirements and instructions, quality control requirements, product specification, manufacturing methods)
- 2.4 explain how to access and use the appropriate information and documentation systems
- 2.5 describe the types of data that should be included in the engineering plans (such as activities to be carried out, sequence in which they must be carried out, timescales, resource requirements, health and safety issues)
- 2.6 explain how to extract information from drawings, documents and related specifications (to include symbols and conventions to appropriate BS or ISO standards and, where appropriate, BS 7671/IEE wiring regulations) in relation to work being planned
- 2.7 describe the materials, formats, codes and conventions that are used in preparing the plans
- 2.8 describe the main planning methods and techniques in use, and what problems could occur in them
- 2.9 describe the factors to be taken into account when preparing the plans, especially those covering working conditions and safety
- 2.10 describe the main types of resources involved with different types of engineering activity, and the typical timescales for providing them
- 2.11 describe the obvious (and hidden) costs of resources/activities
- 2.12 describe the normal timescales for carrying out specific engineering activities, and how and why they vary
- 2.13 describe the products (or assets) involved in the activity being planned, and their availability
- 2.14 describe the engineering activities associated with these products/assets, and the types of data relevant to them
- 2.15 describe the development of the engineering plans (to include both master documents and working instructions, along with their purpose, content and status)
- 2.16 explain how to prepare the plans (to include the structure, style, clarity and compliance with relevant standards)
- 2.17 describe the process used in the organisation to validate the plans produced
- 2.18 describe the control procedure for ensuring that the plans are maintained up to date
- 2.19 describe the procedures for changing the plans, and why control procedures are used
- 2.20 describe the importance of maintaining records; what needs to be recorded and where records are kept
- 2.21 explain why contingency plans need to be drawn up
- 2.22 explain who to inform about the plans
- 2.23 describe the different ways of presenting information to different people
- 2.24 describe the importance of providing the right information at the right time
- 2.25 describe the roles and responsibilities of key personnel in their organisation
- 2.26 describe the problems that can occur during the implementation of the plan, and how these problems can be rectified
- 2.27 describe the extent of their own responsibility and to whom they

- should report if they have any problems that they cannot resolve
- 2.28 describe the sources of technical expertise if they have problems they cannot resolve
 - 2.29 describe the organisational procedures for providing information to different people.

Unit 345

Implementing engineering activities

UAN:	J/600/5763
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 45: implementing engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to implement engineering activities, in accordance with approved procedures. The learner will be required to apply appropriate methods and procedures to ensure that the resources and systems available to them are used effectively and efficiently. The learner will also be required to identify any opportunities to improve the engineering activity during the implementation, and to convey this information to the appropriate people and department (such as with a new or changed assembly or manufacturing activity which may involve planning, design or other departments).</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the implementation of the engineering activities, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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.</p> <p>The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to implementing engineering activities. The learner will be expected to have knowledge that will include</p>

resource management principles. The learner will understand their organisation's methods of operation and quality assurance systems, in sufficient detail to enable them to make informed decisions, and to carry out the implementation activities to the required standard.

The learner will be aware of any company, legislative or regulatory health, safety and environmental requirements applicable to the engineering activity being implemented. 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. implement engineering activities
Assessment criteria
The learner can: 1.1 confirm that conditions are suitable to implement operational methods and procedures 1.2 confirm all of the following during the implementation: <ul style="list-style-type: none">• appropriate plant and equipment is available• materials and components are ready for use• required resources are available• timescales for undertaking the activities are as planned• quality control systems and procedures are in place• health and safety requirements can be met• environmental conditions are suitable• work area/site is suitably prepared• relevant people are informed 1.3 carry out all of the following when implementing the engineering activities: <ul style="list-style-type: none">• use the correct issue of company information• check that all essential information and data needed to implement the engineering activity is available• collect relevant information on the engineering and customer requirements, operations and methods• use the information collected to determine an implementation plan• identify potential problems which may influence the implementation of the engineering activity• check that the appropriate resources will be available at the time they are required• ensure that health and safety regulations and safe working practices are taken into account• ensure that the influence of working conditions is recognised

and included in the implementation plans

1.4 carry out the implementation of one of the following engineering activities:

- drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)
- manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
- material processing activities (such as heat treatment, casting, injection moulding, purification)
- composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
- finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
- installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
- plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
- equipment capability studies/performance measurement
- movement of materials, components or finished goods
- business improvement activities
- engineering safety audits or risk assessments
- quality control/quality assurance
- maintenance activities
- testing and trialling
- modification and repair activities
- research and development
- commissioning/decommissioning
- engineering support services

1.5 provide clear and accurate instructions to all the relevant people

1.6 use the following methods to provide the information/instructions:

- specific company documentation

plus one more method from the following:

- written or typed report
- verbal report
- electronic mail

1.7 obtain accurate information on the operational activities being undertaken

1.8 obtain information on the activities and resources required, from three of the following sources:

- design office
- quality engineering
- plant engineering
- production engineering
- contractor
- customer
- process engineering

<ul style="list-style-type: none"> • planning department • management/directors • sales department • health and safety/environmental engineering • other specific <p>1.9 ensure that quality assurance systems are correctly implemented</p> <p>1.10 ensure that engineering support systems are operating correctly</p> <p>1.11 confirm that one of the following support systems are operating effectively:</p> <ul style="list-style-type: none"> • resource supply (such as materials, equipment and people) • transport • logistics • procurement • utilities <p>1.12 control the use of resources to achieve the most effective results</p> <p>1.13 identify opportunities to improve the operational methods and procedures</p> <p>1.14 carry out all of the following on completion of the implementation activities:</p> <ul style="list-style-type: none"> • validation and evaluation of the implementation systems and procedures used • suggested improvements to their process of implementation • recommendations for improvements or changes to the engineering activities that were implemented <p>1.15 ensure that the implementation of operational methods and procedures complies with all relevant regulations and guidelines</p> <p>1.16 ensure that implementation methods and procedures used comply with relevant regulations and guidelines, from all of the following, as appropriate:</p> <ul style="list-style-type: none"> • organisational guidelines and codes of practice • equipment manufacturer's operation specification/range • health, safety and environmental requirements • recognised compliance agency/body's standards • customer standards and requirements • BS and/or ISO standards.
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Learning outcome
The learner will: 2. know how to implement engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be implemented 2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines when implementing the engineering processes 2.3 describe the Personal Protective Equipment that is required for the work area and process being implemented

- 2.4 explain how to obtain information on the engineering requirements, and the type of information that is available (such as customer requirements and instructions, quality control requirements, product specification, manufacturing methods)
- 2.5 explain how to access and use the appropriate information and documentation systems
- 2.6 describe the engineering methods and procedures that could be used for different types of engineering activity
- 2.7 explain how to identify conditions that are suitable, and those not suitable, for different types of engineering activities
- 2.8 explain how and where to obtain details of the engineering activities being undertaken
- 2.9 describe the types of data that they will require to implement the engineering activity (such as the activities to be carried out, the sequence in which they must be carried out, timescales, resource requirements, health and safety issues)
- 2.10 explain how to extract information from drawings, documents and related specifications (to include symbols and conventions to appropriate BS or ISO standards and, where appropriate BS 7671/IEE wiring regulations), in relation to work being planned
- 2.11 describe the materials, formats, codes and conventions that are used in the drawings and plans
- 2.12 describe the factors to be taken into account when implementing the engineering activity, especially those covering working conditions and safety
- 2.13 describe the main types of resource involved with different types of engineering activity, and the typical timescales for providing them
- 2.14 explain how to verify that resources are suitable
- 2.15 describe the timescales for carrying out specific engineering activities
- 2.16 describe the use of the engineering plans and instruction (to include working instructions, along with their purpose and content)
- 2.17 describe the procedures for changing the plans, to take account of changed circumstances or improvements in the process
- 2.18 explain how to present observations and recommendations, in the appropriate formats
- 2.19 describe the importance of maintaining records; what needs to be recorded and where records are kept
- 2.20 describe the quality assurance systems that are being used
- 2.21 describe the engineering support systems that are available
- 2.22 explain why contingency plans need to be drawn up
- 2.23 identify whom to inform about changes to the plans
- 2.24 describe the different ways of presenting information to different people
- 2.25 describe the importance of providing right information at the right time
- 2.26 describe the roles and responsibilities of key personnel associated with the engineering activity
- 2.27 describe the problems that can occur during the implementation of the engineering activity, and how these problems can be rectified
- 2.28 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
- 2.29 describe the sources of technical expertise if they have problems they cannot resolve.

Unit 346

Monitoring engineering activities

UAN:	D/600/5767
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 46: monitoring engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to monitor engineering activities, in accordance with approved procedures. The learner will be required to monitor the engineering activity, and the supply and use of resources, both within the company and/or at customer premises, at suitable intervals. In addition, the learner may be required to monitor suppliers and contractors associated with the activity. During the monitoring process, the learner will be required to confirm that the engineering methods used are appropriate, and that the outputs and materials used are within the required specification.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the engineering activities being monitored, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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.</p> <p>The learner's knowledge will include knowledge of both organisational procedures and discipline-specific engineering principles and processes, within their area of responsibility. This will provide a</p>

good understanding of their work, and will provide an informed approach to applying monitoring procedures to engineering activities. The learner will be conversant with the relevant organisational and quality assurance procedures within their area of responsibility. The learner will also have a knowledge of resource management principles, quality assurance principles and problem solving techniques, in adequate depth to provide a sound basis for carrying out the monitoring activities to the required standards.

The learner will be aware of any company/customer, legislative or regulatory health, safety and environmental requirements applicable to the engineering activities being monitored. 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. monitor engineering activities
Assessment criteria
The learner can: 1.1 monitor the operational processes at suitable opportunities 1.2 carry out all of the following during the monitoring activities: <ul style="list-style-type: none">• obtain the necessary specifications and documents required for the monitoring process• obtain approval to carry out the monitoring activities• ensure that all appropriate personnel are fully informed of their intended activities• use appropriate Personal Protective Equipment for the area in which they are carrying out the monitoring activities• apply safe working practices and procedures at all times• ensure that by-products and waste are disposed of correctly• follow the defined monitoring procedures at all times 1.3 carry out the monitoring activities on one of the following engineering activities: <ul style="list-style-type: none">• drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)• manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)• material processing activities (such as heat treatment, casting, injection moulding, purification)• composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)

- finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
- installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
- plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
- equipment capability studies/performance measurement
- movement of materials, components or finished goods
- business improvement activities
- engineering safety audits or risk assessments
- quality control/quality assurance
- maintenance activities
- testing and trialling
- modification and repair activities
- research and development
- commissioning/decommissioning
- engineering support services

1.4 during the monitoring activity, carry out all of the following:

- ensure there is an effective supply and use of resources (such as people, materials, equipment)
- verify that materials or equipment used are within specification
- evaluate the outputs of the engineering process, and compare these with specifications
- record any deviations from agreed plans and schedules
- confirm that all relevant regulations and guidelines are complied with
- ensure that relevant people are kept informed

1.5 monitor the engineering activity, using two of the following techniques:

- scheduled
- random
- reactive

1.6 use two of the following during the monitoring activity:

- observation
- sampling
- data collection
- consultations with relevant people

1.7 monitor the supply and use of resources to ensure that they are effectively used

1.8 confirm that the materials used during the operational processes comply with specifications

1.9 confirm that suitable operational methods and procedures have been used

1.10 identify any variations from agreed plans and schedules

1.11 ensure that any problems with the operational processes are identified and solved promptly

- 1.12 obtain relevant information from the appropriate sources, to include two of the following:
- work orders
 - contracts
 - plans/designs
 - purchase orders
 - standard operating procedures
 - planning documentation
 - quality standards
 - equipment or materials supplier information
 - schedules
 - production control documentation
- 1.13 ensure that the outputs of the operational processes comply with specifications
- 1.14 carry out all of the following on completion of the monitoring activities:
- validation and evaluation of the monitoring systems and procedures used
 - suggested improvements to their process of monitoring the engineering activity
 - recommendations for improvements or changes to the engineering activities that were monitored
- 1.15 communicate the outcomes of the monitoring activity to the relevant people, using the following methods:
- specific company documentation
- plus one more method from the following:
- written or typed report
 - verbal report
 - electronic mail
 - computer-based presentation
- 1.16 ensure that the operational processes comply with all relevant regulations and guidelines
- 1.17 the process being monitored must comply with relevant regulations, standards and guidelines from all of the following, as appropriate:
- organisational guidelines and codes of practice
 - equipment manufacturer's operation specification/range
 - health, safety and environmental requirements
 - recognised compliance agency/body's standards
 - customer standards and requirements
 - BS and/or ISO standards.

Learning outcome
The learner will: 2. know how to monitor engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations

- and guidelines relating to the engineering activities to be monitored
- 2.2 describe the specific regulations and guidelines that are relevant to the activities being monitored
 - 2.3 describe the specific safety precautions to be taken when carrying out the monitoring and associated activities
 - 2.4 describe the Personal Protective Equipment to be worn in the specific work area, and where this can be obtained
 - 2.5 describe the implications of not taking account of legislation, regulations, standards and guidelines when carrying out the monitoring activities
 - 2.6 describe the organisational procedures for determining when monitoring should occur, and how it should be undertaken
 - 2.7 describe the monitoring methods and procedures that should be used for the types of engineering activity within their area of responsibility
 - 2.8 describe the potential variations from plans and schedules that might occur during monitoring
 - 2.9 describe the good working knowledge of the processes and specifications of the activity being monitored
 - 2.10 describe the quality assurance systems that are being used
 - 2.11 describe the types of problem that could occur with the monitoring process, and the organisational methods and procedures for resolving them
 - 2.12 describe the importance of solving problems quickly
 - 2.13 explain how to check the outputs of the monitoring process against the specified inputs
 - 2.14 describe the procedures for obtaining information on resources
 - 2.15 explain how to assess the need for resources
 - 2.16 explain how to verify that resources are suitable, and are available within or to the organisation
 - 2.17 describe the importance of maintaining records of the monitoring activities
 - 2.18 describe the type of information to be recorded, and the amount of detail that is required
 - 2.19 explain where records are kept, and the procedure for obtaining them
 - 2.20 describe the importance of ensuring that any records that they use are correctly updated and returned to the appropriate location
 - 2.21 describe the importance of customer care and satisfaction
 - 2.22 describe the different ways of presenting information to different people
 - 2.23 describe the organisational reporting processes and lines of communication
 - 2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
 - 2.25 describe the sources of technical expertise if they have problems they cannot resolve.

Unit 347

Producing technical information for engineering activities

UAN:	K/600/5772
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 47: Producing technical information for engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to produce technical information for engineering activities, in accordance with approved procedures. The learner will be required to produce the technical information for engineering activities such as machining, assembly, fabrication, materials processing and finishing, maintenance, installation and commissioning, material handling and lifting, and other operational activities. The learner will need to produce the technical information in the correct form for the specific engineering activities to take place, and to pass them on to the appropriate people, within agreed timescales. The learner must also ensure that the activities within their control, and the technical information provided, conform to organisational and legal requirements.</p>

The learner's responsibilities will require them to comply with organisational policy and procedures for producing the technical information, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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 gathering appropriate information, determining the technical information required, and presenting the required information in the relevant formats. The learner will understand their organisation's methods of operation, in sufficient detail to enable them to make informed decisions.

The learner will be aware of any health, safety and environmental requirements applicable to their area of responsibility. 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 technical information for engineering activities
Assessment criteria
The learner can: 1.1 produce technical information that contains all the relevant and necessary data for the engineering activity to be carried out 1.2 carry out all of the following when determining and producing the technical information: <ul style="list-style-type: none">• use the correct issue of company information• check that all essential information and data needed to identify the technical requirements is available• ensure that health and safety regulations and safe working practices are taken into account• ensure that the influence of working conditions on technical performance is recognised and included in the technical information• present the technical information in the appropriate formats• resolve any problems as they occur, within their level of responsibility 1.3 produce technical information for one of the following engineering activities: <ul style="list-style-type: none">• drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)• manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)• material processing activities (such as heat treatment, casting, injection moulding, purification)• composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)

- finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
- installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
- plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
- equipment capability studies/performance measurement
- movement of materials, components or finished goods
- business improvement activities
- engineering safety audits or risk assessments
- quality control/quality assurance
- maintenance activities
- testing and trialling
- modification and repair activities
- research and development
- commissioning/decommissioning
- engineering support services

1.4 include five of the following in the technical information:

- equipment operating detail (function)
- equipment performance parameters
- physical characteristics (dimensions, weight)
- environmental considerations/operating conditions
- manufacturing methods
- manufacturing detail
- processing requirements
- work instructions or procedures
- number/volume required
- resource requirements
- equipment/component interfacing
- specific or specialist equipment required
- materials required/used
- timing/delivery details
- cost/budget estimation/details
- aesthetics/finish details
- quality requirements/control
- monitoring/servicing frequency
- training required
- customer interface requirements
- safety requirements

1.5 present the technical information in the appropriate formats

1.6 present the technical information to the appropriate people using the following:

- specific company documentation
- plus one more method from the following:
 - written or typed report

- o verbal report
 - o electronic mail
 - o computer-based presentation
- 1.7 make sure that codes and other references used in the technical information follows agreed conventions
- 1.8 ensure that the technical information complies with all of the following, as appropriate:
- organisational guidelines and codes of practice
 - equipment manufacturer's operation specification/range
 - recognised compliance agency/body's standards
 - customer standards and requirements
 - BS and/or ISO standards
 - health, safety and environmental requirements
- 1.9 take account of applicable local and national standards and conventions when producing the technical information, to include five of the following:
- terminology
 - nomenclature
 - colour codes
 - symbols and abbreviations
 - company instructions
 - referencing and indexing
 - geometric tolerancing
 - document format and layout
 - safe working practice and procedures
 - recognised compliance agency/body's specifications (such as MOD)
- 1.10 pass on the technical information to the appropriate people within agreed timescales
- 1.11 record the technical information and store them securely in accordance with organisational requirements
- 1.12 carry out both of the following on completion of the gathering of the technical information:
- validation and evaluation of the systems and procedures used to gather and produce the technical information
 - recommendations for improvements or changes to the information gathering systems and procedures used
- 1.13 undertake changes to the technical information within agreed control procedures.

Learning outcome
The learner will: 2. know how to produce technical information for engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the technical information being produced 2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines when specifying the technical

information

- 2.3 explain how to obtain information on the engineering requirements, and the type of information that is available (such as customer requirements and instructions, quality control requirements and the product specification)
- 2.4 explain how to extract information from drawings, documents and related specifications (to include symbols and conventions to appropriate BS or ISO standards and, where appropriate BS 7671/IEE wiring regulations), in relation to the work being undertaken
- 2.5 describe the materials, formats, codes and conventions that are used in presenting the technical information
- 2.6 describe the types of data that should be included in the technical information they are producing
- 2.7 describe the factors to be taken into account when determining the technical information, especially those covering working conditions and safety
- 2.8 describe the development of the technical information (to include both master documents and working instructions, along with their purpose, content and status)
- 2.9 explain how to prepare the technical information (to include the structure, style, clarity and compliance with relevant standards)
- 2.10 describe the process used in their organisation to validate the technical information produced
- 2.11 describe the control procedure for ensuring that the technical information is maintained up to date
- 2.12 describe the procedures for changing technical information, and why control procedures are used
- 2.13 describe the importance of maintaining records; what needs to be recorded and where records are kept
- 2.14 explain how to access and use the appropriate information and documentation systems
- 2.15 describe the different ways of presenting information to different people
- 2.16 describe the importance of customer care and satisfaction
- 2.17 describe the importance of providing the right information at the right time
- 2.18 describe the problems that can occur with specifying technical information for engineering requirements, and how they can be minimised
- 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
- 2.20 describe the sources of technical expertise if they have problems they cannot resolve
- 2.21 describe the organisational procedures for providing information to different people.

Unit 348

Obtaining resources for engineering activities

UAN:	A/600/5775
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 48: obtaining resources for engineering activities (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 obtain resources, such as materials, drawings, people, equipment and documentation, for the implementation of engineering activities, in accordance with approved procedures. The learner will be required to apply appropriate methods and approaches for specifying and obtaining the resources. The learner will also be required to highlight any deviations from agreed schedules, to the relevant people.

The learner's responsibilities will require them to comply with organisational policy and procedures for obtaining resources for the engineering activities, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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 will be expected to have knowledge that will include evaluation methods for assessing the operational requirements. The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to obtaining resources for the specified engineering activities. The learner will understand the engineering processes

within their area of responsibility, including quality assurance, resource management, and problem solving principles and procedures, in adequate depth to provide a sound basis for carrying out their activities to the required standard.

The learner will be aware of any company, legislative or regulatory health, safety and environmental requirements applicable to the engineering activities for which the resources are being obtained. 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. obtain resources for engineering activities
Assessment criteria
The learner can: 1.1 assess the operational requirements and any factors that could affect their achievement 1.2 carry out all of the following when determining and obtaining the required resources: <ul style="list-style-type: none">• use the correct issue of company information• check that all essential information and data needed to determine the resources is available• collect relevant information on the engineering requirements• use the information collected to determine the resources required• identify potential problems which may influence the provision of the resources• check that the appropriate resources will be available at the time they are required• ensure that health and safety regulations, environmental issues, safe working practices are taken into account• ensure that resource requirements are met 1.3 specify clearly the resources required to implement the agreed operational methods and procedures 1.4 define the resources required, to include four of the following, and check their availability and suitability: <ul style="list-style-type: none">• the documentation to be used (such as drawings, specifications, quality assurance, surveys)• the people required with the necessary skills and knowledge• the space/work area in which to carry out the engineering activities• the raw materials required (such as type and specification of material, form of material, amount of material)• consumable materials required (such as welding accessories,

masking mediums, oil, cutting compounds)

- bought-in standard components (such as bearings, electrical or electronic components, fluid power components, mechanical fasteners)
- equipment required (such as hand tools, power tools, machinery, lifting and handling equipment)
- measuring or test equipment (such as mechanical measuring, electrical measuring)
- any outside support services required (such as material treatments, specialist lifting and moving equipment)
- special/specific safety equipment required (such as fume extraction, fire equipment, environmental protection)

1.5 consult with all relevant people on the resources that are available

1.6 obtain relevant information from the appropriate information source, including two of the following:

- work orders
- schedules
- purchase orders
- planning documentation
- plans/designs
- quality standards
- contracts
- standard operating procedures
- production control documentation
- equipment or materials supplier information
- customer requirements

1.7 obtain the required resources using the appropriate organisational procedures

1.8 determine and obtain resources for one of the following engineering activities:

- drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)
- manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
- material processing activities (such as heat treatment, casting, injection moulding, purification)
- composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
- finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
- installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
- plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
- equipment capability studies/performance measurement
- movement of materials, components or finished goods
- business improvement activities

<ul style="list-style-type: none"> • engineering safety audits or risk assessments • quality control/quality assurance • maintenance activities • testing and trialling • modification and repair activities • research and development • commissioning/decommissioning • engineering support services <p>1.9 carry out all of the following on completion of the resource gathering activities:</p> <ul style="list-style-type: none"> • validation and evaluation of the systems and procedures used to obtain the required resources • suggested improvements to their process of obtaining the required resource • recommendations for improvements or changes to the resources required by the engineering activities <p>1.10 resolve any issues relating to the resources in the appropriate manner</p> <p>1.11 obtain the resources, and resolve any supply issues, using two of the following organisational procedures:</p> <ul style="list-style-type: none"> • ordering procedures • authorisation procedures • company communication systems • hierarchy of control • company procurement procedure <p>1.12 record information on the resources in the appropriate information systems</p> <p>1.13 record the resource details in the appropriate information systems, and inform the appropriate people that the required resources are available, using the following methods:</p> <ul style="list-style-type: none"> • specific company documentation <p>plus one more method from the following:</p> <ul style="list-style-type: none"> • written or typed report • verbal report • electronic mail.
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Learning outcome
The learner will: 2. know how to obtain resources for engineering activities
Assessment criteria
The learner can: 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be used and resources required 2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines when determining resource requirements 2.3 explain how to obtain information on the engineering activities and resource requirements, and the type of information that is available

- (such as customer requirements and instructions, quality control requirements, product specification, manufacturing methods)
- 2.4 explain how to check the validity of documentation used in the resource planning activities
 - 2.5 describe the organisational procedures that should be used when obtaining resources
 - 2.6 explain how to access and use the appropriate information and documentation systems
 - 2.7 describe the company procedures for access to purchase orders and other relevant technical documentation
 - 2.8 describe the types of resource that will need to be determined and obtained for the planned engineering activities (such as people with the right skills, materials, equipment, documentation, space required, support services, utilities, safety equipment, transportation, customer consent)
 - 2.9 explain how to assess the need for resources
 - 2.10 describe the main types of resources involved with different types of engineering activity, and the typical timescales for providing them
 - 2.11 describe the factors to be taken into account when determining resources, especially those covering working conditions and safety
 - 2.12 explain how to verify that the resources identified are suitable, and are available within or to the organisation
 - 2.13 describe the issues that could occur when obtaining resources, and how to resolve them
 - 2.14 describe the obvious (and hidden) costs of obtaining resources, especially those that have to be contracted out
 - 2.15 describe the development of the resource documentation (to include both master documents and working instructions, along with their purpose, content and status)
 - 2.16 explain how to prepare the resource plans (to include the structure, style, clarity and compliance with relevant organisational standards)
 - 2.17 describe the process used in the organisation to validate the resource plans produced
 - 2.18 describe the procedures for changing the resource requirements, and why control procedures are used
 - 2.19 describe the importance of maintaining records on resource requirements; what needs to be recorded and where records are kept
 - 2.20 describe the different ways of presenting information to different people
 - 2.21 describe the importance of providing the right information at the right time
 - 2.22 describe the roles and responsibilities of key personnel in their organisation
 - 2.23 describe the problems that can occur when obtaining resources, and how these problems can be overcome
 - 2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
 - 2.25 describe the sources of technical expertise if they have problems they cannot resolve
 - 2.26 describe the organisational procedures for providing information to different people.

Unit 349

Obtaining and controlling materials for engineering activities

UAN:	R/600/5779
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 49 obtaining and controlling materials for engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to obtain materials and to maintain control of material stock for the implementation of engineering activities, in accordance with approved procedures. The learner will be required to apply appropriate methods and approaches for specifying and obtaining the materials. The learner will also be required to develop a stock control system to maintain supplies of material for the engineering activity.</p>

The learner's responsibilities will require them to comply with organisational policy and procedures for obtaining the materials and for developing appropriate stock control procedures for the engineering activities. The learner will be expected to report any problems with the activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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 will be expected to have knowledge that will include evaluation methods for assessing the operational requirements. The learner's knowledge will

provide a good understanding of their work, and will provide an informed approach to obtaining materials and maintaining stock controls for the specified engineering activities. The learner will understand the engineering processes within their area of responsibility, and will have a working knowledge of quality assurance, resource management and problem solving principles and procedures, in adequate depth to provide a sound basis for carrying out their activities to the required standard.

The learner will be aware of any company, legislative or regulatory health, safety and environmental requirements applicable to the engineering activities for which the materials are being obtained. 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. obtain and control materials for engineering activities
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 carry out all of the following during the material handling and controlling activities: <ul style="list-style-type: none"> • adhere to procedures or systems in place for risk assessment, COSHH, Personal Protective Equipment and other relevant safety regulations • exercise care and control over the documentation used at all times • collect relevant information on the stock requirement, delivery method and storage facilities • seek out additional information, where there are gaps or deficiencies in the information obtained • ensure that all lifting and handling equipment and accessories are safe to use, and are within their current certification dates • ensure that all materials are stored safely and correctly, as appropriate to their type and, where appropriate, to recommended or health and safety requirements • return all documentation and equipment to the correct location on completion of the activities 1.3 ensure that they have all the necessary information to determine the material requirements, and that the information is up to date 1.4 use relevant information, during the material stock control activities, from two of the following sources:

- specifications
 - works orders
 - purchase orders
 - planning documentation
 - contracts
 - memos
 - material requisitions
 - stores stock level documentation
 - standard operating procedures
 - manufacturing department
- 1.5 correctly extract all necessary data in order to carry out the required tasks
- 1.6 use the information collected to determine the suppliers and their methods of supply
- 1.7 control the delivery and receiving of the engineering materials
- 1.8 control three of the following types of materials:
- raw materials (such as sheet, bars, castings)
 - bought-in components (such as bearings, electrical or electronic components)
 - consumable materials (such as oil, packaging)
 - general stock items (such as mechanical fasteners)
 - safety items (such as gloves, goggles, barrier creams, clothing)
- 1.9 control materials for one of the following engineering activities:
- manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
 - material processing activities (such as heat treatment, casting, injection moulding, purification)
 - composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
 - finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
 - assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
 - installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
 - plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
 - equipment capability studies/performance measurement
 - maintenance activities (such as replacement of components, repair activities, general servicing)
 - research and development (including testing and trialling)
 - safety and environmental engineering
 - quality control/quality assurance
 - commissioning/decommissioning
- 1.10 initiate the purchase of materials using two of the following organisational procedures:
- ordering procedures
 - authorisation procedures

- planning department control procedure
 - finance control procedure
 - company procurement procedure
- 1.11 distribute materials, taking into account all of the following:
- information on material requisition/route cards
 - type and specification of material
 - timing of the delivery
 - location of delivery
 - how the materials are to be presented (such as cut to size, weighed in batches, counted out)
 - quantity of material required (such as total quantities, quantity per delivery, quantity per container)
 - type of container to be used
 - handling requirements
- 1.12 make plans to ensure that materials are checked on arrival
- 1.13 use suitable procedures to ensure that they maintain adequate stock levels
- 1.14 maintain the material and stock control system, using one of the following:
- just-in-time
 - customer request
 - date order replenish
 - electronic ordering
 - stock level replacement
 - monitored response
 - contact order system
- 1.15 arrange for material to be stored in an appropriate location and environment
- 1.16 receive materials into stock, to include carrying out four of the following:
- carrying out quality checks
 - carrying out quantity checks
 - creating suitable storage space
 - arranging material handling (such as lifting, transportation, use of automated storage system)
 - completing all relevant documentation and material stock control records (such as manually or electronically)
- 1.17 identify and deal with any problems which may influence the control/availability of the materials
- 1.18 carry out all of the following on completion of the material stores control activities:
- validation and evaluation of the material stores control systems and procedures used
 - suggested improvements to the process for storing materials
 - recommendations for improvements or changes to the stores control systems and procedures in place.

Learning outcome

The learner will:

2. know how to obtain and control materials for engineering activities

Assessment criteria

The learner can:

- 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be used and the materials required
- 2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines when determining material requirements
- 2.3 explain how to obtain information on the engineering activities, the materials and stock requirements, and the type of information that is available (such as customer requirements and instructions, quality control requirements, product specification, material specifications)
- 2.4 describe the types of material used in the engineering activities (such as raw materials, consumable materials, bought-in specific components and general engineering stock items)
- 2.5 explain how to obtain stock control information, delivery and storage requirements
- 2.6 explain how to check the validity of documentation used in the material control planning activities
- 2.7 describe the organisational procedures that should be used when obtaining materials
- 2.8 describe the organisational requirements for selecting suppliers
- 2.9 describe the organisational requirement for storing and moving materials
- 2.10 explain how to access and use the appropriate information and documentation systems
- 2.11 describe the company procedures for access to purchase orders and other relevant technical documentation
- 2.12 describe the methods used to determine how material will be delivered (such as quantity, container, frequency)
- 2.13 describe the methods for determining stock replenishing, and how to maintain this level
- 2.14 describe the factors to be taken into account when determining the storage of materials, especially those factors relating to working conditions and safety
- 2.15 describe the methods used to determine quantities, and the appropriate container(s) required to transport materials
- 2.16 describe the issues that could occur when obtaining and moving materials, and how to resolve them
- 2.17 describe the obvious (and hidden) costs of obtaining materials and maintaining stock, especially those that have to be contracted out
- 2.18 describe the development of the material control documentation (to include both master documents and supplier instructions, along with their purpose)
- 2.19 describe the process used in the organisation to validate the control procedures produced
- 2.20 describe the procedures for changing suppliers, material requirements, and why control procedures are used

- 2.21 describe the importance of maintaining records on material control; what needs to be recorded and where records are kept
- 2.22 describe the importance of providing the right information at the right time
- 2.23 describe the roles and responsibilities of key personnel in their organisation
- 2.24 problems that can occur when obtaining materials or maintaining stock, and how these problems can be overcome
- 2.25 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
- 2.26 describe the sources of technical expertise if they have problems that they cannot resolve
- 2.27 describe the organisational procedures for providing information to different people.

Unit 350

Providing technical sales and marketing support for engineering activities

UAN:	R/600/5782
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 50 Providing technical sales and marketing support for engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to provide technical sales and marketing support for engineering activities, in accordance with approved procedures. This will require the learner to prepare sales and marketing material in a variety of forms, such as technical manuals, bulletins, sales leaflets and specifications, audio, visual and electronic presentations, customer reports and media advertisements, billboard, website and formal presentation materials. The learner will also be expected to convey technical sales and marketing information directly to customers, within agreed timescales, ensuring that the information used conforms to organisational and legal requirements.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for producing and conveying sales and marketing materials. The learner will report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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.</p>

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to gathering relevant information, determining the technical information required, and presenting the required details in the appropriate formats. The learner will understand their organisation's methods of operation, in sufficient detail to enable them to make informed decisions. The learner will also understand their organisations ethical and legal obligations to the customer.

The learner will be aware of any health, safety and environmental requirements applicable to their area of responsibility. 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. provide technical sales and marketing support for engineering activities
Assessment criteria
The learner can: 1.1 produce technical details that contain all the relevant and necessary data for the engineering activity to be carried out 1.2 carry out all of the following when developing and disseminating technical sales and marketing information: <ul style="list-style-type: none"> • use the correct issue of company information • check that all essential information and data needed to devise the technical sales and marketing material is available and up to date • produce sales and marketing material which is in keeping with company/organisational policy • ensure that health and safety regulations and safe working practices are taken into account • present the technical and marketing materials in the appropriate formats • contact potential and existing customers • resolve any problems as they occur, within their level of responsibility • identify improvements in content and methods of dissemination of information 1.3 produce technical sales and marketing material for one of the following engineering activities: <ul style="list-style-type: none"> • drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine) • manufacturing activities (such as conventional machining, CNC)

machining, detail fitting, pressing)

- fabrication activities (such as sheet metal, pipe and tube, structural steel, welding, riveting, adhering)
- material processing activities (such as heat treatment, casting, injection moulding, purification)
- composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
- finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
- installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
- plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
- equipment capability studies/performance measurement
- maintenance activities (such as preventative maintenance, condition monitoring)
- movement of materials, components, finished goods or waste
- commissioning and decommissioning
- testing and trialling
- research and development services
- modification and repair activities
- engineering safety audits or risk assessments
- quality control/quality assurance
- business improvement activities
- engineering support services
- service/component supply

1.4 present the technical details in the appropriate formats

1.5 produce or contribute to the production of technical sales and marketing material, in three of the following forms:

- technical bulletins
- technical manuals
- sales flyer/leaflets
- specification sheets
- audio visual presentation
- media advertisement
- website
- billboard presentation

1.6 make sure that codes and other references used in the technical details follow agreed conventions

1.7 ensure that the technical sales and marketing materials comply with all of the following, as appropriate:

- organisational guidelines and codes of practice
- equipment manufacturer's operation specification/range
- recognised compliance agency/body's requirements
- BS and/or ISO standards
- advertising media's codes of practice

- health, safety and environmental requirements
- 1.8 pass on the technical details to the appropriate people within agreed timescales
 - 1.9 record technical details and store them securely in accordance with organisational requirements
 - 1.10 carry out all of the following on completion of the technical support activities:
 - validation and evaluation of the technical support systems and procedures used
 - suggested improvements to the method used to provide the technical sales and marketing support
 - recommendations for improvements or changes to the technical support systems and procedures that are in place
 - 1.11 undertake changes to technical details within agreed control procedures.

Learning outcome

The learner will:

2. know how to provide technical sales and marketing support for engineering activities

Assessment criteria

The learner can:

- 2.1 explain how to access information on health and safety regulations and guidelines relating to the technical material being produced
- 2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines when specifying the technical details
- 2.3 explain how to obtain information on the engineering activity or service (such as product specification, service information, availability)
- 2.4 explain how to obtain information from drawings, documents and related specifications (to include symbols and conventions to appropriate BS or ISO standards and, where appropriate, BS 7671/IEE wiring regulations) in relation to work being undertaken
- 2.5 describe the media, formats, codes and conventions that are used in preparing the technical sales and marketing materials
- 2.6 describe the types of information that should be included in the material they are producing
- 2.7 describe the factors to be taken into account when determining the content of technical sales and marketing materials
- 2.8 describe the advantages and disadvantages of different methods of presenting sales and marketing materials
- 2.9 explain how to prepare the technical sales and marketing material (to include the structure, style, clarity and compliance with relevant standards)
- 2.10 describe the control procedure for ensuring that the published information is maintained up to date
- 2.11 describe their organisation's procedures and practices for communicating with customers
- 2.12 describe the methods and techniques used for effective communication and presentations
- 2.13 explain how to review and adjust approaches to customers, in the

light of experiences gained

- 2.14 explain how to use a variety of presentation methods, in appropriate combination (such as verbal, verbal/written/visual/audio combinations)
- 2.15 describe the importance of obtaining feedback; the importance of recording this information, and where records are kept
- 2.16 describe the different ways of presenting information to different people
- 2.17 describe the importance of providing the right information at the right time
- 2.18 describe the problems that can occur with providing technical sales and marketing materials, and how they can be minimised
- 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
- 2.20 describe the sources of technical expertise if they have problems that they cannot resolve
- 2.21 describe the organisational procedures for providing information to different people.

Unit 351

Implementing quality control systems and procedures in an engineering environment

UAN:	H/600/5785
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 51: implementing quality control systems and procedures in an engineering environment (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to implement quality control systems and procedures in an engineering environment, in accordance with approved procedures. The learner will be required to establish precise criteria to enable them to assess the quality of engineering products or processes, such as for component manufacturing, assembly activities, fabrication and welding, casting and patternmaking, materials processing and finishing, installation activities, repair and modifications, maintenance, commissioning and de-commissioning. The learner will also be expected to determine and communicate the quality assurance recommendations to all relevant people.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the quality control of the engineering products or processes, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with minimal supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.</p>

The learner's knowledge will provide a good understanding of their work, and will enable them to have an informed approach to the implementation of quality control systems. The learner will understand their organisation's methods of operation and quality control systems, in sufficient detail to enable them to make informed decisions and to carry out the implementation to the required standard.

The learner will be aware of any health, safety and environmental requirements applicable to the products and processes, and to the quality control 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. implement quality control systems and procedures in an engineering environment
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 carry out all of the following during the quality control activities: <ul style="list-style-type: none">• adhere to procedures or systems in place for risk assessment, COSHH, and other relevant safety regulations• obtain the required quality control specifications and related documents• obtain approval to carry out the quality control activities• ensure that all appropriate personnel are fully informed of their intended activities• use appropriate Personal Protective Equipment for the area in which they are carrying out the quality control• ensure that test results and quality records are stored, in a manner suited to future audit or investigation 1.3 obtain accurate information on the engineering products or processes that are to be quality controlled 1.4 obtain the information about the product or process requiring quality control, from two of the following: <ul style="list-style-type: none">• quality assurance staff• manufacturers' manuals/specifications• engineering drawings• product specifications• regulations and guidelines• international/national standards

- 1.5 establish clear and precise criteria for the quality control activities to be undertaken
- 1.6 carry out all of the following, in preparation for the quality control activity:
 - identify the product or process requiring quality control
 - obtain the criteria for the quality control process
 - identify suitable quality control methods, techniques and procedures
 - obtain appropriate documentation, tools and equipment for the quality control activities to be undertaken
 - demonstrate and recommend the quality control process to the appropriate people
- 1.7 identify suitable methods and procedures for quality control, to include two of the following:
 - material checks
 - production process inspection
 - maintenance procedures
 - customer contracts
 - product performance attributes
 - product or equipment safety checks (such as electrical checks)
 - contractor guidelines
 - incoming inspection
 - other specific
- 1.8 ensure that the quality control recommendations comply with all of the following, as appropriate:
 - organisational guidelines and codes of practice
 - health, safety and environmental requirements
 - customer standards and requirements
 - BS and/or ISO standards
- 1.9 initiate the quality control system, using approved techniques and procedures
- 1.10 implement quality assurance procedures for one of the following engineering activities:
 - drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)
 - manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
 - material processing activities (such as heat treatment, casting, injection moulding, purification)
 - composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
 - finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
 - assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
 - installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
 - plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)

<ul style="list-style-type: none"> • equipment capability studies/performance measurement • movement of materials, components or finished goods • business improvement activities • engineering safety audits or risk assessments • quality control/quality assurance • maintenance activities • testing and trialling • modification and repair activities • research and development • commissioning/decommissioning • engineering support services <p>1.11 carry out all of the following on completion of the quality control activities:</p> <ul style="list-style-type: none"> • validation and evaluation of the quality control systems implemented • suggested improvements to the way in which the quality control systems are implemented • identification of improvements to be made to the quality control systems and procedures <p>1.12 monitor the effectiveness of the quality control system implemented</p> <p>1.13 deal promptly and effectively with problems within their control, and seek help and guidance if they have problems that they cannot resolve</p> <p>1.14 ensure that information on the quality control activities is provided to the relevant people</p> <p>1.15 demonstrate and recommend quality control processes to the relevant people, using the following methods:</p> <ul style="list-style-type: none"> • specific company documentation <p>plus one more method from the following:</p> <ul style="list-style-type: none"> • verbal report • written or typed report • electronic mail • computer-based presentation.

Learning outcome
The learner will:
2. know how to implement quality control systems and procedures in an engineering environment
Assessment criteria
The learner can:
2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be quality assured
2.2 describe the specific regulations and guidelines that are relevant to the activities being quality assured
2.3 describe the specific safety precautions to be taken when carrying out the quality assurance and associated activities
2.4 describe the Personal Protective Equipment to be worn in the

- specific work area that the quality assurance activities are taking place
- 2.5 explain where the required Personal Protective Equipment can be obtained
 - 2.6 describe the implications of not taking account of legislation, regulations, standards and guidelines when carrying out the quality assurance activities
 - 2.7 describe the organisational procedures for determining when and how quality assurance activities should be undertaken
 - 2.8 describe the processes and specifications for the activity being quality assured
 - 2.9 explain how to obtain the quality criteria that could be used for different types of engineering products or processes
 - 2.10 describe the current quality assurance methods that are in use
 - 2.11 describe the methods for obtaining information on the engineering products or processes that are to be quality assured
 - 2.12 describe the relevant sources of information on engineering products or processes
 - 2.13 describe the people who should be involved in the quality assurance process
 - 2.14 describe the impact that quality assurance methods have on the organisation
 - 2.15 describe the people who require information on quality assurance, and the procedures for informing them
 - 2.16 describe the types of recommendation that could emerge from the quality assurance process
 - 2.17 explain how to present the quality recommendations, and the formats to be used
 - 2.18 explain how to ensure that quality improvement recommendations are followed up
 - 2.19 describe the importance of making sure that all information used is accurate
 - 2.20 describe the importance of maintaining quality assurance records
 - 2.21 describe the information that needs to be recorded, and the amount of detail that is required
 - 2.22 explain where quality assurance records are kept, and the procedure for obtaining them
 - 2.23 describe the importance of ensuring that any records that they use are correctly updated and returned to the appropriate location
 - 2.24 describe the problems that could occur with the quality assurance process, and the organisational methods and procedures for resolving them
 - 2.25 describe the importance of solving problems quickly
 - 2.26 describe the organisational reporting processes and lines of communication
 - 2.27 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
 - 2.28 identify the sources of technical expertise if they have problems that they cannot resolve.

Unit 352

Scheduling engineering activities

UAN:	A/600/5789
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 52: Scheduling engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to schedule engineering activities, time and resources, in accordance with approved procedures. The learner will be required to ensure that the scheduled activities are capable of meeting the engineering requirements and those of the customer, and that the new schedules effectively integrate with existing processes. The learner will be expected to produce schedules for significant engineering activities with complex requirements, having multiple operations and resources, and which will cover such things as component/product manufacturing, installation and commissioning, testing and trialling, planned maintenance, lifting, moving and transporting of goods or materials and schedules for capability studies or equipment replacement programs.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the scheduling of engineering activities, and to report any problems with the activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that</p>

they carry out.

The learner's knowledge will include knowledge of organisational procedures and discipline-specific engineering principles and processes, within their area of responsibility. In addition, the learner will be expected to have knowledge of resource management, project management and planning. The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying scheduling procedures. The learner will understand the scheduling process and its application, and will know about the engineering activities within their organisation, in adequate depth to provide a sound basis for carrying out the scheduling activities to the required standard. The learner will understand their organisation's methods of operation in sufficient detail to enable them to make informed decisions.

The learner will be aware of any company, legislative or regulatory health, safety and environmental requirements applicable to the engineering activities being scheduled. 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. schedule engineering activities
Assessment criteria
The learner can: 1.1 confirm the operational activities that are required to achieve the operational methods and procedures 1.2 carry out all of the following when producing the engineering schedules: <ul style="list-style-type: none">• determine the engineering requirements to be scheduled• check that all essential information and data needed to produce the schedules is available• ensure that health and safety regulations, safe working practices and the influence of working conditions are recognised and included in the schedules• collect relevant information on the engineering requirements, operations, methods and resources• identify applicable engineering methods, processes and procedures, including specific sequencing requirements• update existing engineering schedules (where applicable)• determine the availability of required resources

- review the schedule and suggest contingency plans to eliminate any difficulties
 - ensure that the schedule complies with all relevant regulations, standards and guidelines
 - present the engineering schedules in the appropriate formats
- 1.3 identify the most suitable sequence of operational activities
- 1.4 schedule the time and resources available for undertaking the operational activities
- 1.5 obtain accurate details of activities and resources from two of the following people or departments:
- design office
 - quality engineering
 - plant engineering
 - production engineering
 - contractor
 - client/customer
 - process engineering
 - planning department
 - management/directors
 - sales department
 - other specific
 - health and safety/environmental engineering
- 1.6 prepare and review schedules of resources, to include six of the following:
- the documentation to be used (such as drawings, specifications, quality assurance, surveys)
 - people required who have the required skills and knowledge
 - the space/work area in which to carry out the engineering activities
 - the raw materials required (such as type and specification of material, form of material, amount of material)
 - consumable materials required (such as welding accessories, masking mediums, oil, cutting compounds)
 - bought-in standard components (such as bearings, electrical or electronic components, fluid power components, mechanical fasteners)
 - equipment required (such as hand tools, power tools, machinery, lifting and handling equipment)
 - measuring or test equipment (such as mechanical measuring, electrical measuring)
 - any outside support services required (such as material treatments, specialist lifting and moving equipment)
 - utilities/services required (such as electricity, water, gas, compressed air)
 - timescales in which the activities are to take place
 - special/specific safety equipment required (such as fume extraction, fire equipment, environmental protection)
- 1.7 identify any difficulties and produce a contingency plan to limit consequences of departures from the schedule, to include detailing three of the following actions:

- tighter monitoring and control of the project
 - agree revised requirements with management/client
 - change timescales in agreement with management/clients
 - reschedule
 - obtain additional/alternative resources
 - recommend a change to the process
 - other specific actions
- 1.8 ensure that operational schedules are capable of meeting all relevant requirements
- 1.9 produce engineering schedules for one of the following:
- drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)
 - manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
 - material processing activities (such as heat treatment, casting, injection moulding, purification)
 - composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
 - finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
 - assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
 - installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
 - plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
 - equipment capability studies/performance measurement
 - movement of materials, components or finished goods
 - business improvement activities
 - engineering safety audits or risk assessments
 - quality control/quality assurance
 - maintenance activities
 - testing and trialling
 - modification and repair activities
 - research and development
 - commissioning/decommissioning
 - engineering support services
- 1.10 incorporate new operational schedules into the operational process with minimum disruption
- 1.11 identify potential difficulties and produce appropriate contingency plans
- 1.12 deal with departures from the schedule arising from three of the following:
- actual or predicted departures
 - slipping timescales
 - increased cost
 - variations in quality
 - unexpected and unscheduled events

<ul style="list-style-type: none"> • areas of potential or actual conflict
<p>1.13 identify the consequences of departure from the agreed schedules, to include three of the following:</p> <ul style="list-style-type: none"> • delay in delivery • penalties or additional costs • consequential impact on impinging schedules • contract variation • breach of contract
<p>1.14 ensure that operational schedules comply with all relevant regulations and guidelines</p>
<p>1.15 ensure that the schedule complies with all of the following:</p> <ul style="list-style-type: none"> • company policy and procedures • work plans and delivery targets • customer requirements • health, safety and environmental requirements
<p>1.16 specify clearly the operational schedules and record them in the appropriate information systems</p>
<p>1.17 carry out all of the following on completion of the scheduling activities:</p> <ul style="list-style-type: none"> • validation and evaluation of the scheduling systems and procedures used • suggested improvements to their process of scheduling the engineering activity • recommendations for improvements or changes to the scheduling systems and procedures
<p>1.18 record and present the schedule to the appropriate people, using one of the following:</p> <ul style="list-style-type: none"> • specific company documentation <p>plus one more method from the following:</p> <ul style="list-style-type: none"> • verbal report • written or typed report • electronic mail • computer-based presentation.

<p>Learning outcome</p>
<p>The learner will:</p> <p>2. know how to schedule engineering activities</p>
<p>Assessment criteria</p>
<p>The learner can:</p> <p>2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be scheduled</p> <p>2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines when producing the engineering schedules</p> <p>2.3 explain how to obtain information on the activity to be scheduled, and the type of information that is available (such as customer order requirements and instructions, quality control requirements, product specification, manufacturing methods)</p> <p>2.4 explain how to access and use the appropriate information and</p>

documentation systems

- 2.5 explain how to interpret engineering schedules, and the techniques used for scheduling engineering activities
- 2.6 describe the information that should be included in the engineering schedules (such as timescales, resource requirements, health and safety issues)
- 2.7 describe the document formats, codes and conventions that are used in preparing the schedules
- 2.8 describe the factors to be taken into account when preparing the schedules, especially those factors relating to working conditions and safety
- 2.9 explain how to assess resource requirements; the main types of resources involved with different types of engineering activity, and the typical timescales for providing them
- 2.10 explain how to schedule resources
- 2.11 describe the obvious (and hidden) costs of resources/activities
- 2.12 describe the normal timescales for carrying out specific engineering activities, and how and why they vary
- 2.13 describe the methods and techniques for capacity planning
- 2.14 describe the products (or assets) involved in the activity being scheduled, and their availability
- 2.15 describe the development of the engineering schedules (to include both master documents and working instructions, along with their purpose, content and status)
- 2.16 explain how to prepare the schedules (to include the structure, style, clarity and compliance with relevant standards)
- 2.17 describe the process used in the organisation to validate the engineering schedules
- 2.18 describe the control procedure for ensuring that the schedules are maintained up to date
- 2.19 describe the use of the work breakdown structure as a basis for monitoring and control
- 2.20 describe the methods of assessing the progress against the defined schedule
- 2.21 describe the procedures for changing the schedules, and why control procedures are used
- 2.22 describe the importance of maintaining records; what needs to be recorded, and where records are kept
- 2.23 explain why contingency plans need to be drawn up, and how to develop them
- 2.24 describe the methods of evaluating the consequences of schedule changes
- 2.25 describe the methods for recovery of losses arising out of departures from project schedule by contractors
- 2.26 identify whom to inform about the schedules
- 2.27 describe the different ways of presenting information to different people
- 2.28 describe the importance of providing the right information at the right time
- 2.29 describe the roles and responsibilities of key personnel in their organisation
- 2.30 describe the problems that can occur during the implementation of the schedules, and how these problems can be rectified

- 2.31 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
- 2.32 describe the sources of technical expertise if they have problems that they cannot resolve
- 2.33 describe the organisational procedures for providing information to different people.

Unit 353

Determining engineering requirements for the supply of products or services

UAN:	F/600/5793
level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 53: Determining engineering requirements for the supply of products or services (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 determine engineering requirements for the supply of products or services to customers, in accordance with approved procedures. The scope of the unit requires the learner to confirm the requirements with the customer, and to determine how the learner's organisation can respond to these needs and the implications to their organisation of providing the products or services, with regard to present and future workloads.

The engineering requirements must relate to significant engineering products that require multiple operations or stages for their manufacture, or to services that require the input of multiple functions from within the organisation. The learner will be required to complete the work within agreed timescales, whilst ensuring that the activities within their control conform to organisational and legal requirements.

The learner's responsibilities will require them to comply with organisational policy and procedures for determining the engineering requirements. The learner will report any problems that they cannot personally resolve, or that are outside their

permitted authority, to the relevant people. The learner will be expected to work with minimal 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 gathering and determining technical requirements from customers. The learner will understand the engineering products and services within their area of responsibility, in adequate depth to provide a sound basis for carrying out their activities to the required standard. The learner will understand their organisation's methods of operation in sufficient detail to enable them to make informed decisions.

The learner will be aware of any health, safety and environmental requirements applicable to their area of responsibility. 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 requirements for the supply of products or services
Assessment criteria
The learner can: 1.1 carry out all of the following when determining the engineering requirements: <ul style="list-style-type: none">• use the correct issue of company information• check that all essential information and data needed to make valid decisions is available• determine the engineering requirements• check that the organisation's work and technical capacity can meet the customer's requirements• record and file the engineering requirements in the appropriate format 1.2 work safely in accordance with the regulations for their work environment 1.3 obtain sufficient information to understand clearly the customer's requirements 1.4 determine engineering requirements for customer needs for one of the following: <ul style="list-style-type: none">• drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)

- manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
 - material processing activities (such as heat treatment, casting, injection moulding, purification)
 - composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
 - finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
 - assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
 - installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
 - plant and equipment (such as site preparation, plant layout, equipment changeover, equipment supply or replacement)
 - equipment capability studies/performance measurement
 - movement of materials, components or finished goods
 - business improvement activities
 - engineering safety audits or risk assessments
 - quality control/quality assurance
 - maintenance activities
 - testing and trialling
 - commissioning/decommissioning
 - modification and repair activities
 - research and development
 - engineering support services
- 1.5 advise the customer of relevant product or service features, and relate these to the customer's requirements
- 1.6 make sure that the customer requirements are accurately specified
- 1.7 check with the customer and obtain agreement that the requirements are interpreted correctly
- 1.8 determine how their organisation can respond to the requirements in terms of workload and resources
- 1.9 assess the implications of five of the following, in providing the products or services:
- the technical capability of their organisation to provide the products or services requested
 - availability of resources (such as people, materials, equipment, facilities and utilities)
 - costs and capital expenditure involved
 - timescales to supply the products or services
 - effects on current schedules
 - environmental and health and safety implications
 - legal implications (if applicable)
 - training implications
- 1.10 provide the information in an appropriate format, using recognised and accepted conventions for terms and references
- 1.11 record and file relevant information, in accordance with organisational requirements
- 1.12 record the proposals, in accordance with organisational

procedures, using one of the following:

- specific company documentation
- written or typed report
- electronic mail

1.13 record and file product or service proposals containing all of the following:

- description of product or service required
- details of specification requirements
- customer requirements that may be difficult to meet
- delivery estimate
- workload schedule
- resources required
- potential opportunities arising from the proposed supply of the product or service
- need v benefit analysis

1.14 maintain appropriate levels of confidentiality

1.15 make sure that communications with the customer meet organisational guidelines and procedures

1.16 carry out both of the following on completion of the activities:

- validation and evaluation of the systems and procedures used
- identification of improvements that could be made to the systems and procedures.

Learning outcome

The learner will:

2. know how to determine engineering requirements for the supply of products or services

Assessment criteria

The learner can:

- 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be used and plans being produced
- 2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines when determining the engineering requirements
- 2.3 explain how to obtain information on the engineering requirements, and the type of information that is available (such as customer order requirements and instructions, quality control requirements, product specification, manufacturing methods)
- 2.4 explain how to extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work being considered
- 2.5 explain how typical customer requirements for engineering products are usually described
- 2.6 explain how to access and use the appropriate information and documentation systems containing the customer requirements
- 2.7 describe the methods available for analysing customer technical requirements
- 2.8 describe the importance of checking that the specific technical

- requirements/specification requested by the customer are within the technical capabilities and resources of their organisation
- 2.9 describe the main types of resources involved with different types of engineering activity, and the typical timescales for providing them
 - 2.10 describe the obvious (and hidden) costs of resources/activities
 - 2.11 describe the normal timescales for carrying out or supplying specific engineering activities, and how these will impact on the customers' requirements
 - 2.12 describe the information that they will need to consider when determining the engineering requirements (such as activities to be carried out, specification to be achieved, timescales, resource requirements, health and safety issues, cost and budget implications)
 - 2.13 describe the main components and the materials (if any) that are to be used
 - 2.14 describe the products (or equipment) involved with the requirements, and their availability
 - 2.15 describe the structure of their organisation, and the key people (who does what)
 - 2.16 describe the methods used to control costs, and who can provide cost estimates
 - 2.17 describe the importance of maintaining records; what needs to be recorded, and where records are kept
 - 2.18 describe the different ways of presenting information to different people
 - 2.19 describe the importance of providing the right information at the right time
 - 2.20 describe the problems that can occur with preparing details and assessing implications
 - 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
 - 2.22 describe the sources of technical expertise if they have problems that they cannot resolve.

Unit 354

Carrying out condition monitoring of engineering plant and equipment

UAN:	R/600/5796
Level:	3
Credit value:	39
GLH:	81
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 54: carrying out condition monitoring of engineering plant and equipment (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to carry out condition monitoring of engineering plant and equipment, in accordance with approved procedures. The learner will be required to select the appropriate monitoring equipment to use, based on the type of plant or equipment being monitored and the conditions they wish to check. The learner will be expected to check that the monitoring equipment is in a suitable condition to use (undamaged, correctly calibrated, appropriate range, etc), and to set up the equipment ready for use. The learner will then use this equipment to carry out diagnostic condition monitoring (fault diagnosis or prognosis) on a range of equipment, such as mechanical, electrical, process controller, fluid power or integrated systems.</p>

The learner's responsibilities will require them to comply with organisational policy and procedures for the condition monitoring activities undertaken, and to report any problems with the diagnostic equipment or monitoring activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility for their 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 the appropriate condition monitoring techniques to engineering plant and equipment. The learner will understand the monitoring methods and procedures used, and their application, and will know about the various monitoring units, and peripheral components, in adequate depth to provide a sound basis for carrying out the monitoring activities safely and correctly.

The learner will understand the safety precautions required when carrying out the monitoring activities, especially those involved with moving machinery/equipment. The learner will also understand their responsibilities for safety and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

Learning outcome
The learner will: 1. carry out condition monitoring of engineering plant and equipment
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 correctly set up and check-calibrate the equipment required for the monitoring being carried out 1.3 carry out the monitoring activities with the minimum disruption to normal activities 1.4 carry out all of the following during the condition monitoring activities: <ul style="list-style-type: none">• plan the condition monitoring activities so as to minimise disruption to normal working• adhere to procedures or systems in place for risk assessment, COSHH, Personal Protective Equipment and other relevant safety regulations• select the appropriate condition monitoring equipment for the intended purpose• check the calibration of the monitoring equipment before use• set up the monitoring equipment, in accordance with the appropriate procedures• check that the monitoring equipment is functioning correctly• carry out the monitoring activities, using appropriate techniques and procedures

- apply safe working practices and procedures at all times
- 1.5 use appropriate monitoring techniques to set up machinery protection systems, or predictive maintenance system monitoring techniques, on two of the following types of equipment:
- engines (such as piston or turbine)
 - rotating or reciprocating machinery (such as pumps, compressors)
 - mechanical equipment (such as cyclic and rotational devices, gearboxes, drives and linkages)
 - production machinery (such as machine tools, presses, transfer mechanisms)
 - process equipment (such as furnaces, chemical treatment equipment)
 - rotating electrical machinery (such as generators, motors)
 - stationary electrical equipment (such as transformers, switchgear)
 - stationary plant and equipment (such as air receivers, accumulators, tanks, piping)
 - emergency standby or alarm/warning systems and equipment
 - fluid power equipment (such as air receivers, pipework, valves, cylinders and actuators and pumps)
 - instrumentation and control equipment (such as temperature, pressure, level, flow, weight, speed)
 - process controller (such as program controller, robots, input/output interfacing, wiring/cabling, monitoring sensors)
 - electrical equipment (such as power supplies, switchgear and distribution panels, control systems)
 - electronic equipment (such as control units, visual display or indicating devices)
 - environmental systems (such as air conditioning, heating and ventilation, fume extraction)
- 1.6 use two of the following condition monitoring methods:
- off-line/portable monitoring
 - sampled monitoring
 - continuous monitoring
 - protection monitoring
 - human sensory monitoring (sight, sound, touch, smell)
- 1.7 use two of the following monitoring techniques:
- vibration analysis
 - temperature analysis
 - flow analysis
 - particle analysis
 - crack detection analysis
 - leak detection analysis
 - humidity analysis
 - pressure analysis
 - voltage/current analysis
 - radio telemetry analysis

<ul style="list-style-type: none"> • thickness analysis • oil analysis • corrosion detection • environmental pollutant analysis <p>1.8 use monitoring systems in one of the following monitoring conditions:</p> <ul style="list-style-type: none"> • equipment operating under the effects of weather, natural hazards, temperature or pressure • equipment operating in environments with potential flammable or explosive conditions (such as dust, vapours, liquids or gases) • equipment working in wet, dirty, dusty or corrosive conditions • equipment operating in a benign or clean room environment <p>1.9 record and review the outcomes and take appropriate actions</p> <p>1.10 provide clear and accurate information to all relevant people, using the following methods:</p> <ul style="list-style-type: none"> • specific company documentation <p>plus one more method from the following:</p> <ul style="list-style-type: none"> • written or typed report • verbal report • predictive maintenance log or report • electronic mail <p>1.11 carry out all of the following on completion of the condition monitoring activities:</p> <ul style="list-style-type: none"> • validation and evaluation of the condition monitoring systems and procedures used • suggested improvements to the process of condition monitoring • draw valid conclusions, based on the information gained from the condition monitoring activities • recommend actions to be taken in respect of the engineering plant and equipment being monitored.
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Learning outcome
The learner will:
2. know how to carry out condition monitoring of engineering plant and equipment
Assessment criteria
The learner can:
2.1 describe the specific health and safety precautions to be applied during the monitoring procedure, and their effects on others
2.2 describe the health and safety requirements of the area in which the monitoring activity is to take place, and the responsibility these requirements place on them
2.3 describe the hazards associated with carrying out condition monitoring activities on engineering plant and equipment (such as electrical supplies, moving machinery, process controller interface, using damaged or badly maintained tools and equipment, not following laid-down procedures), and how they can be minimised
2.4 explain how to obtain and interpret drawings, charts, specifications,

- manufacturers' manuals, history/maintenance reports, symbols used on monitoring instrument documents, and other documents needed in the monitoring/maintenance process
- 2.5 explain how the engineering plant or equipment to be monitored functions, the operation sequence, the working purpose of individual units/components, and how they interact
 - 2.6 describe the basic principles of condition monitoring, and how it helps prevent equipment failure
 - 2.7 describe the different types of monitoring component or sensor (such as temperature, force, pressure, vibration, rotational, voltage, current), their fittings, and their application
 - 2.8 describe the various monitoring systems and the methods that can be employed to make test measurements for the purposes of machinery protection or predictive maintenance
 - 2.9 describe the methods of attaching monitoring components to different parts of the plant, equipment or system
 - 2.10 describe the importance of checking that monitoring instruments are fit for purpose, undamaged, and have a suitable monitoring range and value
 - 2.11 describe the importance of monitoring equipment calibration and authorisation procedures
 - 2.12 describe the importance of setting up and operating the condition monitoring equipment correctly
 - 2.13 describe the care and control procedures for condition monitoring equipment
 - 2.14 describe the problems that can occur during the monitoring activity, and how they can be overcome
 - 2.15 describe the recording the results from conditioning monitoring, and the documentation to be used
 - 2.16 describe the control procedures for reporting the results from condition monitoring
 - 2.17 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials
 - 2.18 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.

Unit 355

Carrying out fault diagnosis on engineering plant and equipment

UAN:	D/600/5798
Level:	3
Credit value:	50
GLH:	60
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 55: carrying out fault diagnosis on engineering plant and equipment (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to carry out fault diagnosis on engineering plant and equipment, in accordance with approved procedures. The learner will be required to diagnose faults on engineering plant and equipment such as engines and other rotating equipment, mechanical equipment, production machinery, process equipment, electrical and electronic equipment, fluid power, environmental and control equipment and other relevant engineering systems and equipment, at sub-assembly/component level. The learner will be expected to use a variety of fault diagnostic methods and techniques, and to utilise a number of diagnostic aids and equipment. From the evidence gained, the learner will be expected to identify the fault and its probable cause, and to suggest appropriate action to remedy the problem.</p>

The learner's responsibilities will require them to comply with organisational policy and procedures for the fault diagnostic activities undertaken, and to report any problems with these activities, or with the tools and equipment used, that they cannot personally resolve or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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 fault diagnostic techniques and procedures to engineering plant and equipment. The learner will understand the various fault diagnostic methods and techniques used, and their application. The learner will know how to apply and interpret information obtained from diagnostic aids and equipment, in adequate depth to provide a sound basis for carrying out the activities and identifying faults or conditions that are outside the required specification.

The learner will understand the safety precautions required when carrying out the fault diagnostic activities, especially those for isolating the equipment. The learner will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace, and will be required to demonstrate safe working practices throughout.

Learning outcome
The learner will: 1. carry out fault diagnosis on engineering plant and equipment
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 review and use all relevant information on the symptoms and problems associated with the products or assets 1.3 collect information about the fault from four of the following sources: <ul style="list-style-type: none">• the person or operator who reported the fault• monitoring equipment or gauges• recording devices• sensory (such as sight, sound, smell, touch)• plant or machinery records/history• condition of the end product 1.4 Investigate and establish the most likely causes of the faults 1.5 select, use and apply diagnostic techniques, tools and aids to locate faults 1.6 use a range of fault diagnostic techniques, to include: <ul style="list-style-type: none">• half-split technique• plus one more from the following:

- emergent problem sequence
 - six point technique
 - functional testing
 - injection and sampling
 - input/output
 - unit substitution
- 1.7 use a variety of diagnostic aids and equipment, to include two of the following:
- manufacturer's manual
 - algorithms
 - probability charts/reports
 - equipment self diagnostics
 - circuit diagrams/specifications
 - logic diagrams
 - flow charts
 - fault analysis charts (such as fault trees)
 - troubleshooting guides
- 1.8 use two of the following types of test equipment to help in the fault diagnosis:
- mechanical measuring equipment (such as measuring instruments, dial test indicators, torque instruments)
 - electrical/electronic measuring instruments (such as multimeters, logic probes)
 - fluid power test equipment (such as test rigs, flow meters, pressure gauges)
- 1.9 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved
- 1.10 carry out all of the following during the fault diagnostic activities:
- plan the fault diagnostic activities prior to beginning the work
 - use the correct issue of company and/or manufacturers' drawings and maintenance documentation
 - adhere to procedures or systems in place for risk assessment, COSHH, Personal Protective Equipment and other relevant safety regulations
 - ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids)
 - provide safe access and working arrangements for the maintenance area
 - carry out the fault diagnostic activities, using approved procedures
 - collect equipment fault diagnostic evidence from live and isolated systems
 - disconnect or isolate components or parts of the system, when appropriate, to confirm the diagnosis
 - identify the fault, and determine appropriate corrective action
 - dispose of waste items in a safe and environmentally acceptable manner, and leave the work area in a safe condition
- 1.11 carry out fault diagnosis on two of the following types of engineering plant or equipment:

- engines (such as piston or turbine)
 - rotating or reciprocating machinery (such as pumps, compressors)
 - mechanical equipment (such as cyclic and rotational devices, gearboxes, drives and linkages)
 - production machinery (such as machine tools, presses, transfer mechanisms)
 - process equipment (such as furnaces, chemical treatment equipment)
 - rotating electrical machinery (such as generators, motors)
 - stationary electrical equipment (such as transformers, switchgear)
 - stationary plant and equipment (such as air receivers, accumulators, tanks, piping)
 - emergency standby or alarm/warning systems and equipment
 - fluid power equipment (such as air receivers, pipework, valves, cylinders and actuators and pumps)
 - instrumentation and control equipment (such as temperature, pressure, level, flow, weight, speed)
 - process controller (such as program controller, robots, input/output interfacing, wiring/cabling, monitoring sensors)
 - electrical equipment (such as power supplies, switch gear and distribution panels, control systems)
 - electronic equipment (such as control units, visual display or indicating devices)
 - environmental systems (such as air conditioning, heating and ventilation, fume extraction)
- 1.12 determine the implications of the fault for other work and for safety considerations
- 1.13 carry out both of the following on completion of the fault diagnostic activities:
- validation and evaluation of the fault diagnostic systems and procedures used
 - identification of improvements that could be made to the fault diagnostic systems and procedures
- 1.14 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault
- 1.15 find faults that have resulted in two of the following breakdown categories:
- intermittent problem
 - partial failure or reduced performance/out of specification product
 - complete breakdown
- 1.16 record details on the extent and location of the faults in an appropriate format
- 1.17 provide a record of the outcome of the fault diagnosis, using one of the following:
- step-by-step analytical report
 - preventative maintenance log/report
 - corrective action report

- company-specific reporting procedure.

Learning outcome

The learner will:

2. know how to carry out fault diagnosis on engineering plant and equipment

Assessment criteria

The learner can:

- 2.1 describe the health and safety requirements of the area in which they are carrying out the fault diagnosis activities, and the responsibility these requirements place on them
- 2.2 describe the specific safety precautions to be taken when carrying out the fault diagnosis on the particular engineering plant and equipment
- 2.3 describe the isolation and lock-off procedures or permit-to-work procedure that applies
- 2.4 describe the importance of wearing protective clothing and other appropriate safety equipment during the fault diagnostic activities; the type of safety equipment to be used, and where to obtain it
- 2.5 describe the hazards associated with carrying out fault diagnosis on engineering plant and equipment (such as handling fluids, stored pressure/force, electrical contact, process controller interface, using faulty or damaged tools and equipment, using practices and procedures that do not follow laid-down procedures), and how to minimise them
- 2.6 explain where to obtain, and how to interpret drawings, circuit diagrams, specifications, manufacturers' manuals and other documents needed for the fault diagnostic activities
- 2.7 explain how the engineering plant or equipment functions, and the working purpose of the various integrated systems
- 2.8 describe the various fault finding techniques that can be used, and how they are applied (such as half-split, input/output put, emergent problem sequence, six point technique, functional testing, unit substitution, injection and sampling techniques, and equipment self-diagnostics)
- 2.9 explain how to evaluate the various types of information available for fault diagnosis (such as operator reports, monitoring equipment, sensory inputs, machinery history records, and condition of the end product)
- 2.10 explain how to evaluate sensory information from sight, sound, smell, touch
- 2.11 describe the procedures to be followed to investigate faults, and how to deal with intermittent conditions
- 2.12 explain how to use the various aids and reports available for fault diagnosis
- 2.13 describe the types of equipment that can be used to aid fault diagnosis (such as mechanical measuring instruments, electrical measuring instruments, test rigs, and pressure and flow devices), and how to check the equipment is calibrated or configured correctly for the intended use, and that it is free from damage and defects
- 2.14 describe the application of specific fault finding methods and techniques that are best suited to the problem

- 2.15 explain how to analyse and evaluate possible characteristics and causes of specific faults/problems
- 2.16 explain how to make use of previous reports/records of similar fault conditions
- 2.17 explain how to evaluate the likely risk of running the equipment with the displayed fault, and the effects the fault could have on the overall process
- 2.18 explain how to prepare a report which complies with the company policy on fault diagnosis
- 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.

Unit 356

Providing technical advice and guidance on engineering activities

UAN:	R/600/5801
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 56: Providing technical advice and guidance on engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to advise and guide others in work-related engineering technical matters, in accordance with approved procedures. The learner will be expected to provide technical advice and guidance to others involved in engineering activities, such as design, installation, manufacturing, production, operational support activities, maintenance, or equipment capability/performance measurement. The learner will be required to identify suitable opportunities for offering technical guidance, to plan and apply appropriate methods in such guidance, and to keep their methods under review so that they can modify their approach where necessary.</p>

The learner's responsibilities will require them to comply with organisational policy and procedures when providing technical guidance, and to report any problems with these activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the guidance they give.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to the methods, techniques and procedures for providing technical advice and guidance. The learner will understand the engineering activities and their application, and will know about them in adequate depth to provide a sound basis for giving the technical advice.

The learner will understand the safety precautions required in the work area where they provide technical guidance. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the work area.

Learning outcome
The learner will: 1. provide technical advice and guidance on engineering activities
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 ensure that the technical guidance complies with all of the following, as appropriate: <ul style="list-style-type: none">• organisational guidelines and codes of practice• equipment manufacturer's requirements• recognised compliance agency/body's requirements• customer standards and requirements• BS and/or ISO requirements• health, safety and environmental requirements 1.3 ensure that they have accurate and up-to-date information on the engineering activities for which advice and guidance is being sought 1.4 determine the extent of the advice and guidance required 1.5 provide valid and up-to-date information, advice and guidance, as necessary 1.6 provide technical advice and guidance for two of the following groups of people: <ul style="list-style-type: none">• colleagues• contractors• customers (such as distributors, end users, clients)• others working on related technical activity areas 1.7 provide technical guidance for one of the following engineering activities: <ul style="list-style-type: none">• drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)• manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)

- material processing activities (such as heat treatment, casting, injection moulding, purification)
- composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
- finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
- installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
- plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
- equipment capability studies/performance measurement
- movement of materials, components or finished goods
- business improvement activities
- engineering safety audits or risk assessments
- quality control/quality assurance
- maintenance activities
- commissioning/decommissioning
- testing and trialling
- modification and repair activities
- research and development
- engineering support services

1.8 provide technical advice and guidance on four of the following:

- equipment operating detail (function)
- equipment performance parameters
- physical characteristics (dimensions, weight)
- environmental considerations/operating conditions
- manufacturing methods
- manufacturing detail
- processing requirements
- work instructions or procedures
- number/volume required
- resource requirements
- equipment/component interfacing
- specific or specialist equipment required
- materials required/used
- timing/delivery details
- cost/budget estimation/details
- aesthetics/finish details
- quality requirements/control
- monitoring/servicing frequency
- training required
- customer interface requirements
- safety regulations and requirements

1.9 provide technical advice and guidance by the following methods:

- specific company documentation

plus by one other method from the following:

- verbally
- written/typed report
- electronic mail
- computer based presentation

1.10 analyse any problems in full and provide effective advice that will maintain the quality and progress of the work

1.11 deal accordingly with all of the following:

- reported problems found during the engineering activity
- recorded deviations from agreed plans and schedules
- customer requests/complaints.

Learning outcome

The learner will:

2. know how to provide technical advice and guidance on engineering activities

Assessment criteria

The learner can:

- 2.1 describe the specific safety precautions to be taken in the work areas where technical guidance is being given
- 2.2 describe the importance of wearing protective clothing and other appropriate safety equipment in hazardous or clean area environments when giving technical guidance
- 2.3 explain how to obtain the relevant Personal Protective Equipment (PPE), and how to check that it is in a safe and usable condition
- 2.4 describe the regulations and guidelines that are relevant to the work area
- 2.5 explain how to obtain information on regulations and guidelines
- 2.6 explain how to obtain and interpret drawings, charts, specifications and other documents that can be used when giving technical advice and guidance
- 2.7 describe the activities in which the technical guidance is being given
- 2.8 explain how to identify opportunities for giving technical advice, guidance and support
- 2.9 explain how to plan and prepare for providing technical guidance
- 2.10 describe the methods and techniques involved in problem solving
- 2.11 explain how to deal with customer complaints and requests.
- 2.12 explain how to review and adjust approaches to the provision of technical guidance, in the light of experience gained (such as offering written summaries of guidance)
- 2.13 describe the techniques for offering and providing technical guidance (such as verbally, one to one, one to many, in written form, using diagrams, drawings or other technical information)
- 2.14 explain how to use a variety of presentation methods, in appropriate combination (such as verbal, verbal/written combinations)
- 2.15 describe the organisational reporting processes and procedures to be observed
- 2.16 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.

Unit 357

Carrying out project management of engineering activities

UAN:	Y/600/5802
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 57: carrying out Project management of engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to project manage various engineering activities, time and resources, in accordance with approved procedures. The scope of the unit requires the learner to produce project plans for significant engineering activities with multifaceted requirements, having multiple operations and resources, and these plans will cover such things as component/product manufacturing, installation and commissioning, testing and trialling, planned maintenance, and plans for capability studies or equipment replacement programs. In producing the project plans, the learner will need to clearly identify the aims and objectives of the project, the milestones that must be met and the resources and processes required to achieve this, along with the estimated timescales and costs involved, the quality control requirements, and how the project will be monitored to ensure it meets its aims. The learner will also be required to ensure that the project management plans effectively integrate with existing processes.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the project management of engineering activities. The learner will report any problems with the project that</p>

they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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 project management principles and procedures to engineering activities. The learner will understand the project management process and its application, and will know about the engineering activities in adequate depth to provide a sound basis for carrying out the project management to the required standard. The learner will understand their organisation's methods of operation in sufficient detail to enable them to make informed decisions.

The learner will be aware of any health, safety and environmental requirements applicable to the various engineering activities being project managed. 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. carry out project management of engineering activities
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 ensure that project plans include any relevant regulations, standards and guidelines, including all of the following: <ul style="list-style-type: none">• health and safety requirements• BS and ISO standards and procedures• company policy and procedures 1.3 determine the scope of the project, and the processes required to achieve it 1.4 develop a full project plan which accurately identifies the project aims and objectives 1.5 develop project plans which clearly identify all of the following: <ul style="list-style-type: none">• the aims and objectives of the engineering project being undertaken• milestones and deliverables to be met

- individual tasks within the project
 - any special requirements that must be met (such as details of health and safety issues)
 - outcomes in terms of quality, cost and delivery (when needed)
 - resources required
 - start time required for the project
 - completion date of the project
 - the full cost of the project
 - how the project will be monitored, proved and evaluated
- 1.6 develop project objectives, work plans and schedules that are realistic and achievable, and that will meet the overall project aims
- 1.7 form the project team, comprising the correct mix of subject and technical experts to deliver the project objectives
- 1.8 determine and agree individual roles and responsibilities within the project team
- 1.9 develop and manage a monitoring process to review the progress of the project, adjusting the project plan as required
- 1.10 monitor the progress of the project to ensure that all of the following are met:
- project delivery on time
 - project keeps within budget
 - agreed quality standards are met and maintained
- 1.11 obtain authority and support for the release of the necessary resources to carry out the project
- 1.12 consult with appropriate people in order to secure the release of four of the following resources:
- people who have the required skills and knowledge
 - the relevant documentation and information
 - raw materials and consumables
 - equipment (such as hand tools, power tools, machinery, lifting and handling equipment)
 - work space/work area
 - any outside support services
 - special/specific safety equipment
- 1.13 conduct and manage the project in accordance with the plan, consulting with subject experts and specialists according to the needs of the project
- 1.14 carry out project management for one of the following engineering activities:
- manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
 - material processing activities (such as heat treatment, casting, injection moulding, purification)
 - composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
 - finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
 - assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
 - installation activities (such as mechanical, electrical/electronic,

avionic, structural, environmental equipment)

- plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
- equipment capability studies/performance measurement
- movement of materials, components or finished goods
- business improvement activities
- engineering safety audits or risk assessments
- quality control/quality assurance
- maintenance activities
- testing and trialling
- modification and repair activities
- research and development
- commissioning/decommissioning
- engineering support services

1.15 report project progress to relevant parties, at the agreed stages

1.16 produce a report on the project which includes two of the following:

- graphs
- Gantt charts
- critical path analysis
- project schedule
- event calendar

1.17 record and present the report to the appropriate people, using the following methods:

- verbal report
- plus one more method from the following:
 - written or typed report
 - specific company documentation
 - electronic mail
 - computer based presentation

1.18 communicate effectively with all of the following:

- management
- peers
- project team
- customers

1.19 deal effectively with problems within their control and report any that cannot be solved

1.20 identify any difficulties with the project, and produce a contingency plan, detailing three of the following actions to ensure that the project plans meet requirements:

- agree revised requirements with management/customer
- change timescales in agreement with management/customer
- reschedule
- obtain additional/alternative resources
- recommend a change to the process
- other specific actions

1.21 carry out all of the following on completion of the project management activities:

- validation and evaluation of the project management systems and procedures used
- suggested improvements to the process of project management
- recommendations for improvements or changes to the engineering activities that were project managed (where appropriate).

Learning outcome

The learner will:

2. know how to carry out project management of engineering activities

Assessment criteria

The learner can:

- 2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities to be project managed
- 2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines when producing the engineering project plans
- 2.3 explain how to identify the project scope, to determine the need for a full project plan and management approval
- 2.4 explain how to access and use the appropriate information and documentation systems to obtain information on the engineering requirements, and the type of information that is available (such as customer specifications and instructions, quality control requirements, product drawings/specification, manufacturing methods)
- 2.5 describe the different project management methods that can be used, and how to select the methods appropriate to their own circumstances
- 2.6 describe the information that should be included in the engineering project plans to allow the project progress to be monitored and measured (such as aims and objectives of the project, timescales, quality, cost and delivery requirements, resource requirements)
- 2.7 explain how to arrive at an estimate of timescales for the project, and the need to set milestones for achievement
- 2.8 describe the tools and techniques available for project planning and monitoring (such as graphs, Gantt charts, critical path analysis)
- 2.9 explain how to break the project down into individual deliverable tasks
- 2.10 explain how to form and develop a project team to meet the identified objectives
- 2.11 explain how to allocate specific tasks and responsibilities to the project team members, according to individual skills and abilities
- 2.12 explain how to determine the specialist help they may require in the project, and how this can be obtained
- 2.13 explain how to monitor and evaluate the project progress effectively
- 2.14 describe the importance of authorising all stages of work to start, continue or finish, according to their evaluation of progress
- 2.15 explain how to assess resource requirements; the main types of resources involved with different types of engineering activity, and

- the typical timescales for providing them
- 2.16 describe the obvious (and hidden) costs of resources/activities, and how to estimate the likely costs of the project (including the cost of raw materials, people and overheads)
 - 2.17 describe the normal timescales for carrying out the specific engineering activities, and how and why they vary
 - 2.18 describe the products (or assets) involved in the activity being planned, and how to determine their availability
 - 2.19 explain how to prepare the plans (to include the structure, style, clarity and compliance with relevant standards)
 - 2.20 explain why contingency plans need to be drawn up, and the procedures for changing the plan
 - 2.21 explain how to conduct a project meeting, and the importance of obtaining team members' agreement to changes in plans
 - 2.22 explain how to communicate effectively, listen and question, provide feedback, support and coach others
 - 2.23 explain how to present information effectively to management, peers, team members and customers
 - 2.24 describe the different ways of presenting information to different people, and the importance of providing the right information at the right time
 - 2.25 explain how to monitor progress of the project in terms of delivery on time, to budget and within agreed levels of quality
 - 2.26 explain how to report project closure, completion and final status to management, teams and customers
 - 2.27 explain how to solve problems and overcome barriers/difficulties encountered during the life of the project
 - 2.28 explain when to act on their own initiative, and when to seek help and advice from others
 - 2.29 identify whom to liaise with and from whom to obtain relevant and specific information, to support and assist them in running the project
 - 2.30 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.

Unit 358

Developing and maintaining effective customer relationships

UAN:	D/600/5803
Level:	3
Credit value:	20
GLH:	35
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 58: developing and maintaining effective customer relationships (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to develop and maintain effective customer relationships, in accordance with the requirements of their organisation. The learner will be required to be positive and constructive in their dealings with customers, especially when dealing with disagreements. The learner will be expected to keep customers informed about work plans and activities which affect them, and to seek and obtain information from others when necessary, in a polite and courteous manner. The learner will respond in a timely and positive way when asked to provide help or information to customers.</p>

The learner's responsibilities will require them to comply with any policies of their organisation in respect of developing and maintaining positive working relationships with clients and customers. The learner will be expected to work within the general policies of their organisation, and to know when to seek guidance and instructions from others. The learner will be expected to work with a minimum of supervision, taking full responsibility for their own actions and for the quality and accuracy of their work.

The learner's knowledge will provide a good

understanding of the processes for developing and maintaining positive working relationships with customers, and will provide an informed approach to shaping their attitude and behaviour, to responding to the feelings and expectations of customers, and to using effective communications.

The learner will understand the safety and environmental precautions required when carrying out their duties, and they will bear these things in mind when dealing with other people. The learner will also understand their responsibilities for health and safety in their place of work, and the importance of taking the necessary safeguards to protect themselves and others when they are working.

Learning outcome
The learner will: 1. develop and maintain effective customer relationships
Assessment criteria
The learner can: 1.1 establish and maintain productive working relationships 1.2 establish and maintain working relationships with the following: <ul style="list-style-type: none">• external customers/clients plus two more from the following: <ul style="list-style-type: none">• colleagues• supervisors• contractors• other companies 1.3 establish effective customer relations by carrying out all of the following: <ul style="list-style-type: none">• meeting their organisation's standards for attitude and behaviour• communicating with customers in a way that makes them feel valued and respected• identifying and confirming the needs and expectations of the customer• checking with the customer that they have fully understood their needs and expectations• maintaining communication with customers to ensure that they are kept informed and reassured• ensuring that all information passed to the customer is correct and up to date• seeking advice from others on questions they cannot readily answer• maintaining company ethics and legal responsibilities• seeking assistance from others in a polite and courteous way

- 1.4 ensure that they comply with company policy at all times, particularly in regard to all of the following:
- keeping correct records
 - maintaining confidentiality
 - obtaining authority to continue before working beyond agreed limits
 - reporting any problem that they are unable to solve, to the appropriate person
- 1.5 deal with disagreements in an amicable and constructive way so that good relationships are maintained
- 1.6 resolve disagreements by an appropriate amicable and constructive method, to include carrying out three of the following:
- identifying and confirming the needs and expectations of the customers
 - checking with the customer that they have fully understood their needs and expectations
 - explaining clearly to the customer any reasons why their needs or expectations cannot be met
 - seeking guidance and instruction from the appropriate person if a resolution cannot be found
- 1.7 keep others informed about work plans or activities which affect them
- 1.8 seek assistance from others in a polite and courteous way without causing undue disruption to normal working activities
- 1.9 carry out regular checking of customers' opinions, through two of the following:
- verbal responses
 - customer surveys
 - letters from customers
 - sales/service audits
- 1.10 respond in a timely and positive way when others ask for help or information
- 1.11 respond to the individual needs of customers, to include both of the following:
- technically aware
 - technically unaware
- 1.12 respond appropriately to customers, to include three of the following circumstances:
- complaints about service or product
 - problems which require clarification
 - general questions and comments
 - information about work plans or activities that affect them
 - feedback on work undertaken
- 1.13 use all of the following methods of communication when dealing with customers:
- face-to-face
 - electronic mail
 - letters
 - facsimiles (fax)
 - company documents

- telephone.

Learning outcome

The learner will:

2. know how to develop and maintain effective customer relationships

Assessment criteria

The learner can:

- 2.1 describe the legislation regarding health and safety, data protection, equal opportunities and regulations that affect the way that the products and services they deal with are delivered to their customers
- 2.2 describe the industrial, organisational and professional codes of practice, and ethical standards that apply
- 2.3 describe any contractual agreements that their customers have with their organisation
- 2.4 describe the customer's rights in relation to the services they are offering
- 2.5 describe the products or services of their organisation relevant to their customer service role
- 2.6 describe any organisational targets relevant to their job; their role in meeting them, and the implications for their organisation if those targets are not met
- 2.7 describe the formal and informal methods of communication, and how to use the most appropriate one in different situations
- 2.8 explain how to communicate in a clear, polite, confident way, and why this is important
- 2.9 describe the need for customer confidentiality
- 2.10 describe their organisation's standards for appearance and behaviour
- 2.11 describe the questioning techniques used to ensure the root of the problem is identified
- 2.12 describe the ways in which views and opinions should be expressed
- 2.13 describe the techniques for responding to the needs and feelings of others
- 2.14 explain how to deal with problems that could have an adverse effect on relationships or the business
- 2.15 describe the limits of their own authority, and when they need to seek agreement or permission from others.

Unit 359

Handing over and exchanging responsibility for control of engineering activities

UAN:	H/600/5804
Level:	3
Credit value:	20
GLH:	35
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 59: Handing over and exchanging responsibility for control of engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to hand over responsibility and control of an engineering activity to the appropriate person, in accordance with approved procedures. This will involve handing over responsibility for engineering activities, such as those requiring equipment or processes to be set up or changed over, where maintenance or modification needs to be carried out or is completed, on the completion of installation or commissioning activities, and for such things as business improvement or risk assessment activities to take place. This will involve checking that all safety, environmental and, where applicable, contractual arrangements, have been met before final handover to the appropriate person.</p>

On handing over the responsibility, the learner will be expected to highlight any project or process modifications, changed or unusual features, or areas of high risk that may be present in the activities. The learner must also ensure that they receive documented confirmation that everyone involved in the handover accepts that the activity has been handed over satisfactorily.

The learner's responsibilities will require

them to comply with organisational policy and procedures for the handover activities undertaken, and to report any problems with the handover procedure that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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 give an informed approach to applying handover procedures to engineering activities. The learner will understand the activity being handed over, and its application, and will know about the operating procedures and potential problems, in adequate depth to provide a sound basis for carrying out the handover safely and correctly.

The learner will be aware of any health, safety and environmental requirements applicable to their area of responsibility. 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. hand over and exchange responsibility for control of engineering activities
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 verify that the plan or schedule for handover is adequately defined and clear to all those involved 1.3 define, record and agree the state of the project at handover with all the relevant people 1.4 confirm that the activity is ready for handover, by carrying out all of the following checks, as applicable to the activity being handed over: <ul style="list-style-type: none">• the activity is in a suitable condition for handover to take place• all safety and environmental issues have been addressed• any specific customer requirements have been addressed• materials and documents used during the activity have been returned/disposed of in the appropriate manner• documentation identifying the completion of the activity has been issued

- all personnel involved in the activity are aware of the completion
 - arrangements for handover are in place
- 1.5 clearly identify any unusual features of the project or process
- 1.6 ensure that the transfer of responsibilities is executed in a way that avoids gaps in responsibility and dual responsibilities occurring
- 1.7 make the handover to those affected in an accurate and timely manner, and obtain agreement between everyone involved on the precise moment of transfer of responsibility
- 1.8 carry out handover activities at two of the following stages:
- completion of a project
 - phase completion of a project
 - ongoing/work in progress
- 1.9 carry out the correct handover procedures for one of the following engineering activities:
- setting up of manufacturing or processing activities
 - maintenance activities
 - testing and trialling
 - research and development
 - installation activities (such as mechanical, electrical/electronic, environmental equipment installation)
 - modification and repair activities
 - commissioning/decommissioning
 - plant and equipment layout (such as equipment changeover, equipment replacement)
 - equipment capability studies/performance measurement
 - lifting and moving of large components/assemblies (including transportation/delivery)
 - engineering safety audits or risk assessments
 - business improvement activities
- 1.10 carry out all of the following during the handover procedures:
- provide evidence to the appropriate people that the activity is ready to be handed over
 - confirm that the other person(s) accept(s) that the activity is ready for handover to them
 - highlight to the appropriate person any modifications or unusual features that have occurred, and where further work or maintenance may be required
 - hand over all documentation relating to the activity
 - obtain agreement from the other person that they now accept responsibility for the activity being handed over
 - complete any necessary handover documentation
 - confirm that the other person knows who to contact, and how, for future information or requirements
- 1.11 carry out the handover to one of the following people:
- customer/client
 - production/process supervisor
 - maintenance supervisor
 - other specific person

<p>1.12 deal promptly and effectively with problems within their control and report those that they cannot solve</p> <p>1.13 make sure that clear, accurate and complete records of the handover are made</p> <p>1.14 record and present the handover paperwork to the appropriate people using the following methods:</p> <ul style="list-style-type: none"> • specific company documentation <p>plus one more from the following:</p> <ul style="list-style-type: none"> • verbal report • written or typed report • electronic mail <p>1.15 carry out all of the following on completion of the handover activities:</p> <ul style="list-style-type: none"> • validation and evaluation of the handover systems and procedures used • suggested improvements to the way in which the handover activities take place • recommendations for improvements or changes to the handover systems and procedures in place.
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Learning outcome
The learner will:
2. know how to hand over and exchange responsibility for control of engineering activities
Assessment criteria
The learner can:
2.1 describe the health and safety requirements of the area in which the handover is to take place, and the responsibility they place on them
2.2 describe the specific health and safety precautions to be applied during the handover procedure, and their effects on others
2.3 describe the legal aspects for the transfer of responsibilities, and any contractual commitments that might be in force
2.4 describe the methods of transfer of responsibilities
2.5 describe the use of work breakdown structure and quality assurance system for monitoring and control of the handover
2.6 describe the means of identifying and categorising any outstanding work
2.7 describe the importance of handover checklists to ensure that essential aspects of the handover are not missed out
2.8 describe the importance of wearing protective clothing and other appropriate safety equipment during the handover, and where it may be obtained
2.9 describe the checking process to be followed before handing over the activity (such as safety, quality, functionality, specification)
2.10 describe the appropriate handover procedure, depending on the activity carried out (such as installation, service, manufacture, process)
2.11 describe the procedure for involving the appropriate people when commencing handover
2.12 describe the need to highlight any unusual or changed features of the activity

- 2.13 describe the importance of informing the appropriate person of any identified future requirements that may be needed
- 2.14 describe the importance to confirming that the other person understands the handover responsibilities
- 2.15 describe the importance of ensuring that the person they are handing over to accepts that the activity is in a suitable condition for handover to take place
- 2.16 describe the organisational documentation procedures applicable to the handover
- 2.17 explain how to create and maintain effective working relationships with appropriate people (encouraging, helping, politeness, open discussions across the organisation)
- 2.18 describe the problems that can occur during handover, and how they can be overcome
- 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.

Unit 360

Carrying out health and safety risk assessments on engineering activities

UAN:	K/600/5805
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 60: carrying out health and safety risk assessments on engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to carry out a health and safety risk assessment, in accordance with regulatory requirements and approved procedures within their organisation. The learner will be expected to obtain appropriate authorisation and information to conduct a risk assessment on an engineering activity under their responsibility, and to make this information known to the appropriate people. The unit requires the learner to identify hazards in the engineering environment that have the potential to injure people, cause ill-health, or cause damage or loss to property or the environment. The learner will then be expected to assess the level of the risks, and to recommend actions to eliminate, mitigate or control the risks.</p>

The learner's responsibilities will require them to comply with organisational policy and procedures for the risk assessment, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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 health and safety risk assessment procedures in an engineering environment. The learner will understand how to conduct a risk assessment, and the organisational procedures that impact upon the results. The learner will also know about the implications and application of risk assessments, in adequate depth to provide a sound basis for carrying out the activities to the required standard.

The learner will be aware of any health, safety and environmental requirements applicable to the engineering activities being assessed. 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. carry out health and safety risk assessments on engineering activities
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 carry out all of the following during the health and safety risk assessment activity: <ul style="list-style-type: none">• adhere to procedures or systems in place for COSHH, Personal Protective Equipment and other relevant safety regulations• obtain the required risk assessment documentation• ensure that they understand the purpose and scope of the risk assessment to be carried out• obtain approval to carry out the risk assessment activities from the appropriate person in the relevant area• ensure that all appropriate personnel are fully informed of their intended activities• use appropriate Personal Protective Equipment for the area in which they are carrying out the risk assessment• ensure that risk assessment records are stored in a manner suited to future audit or investigation 1.3 review existing workplace health and safety risk assessment practices and procedures: <ul style="list-style-type: none">• review all legal requirements that are appropriate to the workplace and work activities being assessed, to ensure that effective control measures are in place• review any previous accidents or incidents, to ensure that

relevant experience has been considered and included in the latest risk assessment

- compare the latest risk assessment to current workplace and working practices
- identify any significant differences between previous and new working practices
- investigate the action taken as a result of their recommendations (as specified in the latest risk assessment report)
- identify any new hazards arising from changes in the workplace or working practices
- make changes to their risk assessment, in line with the review
- inform promptly everyone affected by the changes

1.4 define clearly why, when and where the risk assessment will be carried out

1.5 ensure that they have accurate and up-to-date information on the engineering activities for which the risk assessment is to be carried out

1.6 select a method of identifying hazards which is appropriate to the area being assessed

1.7 identify engineering work areas, processes, tools, equipment or materials that have the potential to cause harm or damage to people, property or the environment

1.8 conduct a health and safety risk assessment on one of the following engineering activities:

- drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)
- manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
- material processing activities (such as heat treatment, casting, injection moulding, purification)
- composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
- finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
- installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
- plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
- workplace layout (such as positioning of stairways, floors, emergency doors)
- particular groups of people (such as young people, pregnant women, people undertaking repetitive exercises)
- risks to the environment arising from workplace activities (such as emission of gases, fumes or dust; disposal of waste materials, use of substances or materials hazardous to the environment)
- equipment capability studies/performance measurement
- movement of materials, components or finished goods

- business improvement activities
 - quality control/quality assurance
 - engineering support services
 - maintenance activities
 - testing and trialling
 - modification and repair activities
 - research and development
 - commissioning/decommissioning
- 1.9 assess the level of risk, and consider how the risks can be eliminated, mitigated or controlled to minimise harm
- 1.10 carry out a health and safety risk assessment, to include using three of the following:
- direct observation
 - examination of internal records
 - interviewing people at work
 - examination of published information
 - safety, environmental or other specialist expertise
- 1.11 identify the potential risks, considering all of the following:
- process or operations being carried out (such as machining, chemical treatments, unshielded processes/emissions, electrical activities, process complexity and ergonomics)
 - tools and equipment used (such as hand tools, power tools, automatic and computer or robotic controlled machinery, equipment condition, guarding and other safety aids)
 - working practices (such as poor housekeeping, unsafe behaviour, working alone or with others, working at height or in confined spaces, job instructions and procedures)
 - materials and substances (such as lifting and handling, transportation and storage, contact with and emissions from using them, volatile/toxic materials)
 - environmental related (such as location, noise, ventilation, lighting, access and egress, weather conditions)
 - people related (such as competency, teamworking, physical and mental demands, training, stress)
- 1.12 prepare a risk assessment report containing recommendations for minimising the risks
- 1.13 produce a health and safety risk assessment report, which includes references to all of the following:
- the purpose and scope of the risk assessment carried out
 - the specific methods used to identify the potential risks
 - a description of the risk(s) identified, their ranking and severity
 - the potential consequences from the risk occurring
 - any breaches in health and safety legislation and workplace procedures
 - the recommended action(s) to take to eliminate or minimise the risks
 - identification of regulations and/or guidelines applicable to the risk
 - the company health and safety policy relative to the risk

<ul style="list-style-type: none"> • implementation of the risk assessment, and follow-up action required <p>1.14 identify and recommend actions to deal with all of the following categories of risk:</p> <ul style="list-style-type: none"> • risks which can be eliminated • risks which can be reduced • risks which remain constant <p>1.15 present the results of the risk assessments to all relevant people</p> <p>1.16 communicate the outcomes of the health and safety risk assessment to the appropriate people, using the following:</p> <ul style="list-style-type: none"> • specific company documentation <p>plus one more from the following:</p> <ul style="list-style-type: none"> • verbal report • written or typed report • electronic mail • computer-based presentation <p>1.17 record information on the risk assessment in the appropriate format and organisational information systems</p> <p>1.18 carry out all of the following, on completion of the health and safety risk assessment activities:</p> <ul style="list-style-type: none"> • validation and evaluation of the risk assessment procedures used • suggested improvements to their process of carrying out a risk assessment • recommendations for improvements or changes to the risk assessment systems and procedures in place <p>1.19 deal with problems within their control, and report those that cannot be resolved.</p>

Learning outcome
The learner will:
2. know how to carry out health and safety risk assessments on engineering activities
Assessment criteria
The learner can:
2.1 describe the responsibilities for health and safety risk assessment, and their legal duties with regard to health and safety, as required by the latest health and safety regulations
2.2 describe the work areas, people and their responsibilities, for whom they are carrying out the risk assessment
2.3 describe the specific work activities of the people in the workplace where they are carrying out the risk assessment
2.4 describe the specific organisational health and safety procedures covering the area/tasks for which they are carrying out the risk assessment
2.5 explain how to obtain information on the engineering activity, and the health and safety regulations and requirements to be observed
2.6 describe the particular health and safety risks which can arise from different engineering activities, and the precautions that can be taken

- 2.7 describe the various hazard spotting and safety assessment methods and techniques that can be used
- 2.8 explain how to identify hazards which might arise from changes in working practices within their work area
- 2.9 explain how to ensure that the hazard identification causes minimal disruption and concern to other people
- 2.10 describe the types of hazard that are most likely to cause harm to health and safety
- 2.11 explain how to identify whether all reasonable precautions are in place to minimise the risk from the hazard
- 2.12 describe the people who require information on the hazards/risks, and the type and amount of information that is required
- 2.13 describe the potential implications of the risks
- 2.14 describe the methods of identifying hazards and assessing the probability of a risk situation occurring (to include direct observation, examining records and interviewing people)
- 2.15 describe the methods of clarifying risk and hazard issues, and of assessing the potential consequences of the risk
- 2.16 explain how to prioritise and manage hazards
- 2.17 describe the types of risk assessment methods that are appropriate to different types of risk
- 2.18 describe the qualitative and quantitative risk assessment techniques
- 2.19 explain where to obtain information that may be required about health and safety within the workplace
- 2.20 describe the ways of influencing, monitoring and controlling human behaviour
- 2.21 describe the opportunities, procedures and formats for communicating and promoting safety and environmental awareness within the engineering activities
- 2.22 describe the methods of collecting and evaluating information on risk assessment activities
- 2.23 describe the techniques for defining and controlling measurable outcomes
- 2.24 describe the importance of using the company information systems for recording the health and safety information
- 2.25 describe the problems that can occur during risk assessments, and how these problems can be avoided or rectified
- 2.26 describe the sources of technical expertise if they have problems that they cannot resolve
- 2.27 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.

Unit 361

Producing contractual arrangements to supply or procure goods or services for engineering activities

UAN:	M/600/5806
Level:	3
Credit value:	40
GLH:	106
Relationship to NOS:	This unit has been derived from National Occupational Standard engineering technical support Unit No 61: Producing contractual arrangements to supply or procure goods or services for engineering activities (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:	<p>This unit covers the skills and knowledge needed to prove the competences required to produce contractual arrangements to supply or procure goods or services such as materials, components, services, facilities, equipment or people to customers, in accordance with approved procedures. The learner will be required to collect information, specifications and contractual terms and conditions, and to produce a tender to supply specific goods or services as requested by the customer.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for producing the contractual arrangements/tenders to supply or procure the required goods or services for the engineering activities, and to report any problems that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. The learner will be expected to work 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.</p> <p>The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to gathering</p>

appropriate information, contractual terms and conditions, determining technical data, and presenting these in the required format to form a contract/tender. The learner will understand the engineering activity requirements within their area of responsibility, including quality assurance, resource management and problem solving principles and procedures, in adequate depth to provide a sound basis for carrying out their activities to the required standard.

The learner will be aware of any company, legislative or regulatory health, safety and environmental requirements applicable to the engineering activities for which the tender is being supplied. 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 contractual arrangements to supply or procure goods or services for engineering activities
Assessment criteria
The learner can: 1.1 obtain accurate and full information on the goods or services for which tender or procurement contracts are to be prepared 1.2 carry out all of the following when producing contractual arrangements for the supply or procurement of goods or services: <ul style="list-style-type: none">• use the correct issue of company information• collect technical details and specifications of the goods or service to be supplied/procured to the customer• identify potential problems which may influence the provision/procurement of the goods or services• ensure that health and safety regulations, safe working practices and environmental issues are taken into account• ensure that the influence of working conditions is recognised and included in the contractual arrangements• identify sources of any additional or auxiliary resources to be supplied/procured• provide terms and conditions related to the contract• produce the contract in an appropriate format 1.3 obtain information on the goods or services to be supplied/procured, from three of the following sources: <ul style="list-style-type: none">• goods or service specifications• design office• sales department• planning department

- production engineering
 - process engineering
 - plant engineering
 - quality engineering
 - contracts/legal department
 - service department
 - contractor
 - installation department
 - finance department
 - management/directors
 - health/safety/environmental engineering
- 1.4 identify the elements of the project to be tendered/procured through contractual arrangements, and confirm these with interested parties
- 1.5 ensure that the specifications for elements to be contracted out are unambiguous and are in sufficient detail for potential contractors to make competitive bids
- 1.6 ensure that any queries are dealt with promptly and equitably, in accordance with agreed organisational procedures, and that records are kept for future reference
- 1.7 ensure that relevant features and critical success factors are identified and recorded
- 1.8 determine resource requirements for the goods or services for which contracts/tenders are being prepared, to include all of the following, as applicable:
- stock levels of goods or components required
 - people who have the required skills and knowledge to carry out the work
 - the space/work area in which to carry out the engineering activities
 - the raw materials required (such as type and specification of material, form of material, amount of material)
 - consumable materials required (such as welding accessories, masking mediums, oil, cutting compounds)
 - bought in standard components that will be required (such as bearings, electrical or electronic components, fluid power components, mechanical fasteners)
 - equipment required (such as hand tools, power tools, machinery, lifting and handling equipment)
 - any outside support services required (such as material treatments, specialist lifting and moving equipment)
 - timescales in which the activities need to take place
 - special/specific safety equipment required (such as fume extraction, fire equipment, environmental protection)
- 1.9 make sure that the contract/tender proposal is produced in the required detail, and complies with organisational and regulatory requirements
- 1.10 produce contractual arrangements to supply/procure goods or services for one of the following engineering activities:
- drawing/design activities (such as mechanical, electrical/electronic, motor vehicle, aerospace, marine)

- manufacturing activities (such as machining, detail fitting, fabrication of components, pressing)
- material processing activities (such as heat treatment, casting, injection moulding, purification)
- composite manufacture (such as wet lay-up, pre-preg laminating, resin infusion, blow moulding)
- finishing activities (such as stripping finishes, painting, plating, anodising, veneering, lacquering)
- assembly activities (such as mechanical, structural, fluid power, electrical/electronic, woodworking)
- installation activities (such as mechanical, electrical/electronic, avionic, structural, environmental equipment)
- plant and equipment (such as site preparation, plant layout, equipment changeover, equipment replacement)
- equipment capability studies/performance measurement
- movement of materials, components or finished goods
- business improvement activities
- engineering safety audits or risk assessments
- quality control/quality assurance
- maintenance activities
- testing and trialling
- commissioning/decommissioning
- modification and repair activities
- research and development
- engineering support services

1.11 produce a contract/tender which includes information on all of the following, as appropriate:

- precise details of the goods or services to be supplied/procured
- the full costs of the goods or services
- the timescales in which the goods or services will be supplied/procured
- the delivery details
- service level agreements
- penalty clauses to be applied
- protection against breach of contract

1.12 produce contracts which cover two of the following:

- standard contracts
- non-standard contracts
- contracts which have implied terms
- contracts which contain a balance of risk and reward
- contracts which are fixed price or 'cost plus' (variable)

1.13 produce the contract/tender in the appropriate format, and inform the appropriate people, using the following methods:

- specific company documentation

plus one more method from the following:

- written or typed report
- electronic mail

<ul style="list-style-type: none"> • computer-based presentation <p>1.14 ensure that the completed contract is reviewed and confirmed as meeting the customer requirements</p> <p>1.15 carry out both of the following on completion of the contracting activities:</p> <ul style="list-style-type: none"> • validation and evaluation of the contracting systems and procedures used • identification of improvements that could be made to the contracting systems and procedures.

Learning outcome

<p>The learner will:</p> <p>2. know how to produce contractual arrangements to supply or procure goods or services for engineering activities</p>

Assessment criteria

<p>The learner can:</p> <p>2.1 explain how to access information on health and safety regulations and guidelines relating to the engineering activities</p> <p>2.2 describe the implications of not taking account of legislation, regulations, standards and guidelines</p> <p>2.3 explain how to obtain information required to produce a contract/tender (such as technical data, terms and conditions, product specification, manufacturing requirements, manpower)</p> <p>2.4 explain how to check the validity of documentation used to prepare the tender</p> <p>2.5 describe the organisational procedures that should be used when obtaining auxiliary and support resources</p> <p>2.6 describe the company policy and procedures for contractual work, goods, materials and services</p> <p>2.7 describe the types and forms of contract appropriate to project type and project elements within their organisation</p> <p>2.8 describe the precedents for use of particular types and forms of contract within their organisation</p> <p>2.9 describe the methods of identifying potentially suitable contractors</p> <p>2.10 describe the sources of information to establish suitability of potential contractors</p> <p>2.11 describe the methods of accessing information to establish suitability of potential contractors</p> <p>2.12 describe the basic principles of law of contracts, including implied terms of contract</p> <p>2.13 describe the implications of National, European and International contract law</p> <p>2.14 describe the legal requirements governing tendering procedures and ethical considerations in the tendering process</p> <p>2.15 describe the type of information and amount of detail to be written into the contracts/tenders</p> <p>2.16 explain how to use previous or similar tender/contract information to assist in preparing the contract</p> <p>2.17 describe the obvious (and hidden) costs of providing that product/service</p> <p>2.18 explain how to determine the resources that will be required to carry out the work for which they are contracting</p>
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- 2.19 explain how to carry out cost analysis, and determine the costs that will need to be charged for the work to be contracted
- 2.20 describe the procedures and format for submitting tenders
- 2.21 describe the confidentiality and protection of information rights
- 2.22 describe the process and procedures for concluding contractual arrangements
- 2.23 describe the techniques of negotiating contracts
- 2.24 describe the importance of maintaining records on contractual arrangements; what needs to be recorded, and where records are kept
- 2.25 describe the different ways of presenting information to different people
- 2.26 describe the roles and responsibilities of key personnel in their organisation
- 2.27 describe the problems that can occur when producing contractual arrangements, and how these problems can be overcome
- 2.28 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve
- 2.29 describe the sources of technical expertise if they have problems that they cannot resolve.



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

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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

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