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Specification

Edexcel NVQ/competence-based qualifications

Edexcel Level 3 NVQ Diploma in Engineering Woodworking, Pattern and Model Making (QCF)

First registration March 2011

A PEARSON COMPANY

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Our specialist suite of qualifications include NVQs, Apprenticeships, WorkSkills, Functional Skills, Foundation Learning, as well as our exclusive range of BTECs, from entry level right through to Higher National Diplomas.

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Contents

Qualification title covered by this specification

This specification gives you the information you need to offer the Edexcel Level 3 NVQ Diploma in Engineering Woodworking, Pattern and Model Making (QCF):

Qualification title	Qualification Number (QN)	Accreditation start date
Edexcel Level 3 NVQ Diploma in Engineering Woodworking, Pattern and Model Making (QCF)	600/0716/3	01/03/2011

This qualification has been accredited within the Qualifications and Credit Framework (QCF) and is eligible for public funding as determined by the Department for Education (DfE) under Sections 96 and 97 of the Learning and Skills Act 2000.

The qualification title listed above features in the funding lists published annually by the DfE and the regularly updated website. It will also appear on the Learning Aims Database (LAD), where relevant.

You should use the QCF Qualification Number (QN), when you wish to seek public funding for your learners. Each unit within a qualification will also have a unique QCF reference number, which is listed in this specification.

The QCF qualification title and unit reference numbers will appear on the learner's final certification document. Learners need to be made aware of this when they are recruited by the centre and registered with Edexcel.

Key features of the Edexcel Level 3 NVQ Diploma in Engineering Woodworking, Pattern and Model Making (QCF)

This qualification:

- is nationally recognised
- is based on the Semta National Occupational Standards (NOS). The NOS, Assessment Strategy and qualification structure are owned by Semta.

The Edexcel Level 3 NVQ Diploma in Engineering Woodworking, Pattern and Model Making (QCF) has been approved as a component for the Semta Advanced Apprenticeship framework.

What is the purpose of this qualification?

This qualification is appropriate for employees in the engineering sector working across a broad range of areas. It is designed to assess occupational competence in the workplace where learners are required to demonstrate skills and knowledge to a level required in the engineering sector.

Who is this qualification for?

This qualification is for all learners aged 16 and above who are capable of reaching the required standards.

Edexcel's policy is that the qualification should:

- be free from any barriers that restrict access and progression
- ensure equality of opportunity for all wishing to access the qualification.

What are the benefits of this qualification to the learner and employer?

This qualification allows learners to demonstrate competence against National Occupational Standards which are based on the needs of the engineering sector as defined by Semta, the Sector Skills Council. As such it contributes to the development of skilled labour in the sector. The qualification may contribute towards the competence element of an Apprenticeship.

What are the potential job areas for those working towards this qualification?

- engineering woodworking
- pattern production and modification
- corebox production and modification
- full-size and scale-model production and modification

What progression opportunities are available to learners who achieve this qualification?

This qualification allows learners to demonstrate competence in engineering woodworking, pattern and model making at a level required by the engineering industry. Learners can progress up the level and size of the engineering competence and knowledge qualifications and into other occupational areas such as team leading and management.

Further information is available in *Annexe A*.

What is the qualification structure for the Edexcel Level 3 NVQ Diploma in Engineering Woodworking, Pattern and Model Making (QCF)?

Individual units can be found in the *Units* section. The QCF level and credit value are given on the first page of each unit.

To achieve the **Edexcel Level 3 NVQ Diploma in Engineering Woodworking, Pattern and Model Making (QCF)** learners must complete a minimum of 106 credits.

Learners must complete all mandatory units in Group A (15 credits) and then choose one of the following pathways:

Edexcel Level 3 NVQ Diploma in Engineering Woodworking, Pattern and Model Making — Engineering Woodworking (QCF) Learners must complete all the units in Group B1 and a minimum of two units in Group B2, for a minimum total of 211 credits.

Edexcel Level 3 NVQ Diploma in Engineering Woodworking, Pattern and Model Making — Pattern/Model Making (QCF) Learners must complete a minimum of three units in Group C1, for a minimum total of 91 credits.

A Mandatory units

Learners must complete all the units in Group A.

A/601/5013 — Complying with statutory regulations and organisational safety requirements

Y/601/5102 — Using and interpreting engineering data and documentation

K/601/5055 — Working efficiently and effectively in engineering

B Engineering Woodworking

Learners must complete all the units in Group B1 and a minimum of two units in Group B2.

C Mandatory units

Learners must complete all the units in Group B1.

D/502/9315 — Marking out wood and composite materials

K/502/9317 — Producing components using woodworking machines

T/502/9319 — Producing and finishing components using woodworking hand tools

B2 Optional units

Learners must complete a minimum of two units in Group B2.

K/502/9320 — Carrying out wood turning operations

M/502/9321 — Assembling engineering woodwork

T/502/9322 — Applying surface finishes to woodwork components and structures

A/502/9323 — Installing woodwork structures, furniture and fittings

C Pattern/Model Making

Learners must complete a minimum of three units in Group C1.

C1 Optional units

F/502/9324 — Marking out pattern, corebox or model components

J/502/9325 — Producing pattern, corebox or model components using woodworking machines

L/502/9326 — Producing pattern, corebox or model components using metalworking machines

A/502/9340 — Producing pattern, corebox or model components using woodworking hand tools

R/502/9327 — Producing pattern, corebox or model components using hand-fitting techniques

Y/502/9328 — Producing pattern, corebox or model components by FRP moulding

D/502/9329 — Assembling wood/composite pattern, corebox or model components

R/502/9330 — Assembling metal pattern, corebox or model components

Y/502/9331 — Producing pattern, corebox or model components using cast resin techniques

D/502/9332 — Proving patterns, coreboxes or models

H/502/9333 — Setting CNC machine tools for operation

K/502/9334 — Programming CNC machines to produce pattern or model components

M/502/9335 — Producing pattern, corebox or model components using NC/CNC machines

T/502/9336 — Producing components by rapid prototyping techniques

A/502/9337 — Modifying and repairing pattern, corebox or model equipment

F/502/9338 — Producing pattern, corebox or model components using flexible composite materials

How is the qualification graded and assessed?

The overall grade for the qualification is a 'pass'. The learner must achieve all the required units within the specified qualification structure.

To pass a unit the learner must:

- achieve **all** the specified learning outcomes
- satisfy **all** the assessment criteria by providing sufficient and valid evidence for each criterion
- show that the evidence is their own.

The qualification is designed to be assessed:

- in the workplace or
- in conditions resembling the workplace, as specified in the Assessment Strategy for the sector, or
- as part of a training programme.

Assessment Strategy

The Assessment Strategy for this qualification has been included in *Annexe D*. It has been developed by Semta in partnership with employers, training providers, awarding organisations and the regulatory authorities. The Assessment Strategy includes details on:

- criteria for defining realistic working environments
- roles and occupational competence of assessors, expert witnesses, internal verifiers and standards verifiers
- quality control of assessment
- evidence requirements.

Evidence of competence may come from:

- **current practice** where evidence is generated from a current job role
- a **programme of development** where evidence comes from assessment opportunities built into a learning/training programme whether at or away from the workplace
- the **Recognition of Prior Learning (RPL)** where a learner can demonstrate that they can meet the assessment criteria within a unit through knowledge, understanding or skills they already possess without undertaking a course of learning. They must submit sufficient, reliable and valid evidence for internal and standards verification purposes. RPL is acceptable for accrediting a unit, several units or a whole qualification
- a **combination** of these.

It is important that the evidence is:

Valid	relevant to the standards for which competence is claimed
Authentic	produced by the learner
Current	sufficiently recent to create confidence that the same skill, understanding or knowledge persist at the time of the claim
Reliable	indicates that the learner can consistently perform at this level
Sufficient	fully meets the requirements of the standards.

Types of evidence (to be read in conjunction with the Assessment Strategy in Annexe D)

To successfully achieve a unit the learner must gather evidence which shows that they have met the required standard in the assessment criteria. Evidence can take a variety of different forms including the examples below. Centres should refer to the Assessment Strategy for information about which of the following are permissible.

- direct observation of the learner's performance by their assessor (O)
- outcomes from oral or written questioning (Q&A)
- products of the learner's work (P)
- personal statements and/or reflective accounts (RA)
- outcomes from simulation, where permitted by the Assessment Strategy (S)
- professional discussion (PD)
- assignment, project/case studies (A)
- authentic statements/witness testimony (WT)
- expert witness testimony (EPW)
- evidence of Recognition of Prior Learning (RPL).

The abbreviations may be used for cross-referencing purposes.

Learners can use one piece of evidence to prove their knowledge, skills and understanding across different assessment criteria and/or across different units. It is, therefore, not necessary for learners to have each assessment criterion assessed separately. Learners should be encouraged to reference the assessment criteria to which the evidence relates.

Evidence must be made available to the assessor, internal verifier and Edexcel standards verifier. A range of recording documents is available on the Edexcel website www.edexcel.com. Alternatively, centres may develop their own.

Additional Requirements

The Joint Awarding Body and the SSC Working Practices Group have identified additional requirements that are needed to assess and quality assure qualifications placed on the QCF that use NVQ within their title. These requirements are shown in *Annexe D: Additional Requirements for Qualifications that use the title NVQ within the QCF*.

Centre recognition and approval

Centre recognition

Centres that have not previously offered Edexcel qualifications need to apply for and be granted centre recognition as part of the process for approval to offer individual qualifications. New centres must complete both a centre recognition approval application and a qualification approval application.

Existing centres will be given 'automatic approval' for a new qualification if they are already approved for a qualification that is being replaced by the new qualification and the conditions for automatic approval are met. Centres already holding Edexcel approval are able to gain qualification approval for a different level or different sector via Edexcel online.

Approvals agreement

All centres are required to enter into an approvals agreement which is a formal commitment by the head or principal of a centre to meet all the requirements of the specification and any linked codes or regulations. Edexcel will act to protect the integrity of the awarding of qualifications, if centres do not comply with the agreement. This could result in the suspension of certification or withdrawal of approval.

Quality assurance

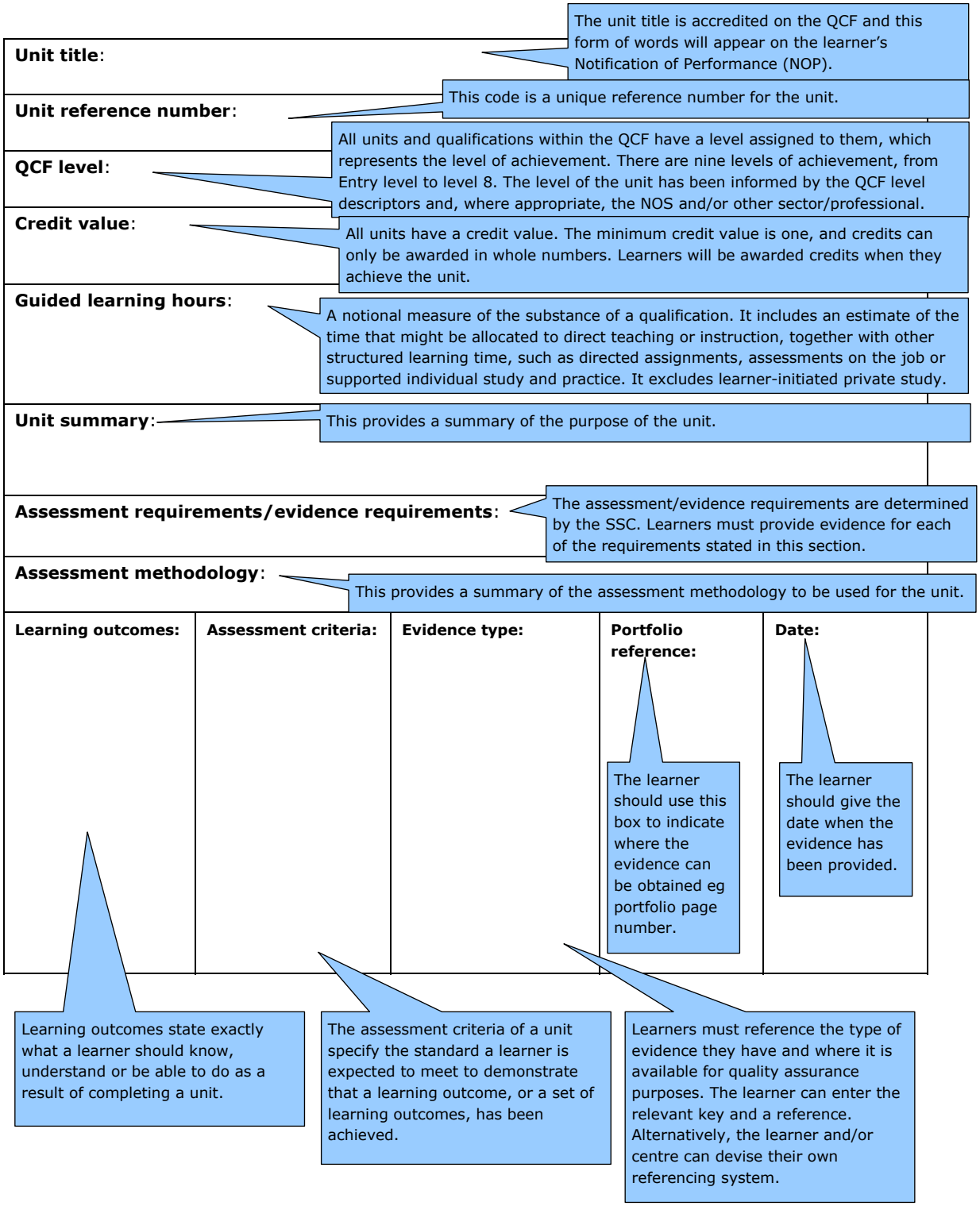
Detailed information on Edexcel's quality assurance processes is given in *Annexe B*.

What resources are required?

Each qualification is designed to support learners working in the engineering sector. Physical resources need to support the delivery of the qualifications and the assessment of the learning outcomes and must be of industry standard. Centres must meet any specific resource requirements outlined in *Annexe D: Assessment Strategy*. Staff assessing the learner must meet the requirements within the overarching Assessment S trategy for the sector.

Unit format

Each unit in this specification contains the following sections.



Units

Unit 1: Complying with statutory regulations and organisational safety requirements

Unit reference number: A/601/5013

QCF level: 2

Credit value: 5

Guided learning hours: 35

Unit summary

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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Comply with statutory regulations and organisational safety requirements	1.1 comply with their duties and obligations as defined in the Health and Safety at Work Act 1.2 demonstrate their understanding of their duties and obligations to health and safety by: – applying in principle their duties and responsibilities as an individual under the Health and Safety at Work Act – identifying, within their organisation, appropriate sources of information and guidance on health and safety issues, such as: - 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 activities to be undertaken 1.4 follow organisational accident and emergency procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 comply with emergency requirements, to include: – identifying the appropriate qualified first aiders and the location of first aid facilities – identifying the procedures to be followed in the event of injury to themselves or others – following organisational procedures in the event of fire and the evacuation of premises – identifying the procedures to be followed in the event of dangerous occurrences or hazardous – malfunctions of equipment 1.6 recognise and control hazards in the workplace 1.7 identify the hazards and risks that are associated with the following: – their working environment – the equipment that they use – materials and substances (where appropriate) that they use – working practices that do not follow laid-down procedures 1.8 use correct manual lifting and carrying techniques 1.9 demonstrate one of the following methods of manual lifting and carrying: – lifting alone – with assistance of others – with mechanical assistance			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 apply safe working practices and procedures to include: – maintaining a tidy workplace, with exits and gangways free from obstruction – using equipment safely and only for the purpose intended – observing organisational safety rules, signs and hazard warnings – taking measures to protect others from any harm resulting from the work that they are carrying out			
2. Know how to comply with statutory regulations and organisational safety requirements	2.1 describe the roles and responsibilities of themselves and others under the Health and Safety at Work Act, and other current legislation (such as The Management of Health and Safety at Work Regulations, Workplace Health and Safety and Welfare Regulations, Personal Protective Equipment at Work Regulations, Manual Handling Operations Regulations, Provision and Use of Work Equipment Regulations, Display Screen at Work Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations) 2.2 describe the specific regulations and safe working practices and procedures that apply to their work activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	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)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	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			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	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			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____
(*if sampled*)

Unit 2: Using and interpreting engineering data and documentation

Unit reference number: Y/601/5102

QCF level: 2

Credit value: 5

Guided learning hours: 25

Unit summary

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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Use and interpret engineering data and documentation	1.1 use the approved source to obtain the required data and documentation 1.2 use the data and documentation and carry out all of the following: – check the currency and validity of the data and documentation used – exercise care and control over the documents at all times – correctly extract all necessary data in order to carry out the required tasks – seek out additional information where there are gaps or deficiencies in the information obtained – deal with or report any problems found with the data and documentation – make valid decisions based on the evaluation of the engineering information extracted from the documents – return all documents to the approved location on completion of the work – complete all necessary work-related documentation such as production documentation, installation documentation, maintenance documentation, planning documentation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 correctly identify, interpret and extract the required information 1.4 extract information that includes three of the following: – materials or components required – dimensions – tolerances – build quality – installation requirements – customer requirements – time scales – financial information – operating parameters – surface texture requirements – location/orientation of parts – process or treatments required – dismantling/assembly sequence – inspection/testing requirements – number/volumes required – repair/service methods – method of manufacture – weld type and size – operations required			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– 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			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 use information extracted from documents to include one from the following: – drawings (such as component drawings, assembly drawings, modification drawings, repair drawings, welding/fabrication drawings, distribution and installation drawings) – diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit diagrams) – manufacturers manuals/drawings – approved sketches – technical illustrations – photographic representations – visual display screen information – technical sales/marketing documentation – contractual documentation – other specific drawings/documents 1.7 use information extracted from related documentation, to include two from the following: – instructions (such as job instructions, drawing instructions, manufacturers instructions) – specifications (such as material, finish, process, contractual, calibration)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– reference materials (such as manuals, tables, charts, guides, notes) – schedules – operation sheets – service/test information – planning documentation – quality control documents – company specific technical instructions – national, international and organisational standards – health and safety standards relating to the activity (such as COSHH) – other specific related documentation 1.8 deal promptly and effectively with any problems within their control and report those which cannot be solved 1.9 report any inaccuracies or discrepancies in documentation and specifications			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to use and interpret engineering data and documentation	2.1 explain what information sources are used for the data and documentation that they use in their work activities 2.2 explain how documents are obtained, and how to check that they are current and valid 2.3 explain the basic principles of confidentiality (including what information should be available and to whom) 2.4 describe the different ways/formats that data and documentation can be presented (such as such as drawings, job instructions product data sheets, manufacturers' manuals, financial spreadsheets, production schedules, inspection and calibration requirements, customer information) 2.5 explain how to use other sources of information to support the data (such as electronic component pin configuration specifications, reference charts, standards, bend allowances required for material thickness, electrical conditions required for specific welding rods, mixing ratios for bonding and finishing materials, metal specifications and inspection requirements, health and safety documentation) 2.6 describe the importance of differentiating fact from opinion when reviewing data and documentation 2.7 describe the importance of analysing all available data and documentation before decisions are made			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	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			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	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			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____
(*if sampled*)

Unit 3: Working efficiently and effectively in engineering

Unit reference number: K/601/5055

QCF level: 3

Credit value: 5

Guided learning hours: 25

Unit summary

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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Work efficiently and effectively in engineering	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			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	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			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 deal with problems affecting the engineering process, to include two of the following: – materials – tools and equipment – drawings – job specification – quality – people – timescales – safety – activities or procedures 1.10 contribute to and communicate opportunities for improvement to working practices and procedures 1.11 make recommendations for improving to two of the following: – working practices – working methods – quality – safety – tools and equipment – supplier relationships – internal communication – customer service – training and development – teamwork – other			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 maintain effective working relationships with colleagues to include two of the following: – colleagues within own working group – colleagues outside normal working group – line management – external contacts 1.13 review personal training and development as appropriate to the job role 1.14 review personal development objectives and targets to include one of the following: – dual or multi-skilling – training on new equipment/technology – increased responsibility – understanding of company working practices, procedures, plans and policies – other specific requirements			
2 Know how to work efficiently and effectively in engineering	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			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	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			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	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			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 4: Marking out wood and composite materials

Unit reference number: D/502/9315

QCF level: 3

Credit value: 21

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare for and mark out materials and components used in engineering woodworking and model making, in accordance with approved procedures. The learner will need to interpret correctly the information contained in the drawings, instructions and specifications, in order to mark out the materials and components accurately and correctly. The learner will be required to select the appropriate marking-out equipment to be used, based on the features to be marked out and the accuracy required. The learner will need to use these instruments to mark out datums, profiles, simple joints, hole positions, assembly positions and cutting lines which will be followed when producing the required components. Materials to be marked out will include softwoods, hardwoods and composites, which may be in sheet form, stock sections, or part-manufactured components or sub-assemblies.

The learner's responsibilities will require them to comply with organisational policy and procedures for the marking-out activities undertaken, and to report any problems with the marking-out equipment, materials or activities that they cannot personally resolve, or 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 applying marking-out methods and procedures to engineering woodworking and model-making components. The learner's knowledge will be sufficient to enable them to identify incomplete, conflicting or inadequate information, and to carry out the marking-out activities to the required specification. The learner will know about the various tools that can be used in the marking-out process and why it is important to mark out accurately and legibly.

The learner will understand the safety precautions required when working with marking-out mediums, tools and equipment, and will be required to demonstrate safe working practices throughout. The learner will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Mark out wood and composite materials	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 obtain and use the correct information for the marking-out activities, to include three from the following: – drawings – specifications – verbal instructions – sketches 1.3 obtain the appropriate marking-out equipment and check that it is in a usable condition 1.4 use a range of marking-out equipment, to include six of the following: – rules and tapes – dividers, compasses or trammels – scribers or knives – squares – straight edge – protractors or bevel gauges – punches – marking gauges – pencils – vee blocks – angle plates			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 prepare suitable datums and marking-out surfaces 1.6 mark out using appropriate methods 1.7 use marking-out methods and techniques, which include one of the following: – direct marking using instruments – use of templates – tracing/transfer methods 1.8 mark out three of the following: – frames – storage units – cases – furniture – jigs – fixtures – transportation units – formers – structures – other specific items			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 mark out workpieces, to include seven of the following features: – datums/centre lines – machining guidelines – square/rectangular profiles – angles/angular profiles – circles – contoured profiles – linear hole positions – radial hole positions – joints – assembly positions 1.10 check that the marking out complies with the specification 1.11 produce marked-out components which meet all of the following quality and accuracy standards: – dimensionally accurate to drawing or specification – has clearly formed lines and profiles – waste material is clearly identified – datum faces/points are clearly marked and identified 1.12 deal promptly and effectively with problems within their control and report those that cannot be resolved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2. Know how to mark out wood and composite materials	2.1 describe the specific safety precautions to be taken when marking out wood and composite materials, and with the tools and equipment that are used 2.2 describe the hazards associated with the marking-out activities (marking-out equipment used, lifting and handling sheet material, long lengths of materials, splinters from wood), and how they can be minimised 2.3 describe the process to be adopted to obtain the required drawings and job instructions 2.4 explain how to extract information from engineering drawings and related specifications (to include symbols and conventions in relation to work undertaken, first and third angle projections) 2.5 describe the principles of marking out and the type of equipment used 2.6 describe the range of operations that the various marking-out equipment is capable of performing 2.7 explain how to prepare the materials in readiness for the marking-out activities, in order to enhance clarity, accuracy and safety (visually checking for defects, preparing the materials, removing sharp corners and edges)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain how to select and establish suitable datums 2.9 explain the importance of ensuring that marking out is undertaken from the selected datums, and the possible effects of working from different datums 2.10 describe the methods of holding and supporting workpieces during the marking-out activities, and equipment that can be used 2.11 describe the use of marking-out conventions when marking out the workpiece (including datums; cutting guidelines; square and rectangular profiles; circular and radial profiles; angles; holes which are linearly positioned, boxed and on pitch circles) 2.12 describe the use of geometrical construction methods applied to marking out 2.13 describe the ways of laying out the marking-out shapes or patterns to maximise the use of materials 2.14 explain how to set and adjust the tools (such as squares, protractors, marking gauges) 2.15 describe the importance of using tools only for the purpose intended; the care that is required when using the equipment and tools; the proper way of storing tools and equipment between operations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain the need for clear lines and dimensional accuracy in marking out to specification and drawing requirements 2.17 describe the things that can go wrong with the marking-out activities, and how these can be avoided 2.18 describe the standards to be attained and company quality control procedures 2.19 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 5: Producing components using woodworking machines

Unit reference number: K/502/9317

QCF level: 3

Credit value: 55

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce engineering woodworking components using machine tools, in accordance with approved procedures. The learner will be required to select the appropriate equipment to use, based on the type of operations to be performed, the size of the components and the materials used. The production of the components will involve the use of both fixed and portable conventional machines, which are designed specifically for wood and composite materials.

The size and complexity of the components produced will vary, and this will require the learner to set up the necessary machines and their associated tooling, and to make any necessary adjustments during machining, in order that the parts produced meet the required specification. The components produced will be used to produce any of the following: frames, cases, storage units, jigs and fixtures, formers, transportation units, furniture and structures.

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the activities, materials or equipment used that they cannot personally resolve, or 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 applying woodwork machining procedures. The learner will understand the equipment being used, and its application, and will know about the tooling, machine-setting arrangements and safety devices, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the work output is to the required specification.

The learner will understand the safety precautions required when carrying out the machining 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce components using woodworking machines	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 machining activities: – obtain all the necessary information to carry out the machining activities (drawings, specifications) – check that the machines tools are fit for purpose and are in a safe and usable condition – ensure the work area is free from hazards – ensure all machine guards and safety devices are correctly positioned – check that dust extraction equipment is functioning correctly – set and adjust the machine to produce the components to the required specification – use safe and approved machining techniques at all times 1.3 confirm that the machine is set up and ready for the machining activities to be carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 use fixed/portable machines, to include seven of the following: – circular saw – band saw – jig saw – sander (eg face, belt, bobbin) – router – planer/thicknesser – morticer/tenoner – combing machine – wood miller – spindle moulder (single or double) – bench or pedestal drill – other special-purpose machine 1.5 manipulate the machine tool controls safely and correctly in line with operational procedures 1.6 produce components to the required quality and within the specified dimensional accuracy			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 produce components which combine different features and cover ten of the following profiles: – flat faces – parallel faces – square faces – angular/tapered faces – stepped features – slots/grooves – tenons – mortices – half-lap joints – combed joints – dovetail joints – rebates – curved profiles – concave profiles – convex profiles – drilled holes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce components made from four of the following materials: – soft woods – hard woods – plywood – blockboard – hardboard – fibreboard (MDF) – plastic materials 1.9 carry out quality sampling checks at suitable intervals 1.10 use appropriate measuring equipment and tools to check five of the following: – dimensions – flatness – squareness – alignment – position – profile – distortion/straightness			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 produce components which meet all of the following quality and accuracy standards: – dimensionally accurate within specification tolerances – free from false tool cuts and material defects – interlocking components (joints) are secure – appropriate surface texture – meet the drawing or specification requirements 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 shut down the equipment to a safe condition on conclusion of the machining activities			
2. Know how to produce components using woodworking machines	2.1 describe the specific safety precautions to be taken whilst carrying out the wood machining activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the machining activities, and the responsibility they place on the learner 2.3 describe the use of machine guards and emergency stop mechanisms 2.4 explain how to set up and use dust extraction equipment, and the importance of ensuring the equipment is operating correctly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the personal protective equipment and clothing to be worn during the machining activities 2.6 describe the hazards associated with machining wood and composite materials, and how they can be minimised 2.7 describe the importance of ensuring that all machine and portable tools are used correctly and within their permitted operating range 2.8 explain the need to ensure that all plugs, sockets and cables on portable machines are in a safe and usable condition 2.9 explain how to obtain the necessary job instructions, drawings and specifications that are used during the machining activities, and how to interpret the information 2.10 describe the various machines that are used in wood machining, and the range of operations they are capable of performing (eg sawing, planing, rebating, profiling) 2.11 explain how to check that the cutting tools are in a usable and safe condition, and the procedure for changing these when required 2.12 explain how different types of machines use different methods to feed the material to the cutting/dressing tool or surface			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 describe the various methods used to hold the components that are being shaped, formed or dressed 2.14 explain how different materials require changes to the machining methods (such as roughing and finishing cuts, changes in feed or speeds) 2.15 explain how to conduct any necessary checks to ensure the accuracy and quality of the components produced, and the type of equipment that is used to carry out these checks 2.16 explain how to recognise defects in the components, which may be material defects or those produced through machining 2.17 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.18 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 6: Producing and finishing components using woodworking hand tools

Unit reference number: T/502/9319

QCF level: 3

Credit value: 70

Guided learning hours: 126

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce wood and composite components for engineering woodworking activities, using hand tools, in accordance with approved procedures. The learner will be required to select the appropriate tools to use, based on the type of operations to be performed, the size of the components, and the materials used. The size and complexity of the components produced will vary, but will involve finishing them using hand tools only. The components produced will be used to produce items such as frames, cases, storage units, jigs and fixtures, formers, transportation units, furniture and structures.

The learner's responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the activities, materials or equipment used that they cannot personally resolve, or 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 applying hand-finishing procedures to woodworking. The learner will understand the equipment being used, and its application, and will know about the cutting tools, their function and maintenance requirements, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the work output is to the required specification. The learner will be able to identify blunt and damaged cutting tools, and will know how to sharpen and adjust them in use, in order for them to work efficiently.

The learner will understand the safety precautions required when carrying out the hand-shaping 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce and finish components using woodworking hand tools	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 hand-shaping activities: – obtain all the necessary information to carry out the hand-shaping activities (drawings, specifications) – check that the hand tools are fit for purpose and in a safe and usable condition – ensure the work area is free from hazards – use safe and approved hand-shaping techniques at all times – maintain the cutting tools in a serviceable condition 1.3 follow relevant specifications for the component to be produced 1.4 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use hand tools to cut and shape materials, to include six of the following: – rip saws – tenon saws – fret/bow saws – jack or smoothing planes – rebating planes – spokeshaves – chisels/gouges – drills/braces – files/rasps – sanding blocks/paper 1.6 shape the materials using appropriate methods and techniques			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 produce components which combine different features and cover eight of the following profiles: – flat faces – parallel faces – square faces – angular/tapered faces – stepped features – curved profiles – concave profiles – convex profiles – circular/round profiles – chamfers and radii – drilled holes – simple joints 1.8 produce components made from four of the following materials: – soft woods – hard woods – plywood – blockboard – hardboard – fibreboard (MDF) – plastic materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 check that all the required shaping operations have been completed to the required specification 1.10 use appropriate measuring equipment and tools to check five of the following: – dimensions – flatness – squareness – alignment – position – profile – distortion/straightness 1.11 produce components which meet all of the following quality and accuracy standards: – dimensionally accurate within specification tolerances – free from false tool cuts and material defects – interlocking components (joints) are secure – have an appropriate surface texture – meet the drawing requirements – meet company and customer requirements 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2. Know how to produce and finish components using woodworking hand tools	2.1 describe the specific safety precautions to be taken whilst carrying out the wood-shaping activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the woodworking activities, and the responsibility they place on the learner 2.3 describe the personal protective equipment and clothing to be worn during the woodworking activities 2.4 describe the hazards associated with cutting and shaping wood and composite materials, and with the tools and equipment that is used, and how they can be minimised 2.5 explain how to obtain the necessary job instructions, drawings and specifications for the woodworking activities, and how to interpret the information 2.6 describe the various hand tools that are used to cut and shape the materials, and the range of operations they are capable of performing (eg rip saws, tenon saws, fret/bow saws; smoothing planes, jack planes, rebating planes; chisels and gouges; files and rasps; spokeshaves)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to check the cutting tools are in a usable and safe condition, and the procedure for sharpening and adjusting these when required 2.8 describe the various methods used to hold the components that are being shaped, formed or dressed by hand 2.9 explain the need to consider grain direction and construction when cutting and shaping wood and composites 2.10 explain how to conduct any necessary checks to ensure the accuracy and quality of the components produced, and the type of equipment that is used 2.11 explain how to recognise defects in the components (material defects or those produced through the cutting and shaping activities) 2.12 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.13 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 7: Carrying out wood turning operations

Unit reference number: K/502/9320

QCF level: 3

Credit value: 60

Guided learning hours: 133

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce engineering woodworking components using wood turning machines, in accordance with approved procedures. The learner will be required to select the appropriate equipment to use, based on the type of operations to be performed, the size of the components and the materials used. The size and complexity of the components produced will vary, and this will require the learner to set up the necessary machines and their associated workholding devices and tooling, and to make any necessary adjustments during machining in order that the parts produced meet the required specification. The components produced will be used to produce items such as frames, display stands/cases, storage units, jigs and fixtures, formers, transportation units, furniture and structures.

The learner's responsibilities will require them to comply with organisational policy and procedures for the wood turning activities undertaken, and to report any problems with the activities, materials or equipment used that they cannot personally resolve, or 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 applying wood turning procedures. The learner will understand the equipment being used, and its application, and will know about the tooling, workholding devices, machine setting arrangements and safety devices, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the work output is to the required specification.

The learner will understand the safety precautions required when carrying out the machining 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Carry out wood turning operations	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 machining activities: – obtain all the necessary information to carry out the wood turning activities (drawings, specifications) – check that the lathe and workholding devices are fit for purpose and in a safe and usable condition – ensure that the work area is free from hazards – ensure that all machine guards and safety devices are correctly positioned – check that dust extraction equipment is functioning correctly – set and adjust the lathe to produce the components to the required specification – use safe and approved machining techniques at all times 1.3 confirm that the machine is set up and ready for the machining activities to be carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 select and mount/position tools/toolrests and workholding devices, to include three from the following: – drive centre and tailstock – screw chuck – face plate – chucks – special securing device 1.5 manipulate the machine tool controls safely and correctly in line with operational procedures 1.6 produce components which combine different features, and which cover ten of the following: – flat faces – parallel diameters – stepped diameters – tapered diameters – convex profiles – concave or dished faces – tapered faces – profiled diameters – external grooves or recesses – drilled holes – bored holes – radii and chamfers			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 produce components made from two of the following materials: – soft woods – hard woods – composite (such as MDF, Ureal) 1.8 carry out quality sampling checks at suitable intervals 1.9 use appropriate measuring equipment and tools to check five of the following: – dimensions – flatness – squareness – position of features – profile – distortion/straightness 1.10 produce components to the required quality and within the specified dimensional accuracy			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 produce components which meet all of the following quality and accuracy standards: – dimensionally accurate within specification tolerances – free from false tool cuts and material defects – appropriate surface texture – meet the drawing or specification requirements 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 shut down the equipment to a safe condition on conclusion of the machining activities			
2. Know how to carry out wood turning operations	2.1 describe the specific safety precautions to be taken whilst carrying out the wood turning activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the wood turning activities, and the responsibility they place on the learner 2.3 describe the use of machine guards and emergency stop mechanisms 2.4 explain how to set up and use dust extraction equipment, and the importance of ensuring the equipment is operating correctly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the personal protective equipment and clothing to be worn during the wood turning activities, and where it can be obtained 2.6 describe the hazards associated with turning wood and composite materials, and how they can be minimised 2.7 explain the importance of ensuring that the lathe, workholding devices and turning tools are used correctly and within their permitted operating range 2.8 explain how to obtain the necessary job instructions, drawings and specifications for the machining activities, and interpret the information 2.9 explain how to set and adjust the toolrest for the various operations being performed 2.10 describe the range of wood turning tools/chisels that are used, and the different operations they are designed to perform 2.11 explain how to check the wood turning tools are in a usable and safe condition, and the procedure for changing or sharpening these when required 2.12 describe the various methods used to hold the components that are being turned 2.13 explain how to produce drilled holes and bored holes in the workpiece, and the equipment that is used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain why different materials require changes to the machining methods (such as roughing and finishing cuts, changes in feed or speeds used to cut them) 2.15 explain how to conduct any necessary checks to ensure the accuracy and quality of the components produced, and the type of equipment that is used for the checking 2.16 explain how to recognise defects in the components (material defects or those produced through machining) 2.17 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.18 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 8: Assembling engineering woodwork

Unit reference number: M/502/9321

QCF level: 3

Credit value: 35

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assemble wood and composite components for engineering woodwork applications using mechanical fixing devices and adhesives, in accordance with approved procedures.

Assemblies produced will include such things as frames, display stands and cases, storage units, jigs and fixtures, formers, transportation units, furniture and structures. The learner will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the type of components to be assembled, and to check that they are in a safe and serviceable condition. The learner will also be expected to select the appropriate fixing devices and adhesives to use, based on the type, size and material of the components to be assembled. The learner will need to identify and create any datums that will be required to locate the components during the assembly process.

The size, shape and complexity of the parts to be assembled and the finished workpiece will vary, and it is anticipated that some components will be sub-assembled prior to the final assembly taking place. The assembly activities will also include making all necessary visual and dimensional checks to ensure the assembly meets the required specification.

The learner's responsibilities will require them to comply with organisational policy and procedures for the woodwork assembly activities undertaken, and to report any problems with the assembly activities, tools, adhesives or equipment used that they cannot personally resolve, or 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 the assembly of woodwork components. The learner will understand the function of the items being assembled, and its application, and will know about the assembly techniques, components, equipment, relevant materials, adhesives and fastening devices, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the finished assembly is to the required specification.

The learner will understand the safety precautions required when carrying out the assembly operations. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Assemble engineering woodwork	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 assembly activities: – obtain and use the correct issue of documents and specifications – comply with relevant COSHH sheets and risk assessment standards – check that all tools and equipment are in a safe and usable condition – obtain all the required components and securing devices for the assembly – use recognised and approved assembly techniques and procedures – produce assemblies which comply with the specification – leave the work area in a safe condition 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 ensure that the specified components are available and that they are in a usable condition 1.5 use the appropriate methods and techniques to assemble the components in their correct positions			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 apply all of the following assembly methods and techniques: – ensuring that correct and undamaged components are used – ensuring that the correct 'hand' of component is used at the appropriate position (left or right handed) – ensuring the correct orientation, position and alignment of components – using cramps to hold the components during the assembly activities – securing components using mechanical fasteners (pins, screws, nails) – securing components using adhesives 1.7 produce engineering woodwork assemblies which include four of the following: – frames – storage units – show stands or cases – furniture – jigs – fixtures – transportation units – formers – structures – other specific items			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 secure the components using the specified connectors and securing devices 1.9 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification 1.10 carry out quality and accuracy checks which include six of the following: – alignment – position – dimensions – flatness – squareness – profile – distortion/straightness 1.11 produce woodwork assemblies which comply with all of the following standards: – dimensionally accurate within specification tolerances – free from material defects – interlocking components (joints) are secure – appropriate surface texture – meet the drawing or specification requirements 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2. Know how to assemble engineering woodwork	2.1 describe the specific safety precautions to be taken whilst carrying out the woodwork assembly activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the woodwork assembly activities, and the responsibility they place on the learner 2.3 describe the personal protective equipment and clothing to be worn during the woodwork assembly activities, and where it can be obtained 2.4 describe the hazards associated with producing wood and composite assemblies, and how they can be minimised 2.5 explain how to obtain the necessary job instructions, drawings and specifications for the assembly activities, and how to interpret the information 2.6 explain the component identification systems (eg codes and component orientation indicators, left and right handing), and how to identify the components to be used 2.7 describe the preparations to be undertaken on the components prior to fitting them into the assembly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the assembly methods and procedures to be used, and the importance of adhering to these procedures 2.9 explain how to mark out the necessary datum lines for the assembly operations 2.10 explain how the components are to be aligned and positioned prior to securing them, and the tools and equipment that are used 2.11 explain why some types of assembly require the use of jigs, fixtures and gauges to aid the assembly 2.12 describe the various mechanical fasteners that will be used to secure the components, and their method of installation (including pins, nails, screws and special securing devices) 2.13 describe the application of adhesives within the assembly activities, and the precautions that must be taken when working with them 2.14 describe the quality control procedures to be followed during the assembly operations 2.15 explain how to conduct any necessary checks to ensure the accuracy and quality of the assembly produced 2.16 explain how to recognise defects, blemishes, poor alignment, ineffective fasteners and damaged components within the assembly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 explain how to check that the tools and equipment to be used are in a safe and serviceable condition 2.18 describe the importance of ensuring that all tools are used correctly and within their permitted operating range 2.19 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.20 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 9: Applying surface finishes to woodwork components and structures

Unit reference number: T/502/9322

QCF level: 3

Credit value: 30

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply surface finishes to engineering woodwork assemblies or installations, by hand methods, in accordance with approved procedures. The learner will be required to select the appropriate equipment to use, based on the materials to be applied and the surface area to be covered. The learner will be expected to use the specified or appropriate techniques to seal, prime, colour, varnish, stain, wax or polish the various parts, using brushes, rollers, pads or cloths, as appropriate to the task.

The learner's responsibilities will require them to comply with organisational policy and procedures for the finishing activities undertaken, and to report any problems with the finishing activities, components or equipment that they cannot personally resolve, or 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 applying hand-finishing techniques and procedures to woodwork assemblies or installations. The learner will understand the finishing procedures used, and their application, and will know about the finishing techniques, paints or coatings and equipment used, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the work is carried out to the required quality.

The learner will understand the safety precautions required when carrying out the finishing operations. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Apply surface finishes to woodwork components and structures	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all the following activities during the finishing process: – obtain and follow the relevant job instructions and finishing specifications – comply with relevant COSHH requirements and risk assessments – prepare the tools and materials in readiness for the finishing operations – wear appropriate protective clothing and breathing apparatus – clean all tools and equipment on completion of the finishing activities – leave the work area in a safe and clean condition 1.3 ensure the material surfaces to be treated are suitably prepared for the finishing operations to be carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 prepare for the finishing operations by carrying out six of the following activities: – cleaning – flattening down – sealing – filling – masking – pre-surface treatments – mixing of colour – mixing of primers – stripping old finishes – re-activating treatments 1.5 check that the finishing equipment and treatment solutions are set up and maintained at satisfactory operating conditions and levels 1.6 carry out the treatment process in accordance with operating procedures and the component specification requirements 1.7 apply finishes to four of the following: – doors and frames – display units/stands – cases – storage units – jigs and fixtures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– formers – furniture – structures – portable screening – transportation units – partitioning – other specific items 1.8 apply six types of the following finishing materials, using appropriate hand tools and techniques: – sanding sealer – water-based paints – oil/alkyd-based paints – synthetic paints – polyurethane varnish – lacquer – stain – wax – French polish – temporary protective coatings – other special finishes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 apply finishes to a range of surfaces, to include all of the following: – flat – horizontal – vertical – overhead – curved or cylindrical 1.10 use three of the following consumables: – masking medium and tape – rubbing paper – abrasive pads – cleaning materials 1.11 ensure that the treated workpiece achieves the required characteristics and meets the finishing specification 1.12 apply finishes which comply with all of the following quality and accuracy standards: – has the required surface coating in line with specification or job requirements – acceptable colour match and gloss levels – free from runs, drips or other surface defects – meets customer/company requirements 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 dispose of waste and excess materials in line with agreed organisational procedures 1.15 shut down the finishing equipment to a safe condition on completion of the processing activities			
2. Know how to apply surface finishes to woodwork components and structures	2.1 describe the specific safety precautions to be taken whilst carrying out the application of paint and other surface finishes (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the finishing activity, and the responsibility they place on the learner 2.3 describe the hazards associated with carrying out hand painting and finishing activities, and with the materials and equipment used, and how they can be minimised 2.4 describe the personal protective equipment and clothing to be worn during the finishing activity 2.5 describe the various types of specification that are used during the finishing activity 2.6 describe the range of surface finishes that can be applied, and the types of surfaces for which they are best suited 2.7 describe the preparation methods and techniques to be undertaken prior to finishing for filling, and flatting			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the surface treatment methods and techniques to be undertaken prior to finishing 2.9 explain how to determine the quantities of finishing materials required and, where applicable, mixing ratios 2.10 describe the preparation methods and techniques for mixing paints, varnishes, lacquers, stains and polishes 2.11 describe the various methods of applying the required finishes using brushes, rollers, paint pads and cloths 2.12 describe the procedures for the transportation and storage of finishing materials 2.13 describe the equipment care and control procedures (eg fume extraction systems) 2.14 describe the cleaning and maintenance procedures for brushes and rollers 2.15 describe the procedures for dealing with waste materials 2.16 explain how to recognise defects such as bubbles, contamination, runs and other surface defects 2.17 describe the problems that can occur with the finishing operations, and how these can be overcome 2.18 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 10: Installing woodwork structures, furniture and fittings

Unit reference number: A/502/9323

QCF level: 3

Credit value: 40

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to install engineering woodwork and composite structures, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the units or structures to be installed. The items to be installed will include such as doors and frames, studded walls, built-in storage cupboards and filing units, partitioning, security screens and doors, display stands and units, portable screens and other similar items. The size, shape and complexity of the parts to be installed will vary, and it is anticipated that some parts will be trial assembled prior to installation taking place.

The learner will be required to select the most appropriate fixing methods and devices, based on the size and weight of the components and structures installed, and the materials to which the structures are being fastened. The learner will also be expected to create all necessary datums that are required for the correct location of the structures during the installation activities. The installation activities will include making all necessary checks and adjustments to ensure that components and structures are correctly positioned and aligned and, where appropriate, that they function correctly.

The learner's responsibilities will require them to comply with organisational policy and procedures for the installation activities undertaken, and to report any problems with the installation activities, components or equipment that they cannot personally resolve, or 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 applying installation techniques and procedures. The learner will understand the items being installed, and will know about the relevant fastening and securing devices, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the installation operations. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Install woodwork structures, furniture and fittings	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all the following activities during the installation: – obtain and use appropriate installation drawings, instructions, sketches or specifications – adhere to relevant COSHH requirements, risk assessments and other relevant safety standards – check that all tools and equipment used during the installation are in a safe and usable condition – ensure that the work area is free from hazards and is large enough to complete the installation – use safe and approved installation techniques and procedures at all times – return all tools and equipment to the correct location on completion of the activities – leave the work area in a safe and debris-free condition 1.3 follow all relevant drawings and specifications for the installation being carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 apply installation methods and techniques to include four of the following: – positioning and aligning – levelling – applying sealants – drilling masonry – setting working clearance 1.5 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.6 use a range of hand and portable power tools during the installation, to include five of the following: – drills – saws – planes – sanders – impact drivers – nail guns – clamps/cramps – brick/stonework cutters			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 use three of the following types of mechanical securing devices: – wood screws – nails – masonry fixing devices – adhesives – nuts and bolts – special purpose or quick-release fasteners 1.8 install, position and secure the equipment and components in accordance with the specification 1.9 install five of the following types of structures: – doors and frames – studded walls – built-in storage cupboards – window frames – partitioning – security screens – security doors – display stands and units – portable screens – other items			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 install structures to three of the following: – brickwork walls/floors – studded/plasterboard walls/ceilings – existing furniture/fittings – new structures – structural steelwork – fabricated structures 1.11 produce installations which comply with all of the following quality and accuracy standards: – dimensional accuracy is within specification/job requirements – installed structures are correctly aligned, level and secure – all moving parts operate correctly without sticking – installation meets company/customer requirements 1.12 ensure that all necessary connections to the equipment are complete 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved 1.14 check that the installation is complete and that all components are free from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2. Know how to install woodwork structures, furniture and fittings	2.1 describe the specific safety practices and procedures that they need to observe when installing engineering woodwork structures (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area where they are carrying out the installation activities, and the responsibility they place on the learner 2.3 describe the hazards associated with installing woodwork structures and assemblies, and with the tools and equipment used, and how they can be minimised 2.4 describe the protective equipment that they need to use for both personal protection and the protection of other people in the near vicinity 2.5 explain how to obtain the necessary job instructions, drawings or installation specifications for the work being carried out 2.6 describe the tools and equipment used in the installation activities, and how to check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the importance of checking that all plugs, sockets and cables on extension leads are in a safe and undamaged condition 2.8 explain how to prepare the site/area for the installation, including marking out vertical and horizontal fixing lines/datums 2.9 describe the tools and equipment that can be used to determine and mark out the required datums (such as spirit levels, plumb bobs and laser levelling devices) 2.10 describe the various types of fixing devices that are used to secure the structures to the required surfaces (including wood screws, masonry fixing devices, rawl plugs, cavity-wall fixing devices, nails and adhesives) 2.11 describe the importance of using the correct fasteners for the particular installation 2.12 describe the procedures for obtaining the correct tools, equipment, components and fasteners for the activities 2.13 describe the techniques used to position, align, adjust and secure the components to the required surfaces without causing damage to the structure or surrounding areas			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the methods of lifting, handling and supporting the components/equipment during the installation activities 2.15 describe the use of frame sealant and adhesives, and the precautions to be taken when using them 2.16 explain how to conduct the necessary checks to ensure the integrity, functionality, accuracy and quality of the installation 2.17 explain how to recognise installation defects (such as misalignment, ineffective fasteners, damage or contamination) 2.18 describe the problems that can occur with the installation operations, and how these can be overcome 2.19 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 11: Marking out pattern, corebox or model components

Unit reference number: F/502/9324

QCF level: 3

Credit value: 21

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare for and mark out materials and components used in the production of pattern, corebox or model parts, in accordance with approved procedures. The learner will need to interpret correctly the information contained in the drawings, instructions and specifications, which will relate to the production of set-outs, or to the marking out of component parts or the full pattern/model.

The learner will be required to select the appropriate marking-out equipment to be used, based on the features to be marked out and the accuracy required, and this will include the use of precision instruments. The learner will need to use these instruments to mark out datums, allowances and cutting lines that will be used in the production of the required components or full patterns/models. Materials to be marked out will include ferrous, non-ferrous, non-metallic and composites, which may be in sheet form, sections (such as square/rectangular, round, hexagonal), part-machined components or subassemblies.

The learner's responsibilities will require them to comply with organisational policy and procedures for the marking out activities undertaken, and to report any problems with the marking-out equipment, materials or activities that they cannot personally resolve, or 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 applying marking out methods and procedures to patterns, coreboxes or model components. The learner's knowledge will be sufficient to enable them to identify incomplete, conflicting or inadequate information, and to undertake the marking-out activities to the required specification. The learner will know why different tools are required to mark out different materials, and why it is important to mark out accurately. The learner will understand why measuring instruments are calibrated and the reasons why calibration records need to be maintained as part of the quality control programme.

The learner will understand the safety precautions required when working with marking out mediums, tools and equipment. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Mark out pattern, corebox or model components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 obtain and use the correct information for the marking out activities, to include three from the following: – drawings – specifications – verbal instructions – sketches 1.3 obtain the appropriate marking-out equipment and check that it is in a usable condition 1.4 use a range of marking-out equipment appropriate to the material and features to be marked out, to include six of the following: – rules or tapes – dividers, compass or trammels – scribers or knives – straight edges – punches – scribing blocks – marking gauges – bevel gauges			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– pencils – squares – protractors – vernier instruments 1.5 prepare suitable datums and marking-out surfaces 1.6 mark out using appropriate methods 1.7 use marking-out methods and techniques which include one of the following: – direct marking out of wood and composite materials – direct marking out of metallic materials – use of templates – tracing/transfer methods 1.8 mark out two of the following: – set-out – pattern or corebox component parts – full pattern or mould – full-size model – scale model			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 mark out workpieces to include six of the following features: – datums/centre lines – machining allowances – square/rectangular profiles – angles/angular profiles – tapers – circles – contoured profiles – linear hole positions (centred and boxed) – radial hole positions – runner channels – ingates – coreprints – location points – joint lines 1.10 check that the marking out complies with the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 produce marked-out components which meet all of the following quality and accuracy standards: – dimensionally accurate to drawing or specification – clearly defined lines and profiles (joint lines, machining allowances) – waste material is clearly identified – datum faces/points are clearly identified 1.12 deal promptly and effectively with problems within their control and report those that cannot be resolved			
2. Know how to mark out pattern, corebox or model components	2.1 describe the specific safety precautions to be taken when marking out pattern, corebox or model components, and with the tools, equipment and marking mediums that are used 2.2 describe the hazards associated with the marking-out activities (marking-out mediums, equipment used, lifting and handling sheet material, long lengths of materials, splinters from wood), and how they can be minimised 2.3 describe the process to be adopted for obtaining the required drawings and job instructions 2.4 explain how to extract information from engineering drawings and related specifications (to include symbols and conventions in relation to work undertaken, first and third angle projections)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the principles of marking out and the type of equipment used (to include hand and precision instruments) 2.6 describe the range of operations that the various marking-out equipment is capable of performing 2.7 explain how to prepare the materials for the marking-out activities, in order to enhance clarity, accuracy and safety (visually checking for defects, preparing the materials, removing sharp corners and edges, applying a marking-out medium where applicable) 2.8 explain how to select and establish suitable datums 2.9 explain the importance of ensuring that marking out is undertaken from the selected datums, and the possible effects of working from different datums 2.10 describe the methods of holding and supporting workpieces during the marking out activities, and the equipment that can be used 2.11 describe the use of marking-out conventions when marking out the workpiece (including datums; cutting guidelines; tapers; coreprints and sets; square and rectangular profiles; circular and radial profiles; angles; holes which are linearly positioned, boxed and on pitch circles)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the use of scales when marking out models and model parts 2.13 describe the use of contraction rules when marking out pattern and corebox components 2.14 describe the ways of laying out the marking-out shapes or patterns to maximise the use of materials 2.15 describe the use of setting and adjusting tools (such as squares, marking gauges, protractors and verniers) 2.16 explain the importance of using tools only for the purpose intended; the care that is required when using the equipment and tools; the proper way of storing tools and equipment between operations 2.17 explain the need for clear lines and dimensional accuracy in marking out to specification and drawing requirements 2.18 describe the things that can go wrong with the marking-out activities, and how these can be avoided 2.19 describe the standards to be attained and company quality control procedures 2.20 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 12: Producing pattern, corebox or model components using woodworking machines

Unit reference number: J/502/9325

QCF level: 3

Credit value: 60

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce pattern, corebox or model components using woodworking machine tools, in accordance with approved procedures. The learner will be required to select the appropriate equipment to use, based on the type of operations to be performed, the size of the components, and the materials used. The production of the components will involve the use of both fixed and portable conventional machines, which are designed specifically for wood and composite materials.

The size and complexity of the components produced will vary, and this will require the learner to set up the necessary machines and their associated tooling, and to make any necessary adjustments during machining in order that the parts produced meet the required specification. The components produced will be used to produce loose or plated patterns (with and without cores), coreboxes, and various types of full-and scale models.

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the activities, materials or equipment that they cannot personally resolve, or 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 applying woodwork machining procedures. The learner will understand the equipment being used, and its application, and will know about the tooling, machine setting and workholding arrangements, and safety devices, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the work output is produced to the required specification.

The learner will understand the safety precautions required when carrying out the wood machining 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce pattern, corebox or model components using woodworking machines	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 machining activities: – obtain all the necessary information to carry out the machining activities (drawings, specifications) – check that the machine tools are fit for purpose and are in a safe and usable condition – ensure the work area is free from hazards – ensure all machine guards and safety devices are correctly positioned – check that dust extraction equipment is functioning correctly – set and adjust the machine to produce the components to the required specification – use safe and approved machining techniques at all times 1.3 confirm that the machine is set up and ready for the machining activities to be carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 use fixed and portable machines, to include five of the following: – circular saw – band saw – sander (eg face, belt, bobbin) – jig saw – router – planer/thicknesser – wood miller – wood lathe – bench or pedestal drill 1.5 manipulate the machine tool controls safely and correctly in line with operational procedures 1.6 produce components which combine different features and cover all of the following: – flat faces – parallel faces – square faces – angular/tapered faces – stepped features – curved profiles – concave profiles – convex profiles – circular/round profiles – drilled holes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 produce components made from two of the following materials: – soft woods – hard woods – composite – resin 1.8 carry out quality sampling checks at suitable intervals 1.9 use appropriate measuring equipment and tools to check four of the following: – dimensions – flatness – squareness – position – concentricity – distortion/straightness 1.10 produce components to the required quality and within the specified dimensional accuracy			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 produce components which meet all of the following quality and accuracy standards: – dimensionally accurate within specification tolerances – free from false tool cuts and material defects – appropriate surface finish – meet the drawing requirements – meet company and customer requirements 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 shut down the equipment to a safe condition on conclusion of the machining activities			
2. Know how to produce pattern, corebox or model components using woodworking machines	2.1 describe the specific safety precautions to be taken whilst carrying out the wood machining activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the wood machining activities, and the responsibility these requirements place on the learner 2.3 describe the use of machine guards and emergency stop mechanisms 2.4 explain how to set up and use dust extraction equipment, and the importance of ensuring the equipment is operating correctly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the personal protective equipment and clothing to be worn during the wood machining activities 2.6 describe the hazards associated with machining wood and composite pattern or model materials, and how they can be minimised 2.7 describe the importance of ensuring that all machine and portable tools are used correctly and within their permitted operating range 2.8 explain the need to ensure that all plugs, sockets and cables on portable machines are in a safe and usable condition 2.9 explain how to obtain the necessary job instructions, drawings and specifications to be used during the machining activities, and how to interpret the information contained in them 2.10 describe the various machines that are used in wood machining, and the range of operations they are capable of performing (eg sawing, planing, rebating, turning, profiling) 2.11 explain how to check that cutting tools (such as chisels, saw blades, drills, milling cutters) are in a usable and safe condition, and the procedure for sharpening or changing these when required 2.12 explain how different types of machine use different methods to feed the material to the cutting/dressing tool or surface			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 describe the various methods used to hold the components being shaped, formed or dressed (iv) 2.14 explain how different materials require changes to the machining methods (such as roughing and finishing cuts, changes in feed or speeds used to cut them) 2.15 explain how to conduct any necessary checks to ensure the accuracy and quality of the pattern components or models produced, and the type of equipment that is used for making the checks 2.16 explain how to recognise defects in the components (material defects or those produced through machining) 2.17 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.18 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 13: Producing pattern, corebox or model components using metalworking machines

Unit reference number: L/502/9326

QCF level: 3

Credit value: 60

Guided learning hours: 119

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce pattern, corebox or model components using machine tools, in accordance with approved procedures. The learner will be required to select the appropriate equipment to use, based on the type of operations to be performed, the size of the components and the materials to be used. The production of the components will involve the use of both fixed and portable conventional machines, which are designed specifically for metallic materials.

The size and complexity of the components produced will vary, and this will require the learner to set up the necessary machines and their associated tooling, and to make any necessary adjustments during machining in order that the parts produced meet the required specification. The components produced will be used to produce loose or plated patterns (with and without cores), coreboxes, and various types of full and scale models.

The learner's responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the activities, materials or equipment that they cannot personally resolve, or 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 applying metalwork machining procedures. The learner will understand the equipment being used, and its application, and will know about the tooling, machine setting arrangements and safety devices, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the work output is to the required specification.

The learner will understand the safety precautions required when carrying out the machining 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce pattern, corebox or model components using metalworking machines	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 machining activities: – obtain all the necessary information to carry out the machining activities (drawings, specifications) – check that the machine and its tools are fit for purpose and are in a safe and usable condition – ensure that the work area is free from hazards – ensure that all machine guards and safety devices are correctly positioned – set and adjust the machine to produce the components to the required specification – use safe and approved machining techniques at all times 1.3 confirm that the machine is set up and ready for the machining activities to be carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 use fixed machines to include three of the following: – milling – turning – electro-discharge – grinding – drilling – band sawing – linishing – jig boring 1.5 use portable machines to carry out all of the following activities: – form holes – polish surfaces – blend joints 1.6 manipulate the machine tool controls safely and correctly in line with operational procedures 1.7 produce components to the required quality and within the specified dimensional accuracy			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce components which combine different features and cover ten of the following: – flat faces – parallel faces – square faces – angular/tapered faces – stepped features – slots and recesses – parallel diameters – tapered diameters – bores – curved profiles – concave profiles – convex profiles – eroded forms – drilled holes – threaded holes – counter bored or countersunk holes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 produce components made from two of the following materials: – low carbon steel – high carbon steel – cast iron – stainless steel – aluminium – brass/bronze – non-metallic 1.10 carry out quality sampling checks at suitable intervals 1.11 use appropriate measuring equipment and tools to check four of the following: – dimensions – flatness – squareness – profile – hole position – concentricity – distortion/straightness			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 produce components which meet all of the following quality and accuracy standards: – dimensional tolerance equivalent to BS4500 or BS1916 Grade 7 – flatness and squareness 0.001in per inch or 0.025mm per 25mm – surface finish 63µin or 1.6 µm – screw threads to BS Medium fit – reamed and bored holes within H8 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved 1.14 shut down the equipment to a safe condition on conclusion of the machining activities			
2. Know how to produce pattern, corebox or model components using metalworking machines	2.1 describe the specific safety precautions to be taken while carrying out the metal machining activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the machining activities, and the responsibility these requirements place on the learner 2.3 describe the use of machine guards and emergency stop mechanisms			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the personal protective equipment and clothing to be worn during the machining activities 2.5 describe the hazards associated with machining metal pattern or model materials, and how they can be minimised 2.6 explain the importance of ensuring that all machine and portable tools are used correctly and within their permitted operating range 2.7 explain the need to ensure that all plugs, sockets and cables on portable machines are in a safe and usable condition 2.8 explain how to obtain the necessary job instructions, drawings and specifications to be used during the machining activities, and how to interpret the information contained in them 2.9 describe the various machines that are used in metal pattern and model machining, and the range of operations they are capable of performing (eg sawing, milling, turning, spark and wire erosion, grinding) 2.10 explain how to check the cutting tools are in a usable and safe condition, and the procedure for changing these when required 2.11 explain how different types of machine use different methods to feed the material to the cutting/dressing tool or surface			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the various methods used to hold the components that are being machined (such as machine vices, chucks, jigs and fixtures, and clamping direct to the machine table) 2.13 explain how different materials require changes to the machining methods (such as roughing and finishing cuts, changes in feed or speeds used to cut them) 2.14 explain how to conduct any necessary checks to ensure the accuracy and quality of the pattern components or models produced, and the type of equipment that is used 2.15 explain how to recognise defects in the components (material defects or those produced through machining) 2.16 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.17 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 14: Producing pattern, corebox or model components using woodworking hand tools

Unit reference number: A/502/9340

QCF level: 3

Credit value: 70

Guided learning hours: 119

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce wood and composite pattern, corebox or model components using hand tools, in accordance with approved procedures. The learner will be required to select the appropriate tools to use, based on the type of operations to be performed, size of the components, and the materials used. The size and complexity of the components produced will vary, but will involve finishing them using hand tools only. The components produced will be used to produce loose or plated patterns, with and without cores, and various types of full and scale models.

The learner's responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the activities, materials or equipment used that they cannot personally resolve, or 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 applying hand finishing woodwork procedures. The learner will understand the equipment being used, and its application, and will know about the cutting tools, their function and maintenance requirements, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the work output is to the required specification. The learner will be able to identify blunt and damaged cutting tools, and will know how to sharpen and adjust them in use in order for them to work efficiently.

The learner will understand the safety precautions required when carrying out the hand shaping 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce pattern, corebox or model components using woodworking hand tools	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 hand-shaping activities: – obtain all the necessary information to carry out the hand-shaping activities (drawings, specifications) – check that the hand tools are fit for purpose and are in a safe and usable condition – ensure that the work area is free from hazards – use safe and approved hand-shaping techniques at all times – maintain the cutting tools in a serviceable condition 1.3 follow relevant specifications for the component to be produced 1.4 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use hand tools to cut and shape materials, to include six of the following items: – rip saws – tenon saws – fret/bow saws – jack or smoothing planes – rebating planes – spokeshaves – chisels/gouges – drills/braces – files/rasps – sanding blocks/paper 1.6 shape the materials using appropriate methods and techniques 1.7 produce components which combine different features and cover eight of the following: – flat faces – parallel faces – square faces – angular/tapered faces – stepped features – rebates – slots			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– curved profiles – concave profiles – convex profiles – circular/round profiles – drilled holes 1.8 produce components made from two of the following materials: – soft woods – hard woods – composite – resin 1.9 check that all the required shaping operations have been completed to the required specification 1.10 use appropriate measuring equipment and tools to check five of the following: – dimensions – flatness – squareness – position – profile – distortion/straightness – alignment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 produce components which meet all of the following quality and accuracy standards: – dimensionally accurate within specification tolerances – free from false tool cuts and material defects – appropriate surface texture – meet the drawing requirements – meet company and customer requirements 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			
2. Know how to produce pattern, corebox or model components using woodworking hand tools	2.1 describe the specific safety precautions to be taken whilst carrying out the wood shaping activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the wood working activities, and the responsibility they place on the learner 2.3 describe the personal protective equipment and clothing to be worn during the woodworking activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with cutting and shaping wood and composite pattern or model materials, and with the tools and equipment used, and how they can be minimised 2.5 explain how to obtain the necessary job instructions, drawings and specifications for the woodworking activities, and how to interpret the information 2.6 describe the various hand tools that are used to cut and shape the materials, and the range of operations they are capable of performing (eg rip saws, tenon saws, fret/bow saws; smoothing planes, jack planes, rebating planes; chisels and gouges; files and rasps; spokeshaves) 2.7 explain how to check the cutting tools are in a usable and safe condition, and the procedure for sharpening and adjusting these when required 2.8 describe the various methods to hold the components that are being shaped, formed or dressed by hand 2.9 explain the need to consider grain direction and construction when cutting and shaping wood and composites 2.10 explain how to conduct any necessary checks to ensure the accuracy and quality of the pattern components or models produced, and the type of equipment that is used for the checks			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain how to recognise defects in the components (material defects or those produced through the cutting and shaping activities) 2.12 explain why it is important to keep the tools and equipment clean and free from damage, to practise good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.13 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 15: Producing pattern, corebox or model components using hand-fitting techniques

Unit reference number: R/502/9327

QCF level: 3

Credit value: 70

Guided learning hours: 154

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce metal components to form pattern, corebox or model equipment using hand-fitting techniques, in accordance with approved procedures. The learner will be required to select the appropriate equipment to use, based on the operations to be carried out and the accuracy required. In producing the components, the learner will be expected to use a range of hand tools, portable power tools, shaping and fitting techniques that are appropriate to the type of material and operations being performed. These activities will include such things as hand sawing, band sawing, filing, drilling, chiselling, threading, scraping, lapping and off-hand grinding. The components produced will have features from the following: flat, square, parallel and angular faces, radii and curved profiles, drilled holes, internal and external threads, and sliding or mating parts.

Materials to be used will include ferrous and non-ferrous, which may be in sheet form, bar sections (such as square/rectangular, round, hexagonal) or part-machined components.

The learner's responsibilities will require them to comply with organisational policy and procedures for the cutting and shaping activities undertaken, and to report any problems with the equipment, materials or activities that they cannot personally resolve, or 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 applying hand-fitting procedures to produce metal parts for plated patterns and associated equipment or models. The learner will understand the hand-fitting techniques used, and their application, and will know about the tools, materials and equipment used, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and producing the components to the required specification.

The learner will understand the safety precautions required when using hand and power tools. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce pattern, corebox or model components using hand-fitting techniques	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 hand-fitting activities: – obtain and use appropriate drawings, instructions, specifications and quality documentation – check all cables, extension leads or air supply hoses are in a serviceable condition – check all tools and equipment are in a safe and usable condition – return all tools and equipment to the correct location on completion of the fitting activities – leave the work area in a safe condition 1.3 follow relevant specifications for the component to be produced 1.4 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use a range of hand-fitting methods, to include seven from the following: – filing – drilling – off-hand grinding – power sawing – scraping – chiselling – external threads – internal threads – lapping – hand sawing – polishing 1.6 shape the materials using appropriate methods and techniques 1.7 produce components which combine several features and cover eight from the following: – flat datum faces – faces which are square to each other – faces which are parallel to each other – faces at an angle to each other – curved profiles – chamfers and radii			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– reamed holes – drilled holes (to a depth) – drilled holes (through) – counterbores, countersinks, or spotface – internal threads – external threads – sliding or mating parts 1.8 cut and shape two different types of material from the following: – low carbon steel – high carbon steel – stainless steel – cast iron – aluminium – brass/bronze – plastic/synthetic 1.9 check that all the required shaping operations have been completed to the required specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 produce components within all of the following standards, as applicable to the process: – dimensional tolerance equivalent to BS4500 or BS1916 Grade 9 – flatness and squareness 0.001in per inch or 0.025mm per 25mm – surface finish 63µin or 1.6 µm – screw threads to BS Medium fit – reamed and bored holes within H8 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved			
2. Know how to produce pattern, corebox or model components using hand fitting techniques	2.1 describe the health and safety requirements and safe working practices and procedures required for the hand-fitting activities undertaken 2.2 describe the importance of wearing appropriate protective clothing and equipment, and of keeping the work area safe and tidy 2.3 describe the hazards associated with carrying out hand fitting techniques (such as use of power tools, trailing leads or hoses, damaged or badly maintained tools and equipment, using files with damaged or poor fitting handles), and how they can be minimised 2.4 describe the procedure for obtaining the required drawings, job instructions and other related specifications			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards in relation to work undertaken) 2.6 explain how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.7 describe the cutting and shaping methods to be used, and the sequence in which the operations will need to be carried out 2.8 explain how the properties of ferrous and non-ferrous metals affect the cutting, forming and shaping processes and the use of various tools (cutting speeds, angles, etc) 2.9 explain how to file flat, square and curved surfaces, and how to achieve a smooth surface finish 2.10 explain how to cut external threads using hand dies, and the method of fixing and adjusting the dies to give the correct thread fit 2.11 explain how to determine the drill size for tapped holes, and the importance of using taps in the correct sequence 2.12 explain how to produce a sliding or mating fit using filing, scraping and lapping techniques			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 explain how to select saw blades for different materials, and how to set the saw blades for different operations (such as cutting externally and internally) 2.14 describe the types of files that are available, and the cut of files for different applications 2.15 explain how to prepare the components for the filing operations (cleaning, de-burring, marking out) 2.16 describe the use of vice-jaw plates to protect the workpiece from damage 2.17 describe the types and application of portable power tools that can be used for the hand-fitting operations 2.18 explain the importance of ensuring that file handles are secure and free from embedded foreign bodies or splits 2.19 explain how to check that portable power tools and extension cables are free from damage and are in a safe usable condition 2.20 explain how to set and adjust tools, such as squares, protractors and verniers 2.21 explain the importance of using tools only for the purpose intended; the care that is required when using the equipment and tools; the proper way of storing tools and equipment between operations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 explain the need for clear and dimensionally-accurate marking out to specification and drawing requirements 2.23 describe the company procedures for controlling documents and information 2.24 describe the problems that can occur with the cutting and shaping operations, and how can these be overcome 2.25 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 16: Producing pattern, corebox or model components by FRP moulding

Unit reference number: Y/502/9328

QCF level: 3

Credit value: 60

Guided learning hours: 119

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce fibre-reinforced plastic (FRP) patterns, negatives, corebox and model components, in accordance with approved procedures. The learner will be required to use appropriate manufacturing drawings, instructions, specifications and quality documentation to produce the various types of component.

The size, shape and complexity of the parts to be produced will vary, and it is anticipated that some components will be produced from existing pattern or model equipment, and others from preformed structures or formers. The components to be produced may combine a range of techniques and shapes, and will have features that include flat laminates, box/tray sections, double curvatures, convex or concave profile, stiffened mouldings and inserts.

The learner's responsibilities will require them to comply with organisational policy and procedures for the moulding activities undertaken, and to report any problems with the moulding activities, materials or equipment that they cannot personally resolve, or 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 applying FRP moulding procedures. The learner will understand the moulding techniques and procedures used, and their application, and will know about the tools, equipment, techniques, materials and consumables, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the components produced are to the required specification.

The learner will understand the safety precautions required when carrying out the moulding operations. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce pattern, corebox or model components by FRP moulding	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 moulding operations: – use the correct issue of drawings, specifications and material data sheets, etc – use copies of relevant COSHH sheets and risk assessments – obtain the correct materials (in life batches, correctly protected) – obtain and check that all tools and equipment to be used are fit for purpose – use approved and safe moulding procedures at all times – return all tools and equipment to the correct location on completion of the activities – leave the work area in a safe condition on completion of the activities 1.3 follow the correct component drawing or any other related specifications for the component to be produced 1.4 determine what has to be done and how this will be achieved 1.5 obtain and prepare the appropriate tools, equipment and materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 carry out the moulding or laying-up activities using the correct methods and techniques 1.7 apply moulding and laying up methods and techniques to include five of the following: – metal tooling – composite tooling – wooden tooling – vacuum bagging – pressure bagging – interference moulding – cutting methods – mixing methods – autoclave moulding – hot wax process – matched metal – oven moulding – press moulding – quick pressing – tape laying			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out six of the following operations: – tool/equipment preparation – curing temperature/pressure – lay-up – trimming – mat orientation – number of plies – room temperature control – de-moulding 1.9 produce components to the required specification 1.10 produce a range of components with five of the following features: – flat laminates – tray sections – single curvature – double curvatures – convex shapes – concave shapes – tapered faces – stiffened mouldings – stepped forms			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 produce a range of components using one type of resin from: – polyester – elastomer – phenolic – silicone – epoxy – bismaleimide – thermoplastic 1.12 produce a range of components using one type of fibrous material from: – glass fibre – aramid – terylene – boron fibre – nylon – carbide – jute – Kevlar – carbon fibre			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 produce a range of components using one type of stiffener from: – honeycomb – foam – syntactic core – supports – inserts – lifting facilities 1.14 produce a range of components using three ancillary materials from: – bagging films – bleed plies – tapes – release agents – solvents – foaming adhesives – fillers – sealants 1.15 check that all the required operations have been completed to specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.16 produce components which comply with all of the following standards: – ISO 9000 series and procedures – customer standards and requirements – company standards and procedures 1.17 deal promptly and effectively with problems within their control and report those that cannot be solved			
2. Know how to produce pattern, corebox or model components by FRP moulding	2.1 describe the specific safety practices and procedures that they need to observe when working with fibre reinforced plastics (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area where they are carrying out the moulding activities, and the responsibility these requirements place on the learner 2.3 describe the protective equipment that they need to use for both personal protection and, where appropriate, the protection of others 2.4 describe the hazards associated with carrying out FRP moulding activities, and with the tools, materials and equipment used, and how they can be minimised 2.5 describe the procedure for the correct separation and safe disposal of waste materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the interpretation of drawings, standards, quality control procedures and specifications used for the moulding activity, and the currency/issue checks of the documents they are working with 2.7 describe the use of and conventions/terminology used in moulding/laying up (such as material tailoring, 'B' staging, vacuum bagging, backing materials, peel piles, bleed felt, foaming adhesives, intensifiers, autoclave techniques, material wet lay-up, dry fibre drying procedures) 2.8 describe the types of component trimming/cutting methods available, and trimming methods on the tool 2.9 describe the methods of achieving consolidation at foam/honeycomb/discontinuous laying-up points 2.10 explain the reasons for part-cure procedures, and their effect 2.11 describe the material types and their merits (such as material life, their construction, types of weave, resins, bulk problems with liquid resins, thermoplastics, pre-impregnated materials, foam, honeycomb, discontinuous materials) 2.12 describe the function and application of the following materials: release agents, gel coats, fibre matting, liquid resins, catalysts, accelerators, hardeners and fillers			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 describe the different mixing methods (manual and mechanical) that can be used when preparing materials for use 2.14 explain how different materials can be used to provide: longer working times; rigid, strong and hard wearing surfaces; backing up mediums; short or long curing times 2.15 describe the procedures when temperature cure is used, and the need for thermocouples on temperature control 2.16 describe the procedures for remoulding, lost wax removal and first article inspection (such as test samples, non-destructive testing (NDT) requirements) 2.17 describe the quality control procedures that need to be followed during the lay-up moulding operations 2.18 describe the procedures for ensuring that they have the correct tools and equipment 2.19 describe the methods and techniques for lifting, handling and supporting the components/equipment/materials during the lay-up moulding activities 2.20 explain how to recognise lay-up/moulding defects (such as misalignment, distortion, foreign object damage, contamination and surface defects)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 describe the tools and equipment used in the lay-up moulding activities, and their calibration, care, preparation and control procedures 2.22 describe the problems that can occur with the lay-up/moulding operations, and how these can be overcome 2.23 describe the recording documentation to be completed for the lay-up/moulding activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation 2.24 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 17: Assembling wood/composite pattern, corebox or model components

Unit reference number: D/502/9329

QCF level: 3

Credit value: 35

Guided learning hours: 84

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assemble wood and composite pattern, corebox and model components using mechanical fixing devices and adhesives, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the type of components to be assembled, and to check that they are in a safe and serviceable condition. The learner will be expected to select the appropriate fixing devices and adhesives to use, based on the type, size and material of the components to be assembled. The learner will need to identify and create any datums that will be required to locate the components during the assembly process.

The size, shape and complexity of the parts to be assembled, and the finished equipment or model will vary, and it is anticipated that some components will be sub-assembled prior to the final assembly taking place. The assembly activities will also include making all necessary checks and adjustments to ensure that the assembled pattern equipment or model meets the required specification, that fasteners are securely tightened, and that the completed assembly is free from damage and has an appropriate cosmetic appearance.

The learner's responsibilities will require them to comply with organisational policy and procedures for the assembly activities undertaken, and to report any problems with the assembly activities, tools, adhesives or equipment used that they cannot personally resolve, or 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 the assembly of components to form wood and composite pattern equipment or models. The learner will understand the pattern equipment or model being assembled, and its application, and will know about the assembly techniques, components,

equipment, relevant materials, adhesives and fastening devices, in adequate depth to provide a sound basis for carrying out the activities to the required specification. The learner's knowledge will be sufficient to enable them to identify damaged and out-of-tolerance components or sub-assemblies. The learner will know the implications of producing assemblies that do not meet specification on the castings, cores or models produced.

The learner will understand the safety precautions required when carrying out the assembly operations. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Assemble wood/composite pattern, corebox or model components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all the following during the assembly activities: – obtain and use the correct issue of documents and specifications – comply with relevant COSHH sheets and risk assessment standards – check all tools and equipment are in a safe and usable condition – obtain all the required components and securing devices for the assembly – use recognised and approved assembly techniques and procedures – produce assemblies which comply with the specification – leave the work area in a safe condition 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 ensure that the specified components are available and that they are in a usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use four of the following types of component in the sub-assemblies: – flat – tapered – stepped – curved – concave – convex 1.6 use the appropriate methods and techniques to assemble the components in their correct positions 1.7 apply all of the following assembly methods and techniques: – ensuring that correct part numbers are used – ensuring that correct 'hand' of components are used (left or right handed) – orientating, positioning and aligning components – securing components using mechanical fasteners (pins, screws, nails) – securing components using adhesives			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce pattern or model assemblies which include four of the following: – flat-backed patterns with a minimum of two cores – irregular joint patterns (with or without cores) – split patterns without cores – split patterns with cores – plated patterns (drags) – plated patterns (copes) – solid turnout coreboxes – split coreboxes – coreboxes with special features (loose pieces, collapsible) – full-size models – sectional full-size models – scale models – sectional scale models 1.9 secure the components using the specified connectors and securing devices 1.10 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 carry out quality and accuracy checks which include all of the following: – overall dimensions – surface finish – completeness of pattern – security of assembled parts – identification marking 1.12 produce pattern/model assemblies which comply with one or more of the following standards: – ISO 9000 series and procedures – customer standards and requirements – company standards and procedures 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			
2. Know how to assemble wood/composite pattern, corebox or model components	2.1 describe the specific safety precautions to be taken whilst carrying out the assembly activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the assembly activities, and the responsibility they place on the learner 2.3 describe the personal protective equipment and clothing to be worn during the assembly activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with producing wood and composite pattern or model assemblies, and how they can be minimised 2.5 explain how to obtain the necessary job instructions, drawings and specifications for the assembly, and how to interpret the information 2.6 explain how to identify the components to be used; component identification systems (eg codes and component orientation indicators) 2.7 describe the preparations to be undertaken on the components prior to fitting them into the assembly 2.8 describe the assembly methods and procedures to be used, and the importance of adhering to these procedures 2.9 explain how to mark out the necessary datum lines for the assembly operations 2.10 explain how the components are to be aligned and positioned prior to securing them, and the tools and equipment that are used 2.11 explain why some types of assembly require the use of jigs and gauges to aid the assembly 2.12 describe the various mechanical fasteners that will be used to secure the pattern or model equipment, and their method of installation (including pins, nails, screws and special securing devices)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 explain the application of adhesives within the assembly activities, and the precautions that must be taken when working with them 2.14 describe the quality control procedures to be followed during the assembly operations 2.15 explain how to conduct any necessary checks to ensure the accuracy and quality of the pattern equipment or models produced 2.16 explain how to recognise defects blemishes, poor alignment, ineffective fasteners, or damaged components 2.17 explain how to check that the tools and equipment to be used are in a safe and serviceable condition 2.18 explain the importance of ensuring that all tools are used correctly and within their permitted operating range 2.19 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment and to maintain a clean and unobstructed working area 2.20 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 18: Assembling metal pattern, corebox or model components

Unit reference number: R/502/9330

QCF level: 3

Credit value: 35

Guided learning hours: 84

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assemble metal pattern, corebox and model components using mechanical fixing devices and adhesives, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the operations to be performed and type of components to be assembled, and to check that they are in a safe and serviceable condition. The learner will be expected to select the appropriate fixing devices and adhesives to use, based on the type, size and material of the components to be assembled. The learner will need to identify and create any datums that will be required to locate the components during the assembly process.

The size, shape and complexity of the parts to be assembled, and the finished equipment or model will vary. However, it is anticipated that the assembled pattern equipment will consist mainly of plated patterns and coreboxes used in mechanised production. The assembly activities will also include making all necessary checks and adjustments to ensure that the assembled pattern equipment or model meets the required specification, that fasteners are securely tightened, and that the completed assembly is free from damage and has an appropriate cosmetic appearance.

Final dimensional inspection will normally be carried out by others using co-ordinate measuring equipment.

The learner's responsibilities will require them to comply with organisational policy and procedures for the pattern or model assembly activities undertaken, and to report any problems with the assembly activities, tools or equipment used that they cannot personally resolve, or 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 produce.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to the assembly of components to form metal pattern equipment or models. The learner will understand the pattern equipment or model being assembled, and its application, and will know about the assembly techniques, components, equipment, relevant

materials and fastening devices, in adequate depth to provide a sound basis for carrying out the activities to the required specification. The learner's knowledge will be sufficient to enable them to identify damaged and out-of-tolerance components or other ancillary equipment supplied. The learner will know the implications of producing assemblies that do not meet specification on the castings, cores or models produced.

The learner will understand the safety precautions required when carrying out the assembly operations. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assemble metal pattern, corebox or model components	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 activities during the assembly activities: – obtain and use the correct issue of documents and specifications – comply with relevant COSHH sheets and risk assessment standards – check that all tools and equipment are in a safe and usable condition – obtain all the required components and securing devices for the assembly – use recognised and approved assembly techniques and procedures – produce assemblies which comply with the specification – leave the work area in a safe condition 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 ensure that the specified components are available and that they are in a usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use four of the following types of component in the sub-assemblies: – flat – tapered – stepped – curved – concave – convex 1.6 use the appropriate methods and techniques to assemble the components in their correct positions 1.7 apply all of the following assembly methods and techniques: – ensuring that correct part numbers are used – ensuring that correct hand of components are used (left or right handed) – orientating, positioning and aligning components – securing components using mechanical fasteners (nuts, bolts, set screws, dowels and pins) – applying sealants/adhesives – applying bolt locking methods (split pins, wire locking, lock nuts, stiff nuts)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce pattern or model assemblies which include four of the following: – plated patterns (drags) – plated patterns (copes) – vacuum forming tools – stripping plates – core/mould assembly jigs/fixtures – core boxes (solid, split or with special features) – full-size models – sectional full size models – scale models – sectional scale models 1.9 secure the components using the specified connectors and securing devices 1.10 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification 1.11 carry out quality and accuracy checks which include all of the following: – overall dimensions – surface finish – completeness – security of assembled parts – identification marking			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 produce pattern/model assemblies which comply with one or more of the following standards: – ISO 9000 series and procedures – customer standards and requirements – company standards and procedures 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			
2. Know how to assemble metal pattern, corebox or model components	2.1 describe the specific safety precautions to be taken whilst carrying out the assembly activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the assembly activities, and the responsibility they place on the learner 2.3 describe the personal protective equipment and clothing to be worn during the assembly activities 2.4 describe the hazards associated with producing metal pattern or model assemblies, and how they can be minimised 2.5 explain how to obtain the necessary job instructions, drawings and specifications for the assembly, and how to interpret the information 2.6 explain how to identify the components to be used; component identification systems (eg codes and component orientation indicators)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the preparations to be undertaken on the components prior to fitting them into the assembly 2.8 describe the assembly methods and procedures to be used, and the importance of adhering to these procedures 2.9 explain how to mark out the necessary datum lines for the assembly operations 2.10 explain how the components are to be aligned and positioned prior to securing them, and the tools and equipment that are used 2.11 explain why some types of assembly require the use of jigs and gauges to aid the assembly 2.12 describe the various mechanical fasteners that will be used to secure the pattern or model equipment, and their method of installation (including threaded fasteners, dowels and pins, special securing devices) 2.13 describe the application of sealants and adhesives within the assembly activities, and the precautions that must be taken when working with them 2.14 describe the quality control procedures to be followed during the assembly operations 2.15 explain how to conduct any necessary checks to ensure the accuracy and quality of the pattern equipment or models produced			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain how to recognise defects, blemishes, poor alignment, ineffective fasteners, or damaged components 2.17 describe the methods and equipment used to lift and handle large or heavy components into position 2.18 explain how to check that the tools and equipment to be used are in a safe and serviceable condition, and how to check that the equipment is within its current certification dates 2.19 explain the importance of ensuring that all tools are used correctly and within their permitted operating range 2.20 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.21 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 19: Producing pattern, corebox or model components using cast resin techniques

Unit reference number: Y/502/9331

QCF level: 3

Credit value: 60

Guided learning hours: 119

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to cast resin pattern parts, coreboxes, corebox parts and model components, in accordance with approved procedures. The learner will be required to use appropriate manufacturing drawings, instructions, specifications and documentation, together with other quality documentation to produce the various types of component. The size, shape and complexity of the parts to be produced will vary, and it is anticipated that originals and duplicates will be used in the process. Individual sections of patterns, coreboxes and models will be cast from existing equipment when alterations, modifications or repairs are required.

The learner's responsibilities will require them to comply with organisational policy and procedures for the resin casting activities undertaken, and to report any problems with the casting activities, tools or equipment used that they cannot personally resolve, or 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 applying resin casting procedures. The learner will understand the resin casting requirements and procedures, and their application, and will know about the tools, techniques, materials and consumables used, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the components produced are to the required specification.

The learner will understand the safety precautions required when carrying out the casting operations. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce pattern, corebox or model components using cast resin techniques	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 resin casting operations: – use the correct issue of drawings, specifications and material data sheets – use copies of relevant COSHH sheets and risk assessments – obtain materials (in life batches, correctly protected) – obtain all tools and equipment to be used and check that they are fit for purpose – use approved and safe casting procedures at all times – return all tools and equipment to the correct location on completion of the activities – leave the work area in a safe condition 1.3 follow the correct component drawing or any other related specifications for the component to be produced 1.4 determine what has to be done and how this will be achieved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 obtain and prepare the appropriate tools, equipment and materials 1.6 prepare all of the following in readiness for the casting activities: – masters – frames – inserts – release systems 1.7 use seven of the following materials during the casting activities: – resins (including quick set) – catalysts – accelerators – pigments – wax – release agents – fillers – stoppers – wood/metal inserts 1.8 carry out the moulding or laying-up activities using the correct methods and techniques			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 prepare and cast materials to include all of the following: – determining the correct type and amount of resin mixes – mixing the materials either manually or mechanically – casting full or part-mould sections or models – applying correct de-moulding techniques – trimming and dressing cast components – rectifying minor surface defects (as appropriate) 1.10 produce components to the required specification 1.11 produce a range of components which cover five of the following features: – flat faces – tapered faces – curved profiles – stepped features – concave profiles – convex profiles 1.12 check that all the required operations have been completed to specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 produce pattern. or model assemblies which comply with one or more of the following standards: – ISO 9000 series and procedures – customer standards and requirements – company standards and procedures 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			
2. Know how to produce pattern, corebox or model components using cast resin techniques	2.1 describe the specific safety practices and procedures that they need to observe when working with cast resin materials and procedures (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area where they are carrying out the activities, and the responsibility they place on the learner 2.3 describe the protective equipment that they need to use for personal protection and, where appropriate, the protection of others 2.4 describe the hazards associated with carrying out resin casting activities (tools, materials and equipment), and how they can be minimised 2.5 describe the procedure for the correct separation and safe disposal of waste materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the interpretation of drawings, standards, quality control procedures and specifications used for the casting activity, and the currency/issue checks of the documents they are working with 2.7 describe the use of, and conventions/terminology used in, resin casting 2.8 describe the procedures for ensuring that they have the correct tools and equipment for the casting activities, and how to check that they are in good order and fit for purpose 2.9 describe the different methods used to produce cast resin components for pattern or model making 2.10 describe the types of resin and other materials that are used in the casting process, and why different amounts of materials are used in the resin mixes 2.11 describe the function and application of the following materials: release agents, liquid resins, catalysts, accelerators, pigments, wax, stoppers, fillers, inserts 2.12 describe the different mixing methods that can be used when preparing materials for use (both manual and mechanical) 2.13 describe the correct sequence and technique of mixing the various materials together, and the effects on the cast resins of using incorrect sequences and volumes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain the importance of keeping the masters clean and free from damage; practicing good housekeeping of mixing tools, containers and equipment; maintaining a clean, unobstructed and well ventilated working area 2.15 describe the methods of removing the completed casting from the moulds without causing damage to the casting or the mould 2.16 describe the methods of trimming and dressing the finished casting, and the tools and techniques that are used 2.17 describe the quality control procedures to be followed during the casting operations 2.18 explain how to recognise casting defects (contamination and surface defects), their cause, effect and prevention 2.19 describe the problems that can occur with the resin casting operations, and how these can be overcome 2.20 describe the recording documentation that needs to be completed for the resin casting activities undertaken 2.21 explain how to mark and identify specific pieces of work in relation to the documentation, where appropriate 2.22 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 20: Proving patterns, coreboxes or models

Unit reference number: D/502/9332

QCF level: 3

Credit value: 40

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to check and prove patterns, coreboxes or model components, in accordance with approved procedures. This will involve proving the equipment by either having castings or cores produced in the foundry or by producing cast resin negatives or models. The learner will then be expected to check that the castings, cores or models comply with the specification for dimensional accuracy, shape/profile, freedom from flash, cross joints and thick or thin sections. This will require the learner to select the appropriate method, tools and equipment to use, based on the type, size and requirements of the equipment to be proved. The complexity of the equipment to be proved will vary, and it is anticipated that originals and duplicates will be used in the checking process. The learner will prove either new equipment or existing equipment that has been altered, modified or repaired.

The learner's responsibilities will require them to comply with organisational policy and procedures for the proving activities undertaken, and to report any problems with the activities, tools or equipment used that they cannot personally resolve, or 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 produce.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying pattern, corebox or model proving procedures. The learner will understand the procedures and techniques used, and their application, and will know about the casting and resin casting methods, in adequate depth to provide a sound basis for carrying out the activities and identifying any irregularities in the samples produced by the different methods.

The learner will understand the safety precautions required when carrying out the proving operations. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Prove patterns, coreboxes or models	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 proving activities: – use the correct issue of drawings, specifications and material data sheets – use copies of relevant COSHH sheets and risk assessments – obtain all tools and equipment to be used, and check that they are fit for purpose – use approved and safe casting procedures at all times – return all tools and equipment to the correct location on completion of the activities – leave the work area in a safe condition 1.3 follow and make appropriate use of the specifications for the product or asset being checked 1.4 use all the correct tools and inspection equipment and check that they are in a useable condition 1.5 carry out the checks in an appropriate sequence using approved methods and procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 produce samples for inspection to include two of the following: – sample castings – sample cores – cast resin masters – cast resin negatives 1.7 carry out all of the following checks on the sample castings produced, and record the results: – visual checks for defects – dimensional checks using instruments – checks using profile gauges – freedom from excessive flash – cross joints – thick or thin sections – other sub-standard features 1.8 identify and assess any defects or variations from the specification and take appropriate action 1.9 complete pattern or model proving activities by carrying out all of the following: – confirming equipment is acceptable for production – reporting sub-standard equipment for rectification or replacement – completing all relevant paperwork/documentation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report completion of compliance activities in line with organisational procedures			
2. Know how to prove patterns, coreboxes or models	2.1 describe the specific safety precautions to be taken whilst carrying out the pattern or model proving activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials used) 2.2 describe the health and safety requirements of the work area in which they are carrying out the proving activities, and the responsibility they place on the learner 2.3 describe the COSHH regulations with regard to the substances used in the proving process 2.4 describe the hazards associated with checking and proving castings and cast resin masters/negatives, and how they can be minimised 2.5 describe the personal protective equipment and clothing to be worn during the checking and proving activities 2.6 explain how to extract and use information from pattern drawings, specifications and work instructions (to include symbols and conventions to appropriate BS or ISO standards in relation to the work undertaken)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.8 describe the use of British, European and international standards in determining if components and products are fit for purpose 2.9 describe the general principles of quality assurance and control systems and procedures 2.10 describe the preparations of the castings to be undertaken before the castings are checked 2.11 describe the application of the various tools and equipment used to check the castings 2.12 explain the importance of ensuring that tools and equipment are set up correctly and are in a safe and useable condition 2.13 describe the procedure and methods used to check tools and equipment are within calibration date 2.14 describe the quality control procedures to be followed when checking the castings 2.15 explain how to conduct any necessary checks to ensure the dimensional accuracy, position of cored holes, completeness of the casting and freedom from defects 2.16 describe the types of defect that can be found on the castings, and why they occurred.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the factors that have to be considered to determine if the castings are acceptable or if the equipment needs to be modified or scrapped 2.18 describe the documentation to be completed to confirm that the equipment has been checked, and that the results of the findings have been recorded 2.19 explain the importance of ensuring that all tools and equipment are returned to their correct location on completion of the checking and proving activities 2.20 describe the identification of defects which relate directly to the pattern equipment or models 2.21 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 21: Setting CNC machine tools for operation

Unit reference number: H/502/9333

QCF level: 3

Credit value: 70

Guided learning hours: 126

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare and set up numerically controlled (NC) or computer numerically controlled (CNC) machine tools, such as milling, turning or electro-discharge machines, in accordance with approved procedures. The learner will be expected to select the appropriate workholding devices to be used, and to mount and position them to the machine in the correct location for the type of operation being carried out. The learner will also be required to select the appropriate tools, cutters, electrodes or wires, to check them for defects, and to mount and secure them to the relevant tool holding devices and machine spindle.

The learner will need to ensure that all the tools have been allocated a relevant tool number, and that the relevant data on their coordinates and datum positions is entered into the operating program and machine. This will involve loading programs to the machine control, performing a 'dry run', proving the component program, checking for errors/faults, editing and saving program changes.

The learner's responsibilities will require them to comply with organisational policy and procedures for the machine-setting activities undertaken, and to report any problems with the equipment, tooling, programs or setting-up activities that they cannot personally resolve, or 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 the setting-up procedures used. The learner will understand the NC/CNC machine used, and its application, and will know about the workholding devices, tooling, machine operating programs and setting-up procedures, in adequate depth to provide a sound basis for setting up the equipment, correcting faults and ensuring that the work output is produced to the required specification.

The learner will understand the safety precautions required when working with the machine and its associated tools and equipment. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Set CNC machine tools for operation	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 activities during setting up: – confirm that the correct operating program has been loaded – check that the tooling is in a usable condition – ensure that the workpiece is correctly positioned and secured without distortion – update the program tool data as applicable – position and adjust machine guards – apply safe working practices at all times 1.3 follow the correct specifications for the component to be produced 1.4 determine what has to be done and how the machine will be set to achieve this			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 prepare the tooling for operation by carrying out all of the following activities, as applicable to the machine type: – pre-setting tooling/electrodes in tooling cartridges/holders, manually or by using setting jigs/fixtures – positioning tools in the correct position in the machine head, turrets, magazine, carousel or docking station – loading and threading wire through wire-feed mechanism and wire guides – checking that tools, wires or electrode cartridge holders have a specific tool number or technology setting in relationship to the operating program – entering all relevant tool data to the operating program (tool lengths, tool offsets, radius compensation, wire type and size, number of skims) – setting tool or wire datum point – saving changes to program 1.6 mount and set the required workholding devices, work piece and cutting tools			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 prepare one of the following NC/CNC machines in readiness for production: – turning – milling – spark erosion – wire erosion – machining centre 1.8 position and secure workpieces using three of the following workholding methods and devices: – clamping direct to machine table – vee blocks and clamps – machine vice – chucks with hard jaws – chucks with soft jaws – collet chucks – jigs and fixtures – angle plate – faceplates – indexing/rotating device – magnetic or pneumatic tables – other workholding devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 select and mount, in the appropriate tool holding device, the following types of tooling for the selected machine: either: turning tools, to include six of the following: – turning – facing – twist/core drills – boring tools – reamers – thread-cutting tools – recessing/undercutting tools – profiling tools – taps or: milling cutters, to include six of the following: – face mills – end mills – slot drills – twist/core drills – profile cutters – boring tools – reamers – taps			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	or: electrodes, to include two of the following, as applicable to the machine type: – plain electrodes – profile electrodes – hollow electrodes – wires 1.10 set the machine tool operating parameters to achieve the component specification 1.11 set up the machine to produce pattern, corebox or model components, combining several different operations as follows for the selected machine: either: turning, to include six of the following – parallel diameters – reamed holes – profiles – tapered diameters – bored holes – undercuts/recesses – shoulders and steps – internal threads – flat faces – drilled holes – external threads – tapered bores			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	or: milling, to include six of the following: – flat faces – drilled holes – open ended slots – parallel faces – reamed holes – special profile – square faces – bored holes – indexed or rotated forms – angular faces – enclosed slots or: electro discharge machining, to include five of the following: – flat faces – tapered faces – angular faces – external profiles – internal profiles – slots – holes — linear (rows, angles) – holes on pitch circles – other special forms			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 set the feeds and speeds appropriate to one of the following types of material: – carbon steel – cast iron – stainless steel – brass/bronze – non-metallic 1.13 conduct 'dry runs' to prove that the machine is operating to required specification, to include all of the following, as appropriate: – dimensional tolerance equivalent to BS4500 or BS1916 Grade 7 – turning and milling surface finish 63µin or 1.6µm – EDM surface finish 32µin/0.8µm, 18VDI – reamed and bored holes within H8 – angles within +/- 0.5 degree – screw threads BS medium fit – flat and square 0.001in per inch or 0.025mm per 25mm 1.14 check that all safety mechanisms are in place and that the equipment is set correctly for the required operations 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2. Know how to set CNC machine tools for operation	2.1 describe the specific safety precautions to be taken when setting up workholding devices and tooling on NC/CNC machines 2.2 explain how to start and stop the machine in normal and emergency situations 2.3 explain the importance of ensuring that the machine is isolated from the power supply before mounting cutting tools/electrodes and workholding devices 2.4 explain the importance of wearing the appropriate protective clothing and equipment, and of keeping the work area clean and tidy 2.5 describe the hazards associated with working on NC/CNC machines (such as use of moving machinery, automatic machine operation, handling cutting tools, lifting and handling workholding devices, hot and airborne metal particles), and how they can be minimised 2.6 explain how to handle and store cutting tools, electrodes/wires and verified tapes and programs, safely and correctly 2.7 explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards in relation to work undertaken)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.9 describe the range of workholding methods and devices that are used on NC/CNC machines 2.10 explain why it is important to set the workholding device in relationship to the machine datums and reference points 2.11 describe the methods of setting the workholding devices, and the tools and equipment that can be used 2.12 describe the range of cutting tools or electrodes that are used on the NC/CNC machines they are using, and typical applications of each 2.13 explain how to check that the cutting tools or electrodes are in a safe and serviceable condition 2.14 describe the use of tungsten carbide, ceramic and diamond indexible tip tooling, and the factors which will determine their selection and use (the condition of material supplied, hardness of the material, the cutting characteristics of the material, tolerances to be achieved, component surface finish and specifications) 2.15 describe the factors which affect the selection of electrodes or the type and size of wire to be used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 describe the various tool holding devices that are used, and the methods of correctly mounting and securing the cutting tools or electrodes to the tool holders 2.17 describe the advantages of using pre-set tooling, and how to set the tooling using setting jigs/fixtures 2.18 describe the use of magazines and carousels, and how to position and identify the tools in relationship to the operating program 2.19 explain how to place the machine into the correct operating mode, and how to access the program edit facility in order to enter tooling data (such as tool datums, positions, lengths, offsets and radius compensation) 2.20 explain how to conduct trial runs (using single-block run, dry run, and feed/speed override controls) 2.21 describe the things that they need to check before allowing the machine to operate in full program run mode 2.22 explain how the various materials will affect the feeds and speeds that can be used 2.23 describe the application of cutting fluids with regard to a range of different materials, and why some materials do not require the use of cutting fluids			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.24 describe the typical problems that can occur with the setting up of the tooling and workholding devices, and what to do if such problems occur 2.25 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 22: Programming CNC machines to produce pattern or model components

Unit reference number: K/502/9334

QCF level: 3

Credit value: 84

Guided learning hours: 231

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to program a CNC machine tool control to produce components used in the production of patterns, coreboxes or models, and to prove the program, in accordance with approved procedures. The learner will be required to produce the component program using manual data input, or by use of a remote computer, saving the prepared program on magnetic tape, disk or downloading it into the machine controller from the computer. The learner will need to check the program using single-block run and program edit facilities. The learner will also be required to adjust the machine-tool equipment and program following proving/editing procedures to achieve component specification. The learner must ensure that any edited programs are saved safely and correctly.

The learner's responsibilities will require them to comply with organisational policy and procedures for producing, loading and proving the programs, and to report any problems with these activities that they cannot personally resolve, or 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 applying the machine-tool programming procedures used. The learner will understand the CNC machine tools used in the process, and their application, and will know about the programming, editing and proving process, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the machine controller is set up to produce the components to the required specification.

The learner will understand the safety precautions required when working on the machine and with the associated tools and equipment. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Programme CNC machines to produce pattern or model components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 ensure that they apply all of the following checks and practices during the programming activities: – the correct component drawings are obtained, and are checked for currency and validity – the appropriate reference manuals and programming codes are used to suit the machine controller – the machine controller is made ready to accept the operating program – the prepared program is inputted/loaded into the controller, safely and correctly – programs are stored safely and correctly in the appropriate format – program media is stored safely and correctly, away from contaminants or electromagnetic sources 1.3 use the correct control program and ensure it is correctly loaded into the machine controller 1.4 produce CNC programs using one of the following methods: – written – entered direct into the machine controller – using computer software			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 develop part programs which contain all of the following: – all necessary positional information – appropriate letter address codes – preparatory commands and machine management/auxiliary functions – repetitive programs (subroutines, canned cycles, labels) – absolute or incremental systems of measurement – tool/cutter change positions – tool information (lengths, offsets, radius compensation) 1.6 follow the correct procedures for calling up the program and dealing with any error messages or faults 1.7 confirm program integrity 1.8 prepare, load and prove programs for one of the following types of CNC machine tool: – two-axis machine – three-axis machine – multiple (five or more) axis machines – machining centres			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 prove the part program using six of the following: – single-block run – graphic displays – full dry run – search facilities – program save/store facilities – edit facilities – program override controls (speed, feed, tool data) – data input facilities 1.10 adjust the equipment and program operating parameters to optimise the outcomes to be achieved 1.11 load and correctly set up all associated equipment 1.12 check that all safety mechanisms are in place and that the equipment is set correctly for the required operations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 confirm that the machine and program operates safely and correctly, by checking all of the following: – all operations are carried out to the program coordinates – tool change positions are safe and clear of the workpiece and machine equipment – the correct tools are selected at the appropriate points in the program – tool cutter paths are executed safely and correctly – auxiliary functions operate at the correct point in the program (cutter start/stop, coolant flow) – programs have been saved in the appropriate format 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			
2. Know how to programme CNC machines to produce pattern or model components	2.1 describe the specific safety precautions to be taken when loading and proving CNC machine tool operating programs 2.2 explain how to start and stop the machine in normal and emergency situations 2.3 explain the importance of wearing the appropriate protective clothing and equipment, and of keeping the work area clean and tidy			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the computing coding language used in CNC programs with regard to machine axes, positional information, machine management and auxiliary functions 2.5 explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards in relation to work undertaken) 2.6 explain how to interpret first and third angle drawings, imperial and metric systems of measurement, and system of tolerancing 2.7 explain how to interpret CNC drawings, and the use of workpiece zero/reference points 2.8 describe the systems of measurement used on CNC drawing (including absolute and incremental) 2.9 describe the use of repetitive programs and canned cycles to reduce program size and inputting time 2.10 explain how to prepare part programs, using operational sequences and machining techniques which avoid unnecessary tool/cutter movements or tool changes 2.11 describe the function keys and operating system of the machine computer control system being operated 2.12 explain how to set machine datums for each machine axis being used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 explain how to set the machine controller in program and editing modes, and how to enter or download the prepared program 2.14 explain how to deal with error messages and faults on the program or equipment 2.15 explain how to access the program edit facility in order to enter tooling data (such as tool datums, positions, lengths, offsets and radius compensation) 2.16 describe the use of tool posts, magazines and carousels, and how to identify the tools in relationship to the operating program 2.17 explain how to conduct trial runs (using single-block run, dry run and feed and speed override controls) 2.18 describe the factors which affect the feeds and speeds that can be used, and why they may need to be adjusted from the program setting (condition of material, workholding method, tooling used, tolerance and finish to be achieved) 2.19 describe the things that they need to check before allowing the machine to operate in full program run mode			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 explain how to save the completed programs in the appropriate format, and the need to store program tapes and disks safely and correctly, away from contaminants and electromagnetic sources 2.21 describe the typical problems that can occur with the programming, loading and editing activities, and what to do if such problems occur 2.22 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 23: Producing pattern, corebox or model components using NC/CNC machines

Unit reference number: M/502/9335

QCF level: 3

Credit value: 63

Guided learning hours: 112

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out operations, in accordance with approved procedures, using numerically controlled (NC) machines, or computer numerically controlled (CNC) machines, such as turning, milling, electro-discharge machines or machining centres.

The learner will take charge of the prepared machine and check that it is ready for the machining operations to be performed. This will involve checking that all the required components and consumables are present, and that the machine has been approved for production. In operating the machine, the learner will be expected to follow the correct procedures for calling up the operating program, dealing with any error messages, and for executing the program activities safely and correctly.

The pattern, corebox or model components produced will have a number of different features, and will include diameters, bored holes, tapers, flat faces, square and parallel faces, angular faces, slots, indexed or rotated forms, internal and external profiles, grooves/undercuts, drilled, reamed and tapped holes, as applicable to the type of machine used and the components produced. The learner will be required to monitor the machining operations continuously, making any necessary adjustments to machine parameters in line with their permitted authority.

The learner's responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the equipment, tooling, program, materials or activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work to with minimal supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to applying NC/CNC machining procedures. The learner will have an understanding of the NC/CNC machining process, and its application, and will know about the machine, tooling, materials, machining activities and consumables, in adequate depth to provide a sound background to machine operation and for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the machine, and its associated tools and equipment. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce pattern, corebox or model components using NC/CNC machines	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 confirm that the equipment is set up and ready for operation, by checking all of the following: – machine guards are in place and are correctly adjusted – components are correctly positioned and held securely without distortion – cutting tools or electrodes/wires are in a suitable condition – the operating program is at the correct start point – the workpiece is clear of the machine spindle – safe working practices and startup procedures are observed – machine settings are adjusted, as required, to maintain accuracy 1.3 follow the defined procedures for starting and running the operating system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 operate one of the following NC/CNC machines: – NC/CNC lathe – NC/CNC wire erosion machine – NC/CNC milling machine – CNC machining centre – NC/CNC spark erosion machine 1.5 produce pattern, corebox or model components which combine several different operations and cover the following: either: turning operations, to include eight of the following features: – external diameters – tapered diameters – shoulders and steps – tapered faces – tapered holes – reamed holes – bored holes – drilled holes – internal threads – flat faces – external threads – recesses and undercuts – external or special profiles			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	or: milling operations, to include six of the following features: – flat faces – parallel faces – reamed holes – square faces – steps or shoulders – bored holes – angular/tapered faces – open ended slots – special profiles – enclosed slots – drilled holes – indexed or rotated forms or: electro discharge operations, to include six of the following features: – flat faces – square faces – engraving – angular/tapered faces – slots/recesses – threads – external profiles			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– tapered holes – special forms – internal profiles – linear holes (rows, angles) – holes on pitched circles 1.6 machine two of the following types of material: – carbon steel – cast iron – stainless steel – brass or bronze – non-metallic materials 1.7 deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved 1.8 monitor the computer process and ensure that the production output is to the required specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 produce components within all of the following quality and accuracy standards: – dimensional tolerance equivalent to BS4500 or BS1916 Grade 7 – components to be free from false tool cuts, burrs and sharp edges – flatness and squareness 0.001in per inch or 0.025mm per 25mm – reamed/bored holes within H 8 – angles within +/- 0.5 degree – screw threads BS medium fit – surface finish 63µin or 1.6µm 1.10 shut down the equipment to a safe condition on conclusion of the activities			
2. Know how to produce pattern, corebox or model components using NC/CNC machines	2.1 describe the specific safety precautions to be taken when working with NC/CNC machines and equipment 2.2 describe the safety mechanisms on the machine, and the procedures for checking that they are operating correctly 2.3 explain how to start and stop the machine in both normal and emergency situations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with working on NC/CNC machines (such as use of moving machinery, automatic machine operation, handling cutting tools, lifting and handling workholding devices, hot and airborne metal particles), and how to minimise them 2.5 explain the importance of wearing the appropriate protective clothing and equipment, and of keeping the work area clean and tidy 2.6 explain where to obtain component drawings, specifications and/or job instructions for the components being machined 2.7 explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards in relation to work undertaken) 2.8 explain how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.9 explain how to interpret the visual display, and understand the various messages displayed 2.10 explain the function of error messages, and what to do when an error message is displayed			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain how to find the correct restart point in the program when the machine has been stopped before completion of the program 2.12 describe the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons) 2.13 explain how to operate the machine (using single-block run, full program run and feed/speed override controls) 2.14 explain how to make adjustments to the program operating parameters to take account of tool wear 2.15 explain how to set and secure the workpiece to the machine spindle/workholding device; the effects of clamping the workpiece; and how material removal can cause warping/distortion of the finished workpiece 2.16 describe the various types of cutting tools or electrodes used, and how they are located and secured to the machine tool posts, turrets, slides and tool magazine or carousel 2.17 describe the safe and correct handling and storage of tooling 2.18 explain how to check that the tooling or electrodes are in a serviceable condition, and the effects that worn tooling or electrodes will have on the workpiece surface finish and tolerances			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the problems that can occur with the machining activities, and how these can be overcome 2.20 describe the application of cutting fluids or dielectrics with regard to different materials being machined 2.21 describe the quality control procedures used, inspection checks that need to be carried out, and the equipment that is used 2.22 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 24: Producing components by rapid prototyping techniques

Unit reference number: T/502/9336

QCF level: 3

Credit value: 35

Guided learning hours: 84

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce components by rapid prototyping techniques, in accordance with approved procedures. The learner will be required to select the appropriate prototyping equipment, based on the type and size of the components and the surface finish required. The learner will be expected to prepare the equipment in readiness for the required operations, to import a stereolithography (STL) file from a computer aided design (CAD) system, to load the file into the rapid prototyping software, and to orientate the file to its optimal manufacturing position.

In operating the equipment, the learner will need to access the software and produce a suitable file to drive the rapid prototyping equipment. In producing the components, the learner will need to set up all of the machine operating functions, parameters and safety devices, and to produce components that have features such as regular parallel, angular and symmetrical surfaces and forms, angular and circular profiles, and irregular and variable surface forms and profiles.

The learner's responsibilities will require them to comply with organisational policy and procedures for using rapid prototyping software and for operating rapid prototyping equipment. The learner will report any problems with the hardware, software, materials or equipment that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work with minimal supervision, whilst working to verbal or written instructions and component drawings, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to the design of components using solid modellers. The learner will understand the rapid prototyping equipment, and its application, and will know about the materials and consumables used, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the components produced are to the required specification.

The learner will understand the safety precautions required when working with the rapid prototyping equipment. 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce components by rapid prototyping techniques	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare the system and data for operation by carrying out all of the following: – check that all the equipment is in a safe and usable working condition (undamaged, safety devices in place and operational) – obtain sufficient quantities of all required materials – obtain all the necessary data, documentation and specifications for the components to be produced – ensure the machine build calibration is current – create operating files to drive the equipment – check data files are suitable for application, and modify where appropriate – set operating parameters (layer thickness, shrinkage, beam offset and material type) – orientate the files for processing – apply safe working practices and procedures at all times			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 set up the rapid prototyping equipment, to include carrying out all of the following: – powering-up the equipment and activating the appropriate software – setting up the software ready to receive the component information – importing files from system – loading files into the 'build' software 1.4 follow instructions and any relevant specifications to produce the component 1.5 produce the required components using appropriate manufacturing methods and techniques 1.6 produce components using one of the following types of rapid prototyping equipment: – stereo lithography apparatus (SLA) – fused deposition modelling (FDM) – selective laser sintering (SLS) – direct metal laser sintering (DMLS) – selective laser melting (SLM) – 3D printing (thermojet) – laminated object manufacturing (LOM)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 produce components which combine features and techniques and cover all of the following: – regular parallel and square surfaces and forms – angular and symmetrical surfaces and forms – circular and curved surfaces and forms – irregular and variable surface forms and profiles 1.8 produce components made from one of the following materials: – photo-polymer resin – plastics – wax – metal – laminated paper 1.9 check that the finished component meets the requirements and make any necessary adjustments 1.10 produce components which comply with all of the following quality and accuracy requirements: – correctly formed – free from manufacturing defects – dimensionally accurate, within tolerance – satisfactory visual appearance/finish – meets customer and/or drawing specification 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2. Know how to produce components by rapid prototyping techniques	2.1 describe the safe working practices and procedures to be observed when setting and operating rapid prototyping equipment (care when working with laser beams; machine guards; ventilation and fume extraction; machine safety devices) 2.2 explain how to start and stop the machine in normal and emergency situations, and how to close the machine down on completion of activities 2.3 explain the importance of ensuring the machine is isolated from the power supply before working with the equipment 2.4 explain the importance of wearing the appropriate protective clothing and equipment, and of keeping the work area clean and tidy 2.5 describe the hazards associated with rapid prototyping machines (dangers from laser beams; live electrical components; materials; fumes/gases), and how they can be minimised 2.6 describe the basic principles of rapid prototyping (using a laser beam/inkjet printer heads to form material profile; process principles; using software packages; methods of guiding and optical focusing of the beam; how variation in the parameters influences the component feature, quality and output; equipment calibration procedures; terminology used in rapid prototyping; the importance of creating effective component support structures)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the key components and features of the equipment (types of rapid prototyping equipment; power ranges; beam guiding and focusing arrangements; material capabilities; facilities for manipulating the components for production; and safety features) 2.8 describe the benefits and limitations of the different types of rapid prototyping equipment 2.9 describe the rapid prototyping techniques used, and how to differentiate between the different processes (including the advantages and disadvantages) 2.10 describe the finishing techniques that are required, and how they are applied to the different rapid prototyping processes 2.11 explain how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards in relation to work undertaken) 2.12 explain how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 explain how to import appropriate files (STL) from a data system into the rapid prototyping software, how to orientate these for processing, and how to create operating files to drive the process 2.14 describe the setting up of the rapid prototyping equipment to achieve the component specification (electrical and optical conditions; focal distance; forming speed) 2.15 explain how to place the machine in the correct operating mode, and how to access the program edit facility, in order to make minor adjustments for production 2.16 describe the different materials used to produce components by the rapid prototyping process, and how the various materials used will affect the operating conditions that can be applied 2.17 explain why certain materials are suitable for producing components by the rapid prototyping process 2.18 explain the importance of knowing when components can be unloaded from the machine in relation to the different rapid prototyping processes 2.19 explain the importance of handling and storing materials correctly 2.20 explain how and where to dispose of any waste materials, including damaged components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 explain how finished components are stored and transported 2.22 describe the problems and defects that can occur in components produced by rapid prototyping processes, how these have occurred, and what preventative actions are needed to overcome them 2.23 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 25: Modifying and repairing pattern, corebox or model equipment

Unit reference number: A/502/9337

QCF level: 3

Credit value: 35

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out modifications and repairs to existing patterns, coreboxes or models, in accordance with approved procedures. The equipment may have to be modified for a number of reasons, which could include, performance out of specification, inherent design problems, changes to customer specification, or casting/production problems. The type of equipment being modified or repaired will include loose or plated patterns (with and without cores), solid turnout, split and multi-part coreboxes, and various types of full and scale models.

The modifications or repairs will be carried out using a combination of hand and machine skills, and the learner will be expected to select the relevant and current documentation relating to the modifications or repairs, to determine the methods to be used, and to obtain the tools and equipment required for the modification or repair, checking that they are in a safe and usable condition. In carrying out the modification or repair, the learner will be required to follow safe and approved procedures and techniques at all times.

The materials used to modify or repair the equipment will, in the main, compare with the original part but, for operational purposes, different materials could be substituted, provided these materials will not affect serviceability of the equipment. The pattern or model equipment, and its components, could be modified using a number of methods and techniques including, where appropriate, adjusting, removing and replacing, repairing or manufacturing new components. Modified component parts will be checked for accuracy, security, completeness and function, as per the specification.

The learner's responsibilities will require them to comply with organisational policy and procedures for the modification activities undertaken, and to report any problems with the modification activities, materials or equipment that they cannot personally resolve, or 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 applying modification and repair methods, techniques and procedures to pattern and model equipment. The learner will understand the equipment being modified, including its application, and the reason for modification, and will know about the tools and equipment to be used, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the modification or repair 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Modify and repair pattern, corebox or model equipment	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 modification or repair activities: – use the correct issue of drawings, job instructions and specifications – use copies of relevant COSHH sheets and risk assessments – check that tools and measuring instruments to be used are within calibration dates – ensure the components used are free from dirt or other forms of contamination – use lifting and slinging equipment in accordance with health and safety guidelines and procedures – apply safe and appropriate modification or repair techniques at all times – leave the work area in a safe condition on completion of the activities 1.3 obtain the relevant specification and job instructions for the modification or repair being performed			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 confirm and agree what modification or repair is to be carried out to meet the specification 1.5 determine how the pattern, corebox or model equipment will need to be prepared for the modification or repair being carried out 1.6 check that any materials and equipment required are available and that they are suitable for the work to be carried out 1.7 carry out the modification or repair to achieve the required changes in line with agreed instructions and specifications 1.8 carry out modifications or repairs on two of the following: – loose patterns – plated patterns – solid coreboxes – split coreboxes – multi-part coreboxes – full-size models – scale models – runner/feeder system parts			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 carry out the modification or repair by two of the following: – adding or decreasing metal thickness – alterations to core prints – alterations to core locations – altering size of model parts – altering shape of models 1.10 complete the modification or repair using two of the following techniques: – dismantling and re-assembling – adjusting existing components – making and attaching complete new parts – making and attaching sectional parts – adding new material to damaged parts using adhesives/resin mixes/fillers 1.11 modify or repair equipment/models which are used for two of the following: – one-off production – batch production – temporary use – permanent use			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 carry out modifications or repairs to equipment which comply with one or more of the following quality and accuracy standards: – BS or ISO standards and procedures – customer standards and requirements – company standards and procedures – specific equipment requirements 1.13 complete all relevant documentation in accordance with organisational requirements 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			
2. Know how to modify and repair pattern, corebox or model equipment	2.1 describe the specific safety precautions to be taken whilst carrying out the modification on the pattern, corebox or model equipment (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the modification activities, and the responsibility they place on the learner 2.3 describe the COSHH regulations pertinent to the substances used in the modification process 2.4 describe the hazards associated with modifying pattern, corebox and model equipment, and the tools and equipment that are used, and how these hazards can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the personal protective equipment and clothing to be worn during the modification activities 2.6 describe the various types of drawing and specifications that are used during the modification 2.7 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards in relation to work undertaken) 2.8 explain how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.9 describe the basic function of the pattern, corebox or model equipment being modified or repaired (to include plated patterns, loose patterns, solid, split and multi-part coreboxes, full-size and scale models) 2.10 explain the reasons why pattern, coreboxes and model equipment may require modification 2.11 describe the preparations to be undertaken on the components prior to carrying out the modification 2.12 explain how the different materials used in the original equipment may affect the choice of repair/modification methods			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 describe the various methods that could be used to modify assemblies (adjust, remove and replace, repair and manufacture) 2.14 describe the basic concepts and techniques that can be used, where appropriate, to modify the assembly (machining, fitting, bonding, filling and blending) 2.15 describe the benefits and limitations of the various types of locating and securing devices used on patterns, coreboxes and model equipment 2.16 explain why the cost of the modification or repair needs to be determined before commencing work 2.17 describe the quality control procedures to be followed during the modification, and the importance of adhering to them 2.18 explain how to conduct any necessary checks to ensure the accuracy, position, security, function and completeness of the modification 2.19 describe the methods and equipment used to transport, lift and handle components and assemblies 2.20 explain how to check that the tools and equipment to be used are correctly calibrated and are in a safe and serviceable condition 2.21 explain the importance of ensuring that all tools are used correctly and within their permitted operating range			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 explain the importance of ensuring that all tools, equipment and components are accounted for and returned to their correct location on completion of the modification activities 2.23 describe the problems associated with carrying out modifications on pattern, corebox and model equipment, and the importance of informing the appropriate people of non-conformances 2.24 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Unit 26: Producing pattern, corebox or model components using flexible composite materials

Unit reference number: F/502/9338

QCF level: 3

Credit value: 40

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce flexible composite moulds for model components, using hand tools and equipment, in accordance with approved procedures. The learner will be required to select the appropriate tools and equipment to use, based on the type, size and material of the mould to be produced. The size, shape and complexity of the moulds to be produced will vary, so the learner must set out the mould masters to ensure that the number, quality and accuracy of the models produced per mould is achieved.

The learner will also be expected to set up the machine moulding parameters, such as mould pressures, mould temperatures, curing and setting times, safely and correctly. Extracting the finished moulds, cutting runner and air release systems, and inspecting the mould cavities for defects, will also form part of the learner's role.

The learner's responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the moulding activities, materials or equipment that they cannot personally resolve, or 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 applying flexible composite moulding techniques and procedures. The learner will understand the moulding techniques and procedures used, and their application, and will know about the relevant equipment, tools and materials, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the moulding 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.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Produce pattern, corebox or model components using flexible composite materials	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 moulding activities: – use the correct issue of moulding procedure and quality documentation – use copies of relevant COSHH sheets and risk assessment standards – check all tools and equipment to be used are in a safe and usable condition – check that there are sufficient masters available to produce the required mould – check that sufficient moulding materials are available and are within current shelf life – ensure moulding machines are correctly set up and operated safely – leave the work area in a safe condition on completion of the activities 1.3 follow relevant specifications for the component to be produced			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition 1.5 prepare moulds for curing to include carrying out all of the following operations: – marking out the positions of the masters around the mould – applying suitable release agents to the masters – arranging masters on the mould face – inserting mould location devices – closing moulds 1.6 shape the materials using appropriate methods and techniques 1.7 produce moulds in one of the following materials: – rubber – silicone – other flexible composite 1.8 set moulding machine conditions to include all of the following: – mould pressure – mould temperature – setting time – curing time			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 produce moulds for models which have four of the following features or profiles: – flat faces – tapered profiles – curved contours – stepped faces – complex profiles 1.10 check that all the required shaping operations have been completed to the required specification 1.11 finish moulds after processing by completing all of the following activities: – extracting masters from moulds – cutting runner and air release systems – inspecting mould cavities for defects – replacing masters in correct locations 1.12 produce moulds which comply with one or more of the following quality and accuracy standards: – mould cavities are correctly formed, complete and free from defects – impressions are correctly spaced around the mould – locators are correctly positioned – runner channels and air release systems are correctly formed and connected – moulds meet product specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			
2. Know how to produce pattern, corebox or model components using flexible composite materials	2.1 describe the specific safety precautions to be taken whilst carrying out the flexible composite moulding operations (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the moulding activities, and the responsibility these requirements place on the learner 2.3 describe the hazards associated with producing flexible composite moulds, and how they can be minimised 2.4 describe the personal protective equipment and protective clothing to be worn during the moulding and forming activities 2.5 explain how to obtain the necessary job instructions, drawings and related specifications, and how to interpret their information correctly 2.6 describe the range of hand tools and associated equipment that is used to cut, shape and form materials used in flexible composite moulds 2.7 explain how to check that the tools and equipment to be used are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain the importance of ensuring that all tools and equipment are used in the correct manner, only for their intended purpose, and within their permitted operating range 2.9 explain how to identify the materials to be used, material identification systems, and any codes that are used 2.10 describe the various techniques used to form and shape rubber and silicone materials 2.11 explain how to prepare the masters and arrange them around the mould (marking out positions for the masters, positioning them around the mould, inserting mould location dowels, applying mould release agents) 2.12 explain how to set up flexible composite moulding machines for the correct pressures, temperature, curing and setting times 2.13 describe the effects on the completed moulds of using incorrect pressure or temperature during the curing process 2.14 explain how to remove moulds safely from the machine, and extract the masters, without causing damage to the mould cavities 2.15 explain how to finish the moulds by cutting runner and air release systems, and how to inspect them for defects			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain how to identify defects in the models which can be directly related to incorrect running, siting of the masters and incorrect air release systems 2.17 explain why it is important to keep the model masters clean and free from damage, to practise good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.18 describe the quality control procedures to be followed, and how to conduct any necessary checks to ensure the accuracy and quality of the moulds produced 2.19 describe the problems that can occur with the moulding and forming operations, and how these can be overcome 2.20 describe the extent of their own responsibility, and to whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date:_____

Learner signature: _____ Date:_____

Assessor signature: _____ Date:_____

Internal verifier signature: _____ Date:_____

(*if sampled*)

Further information

Our customer service numbers are:

BTEC and NVQ	0844 576 0026
GCSE	0844 576 0027
GCE	0844 576 0025
The Diploma	0844 576 0028
DiDA and other qualifications	0844 576 0031

Calls may be recorded for training purposes.

Useful publications

Related information and publications include:

- *Centre Handbook for Edexcel QCF NVQs and Competence-based Qualifications* published annually
- functional skills publications – specifications, tutor support materials and question papers
- *Regulatory Arrangements for the Qualification and Credit Framework* (published by Ofqual, August 2008)
- the current Edexcel publications catalogue and update catalogue.

Edexcel publications concerning the Quality Assurance System and the internal and standards verification of vocationally related programmes can be found on the Edexcel website.

NB: Some of our publications are priced. There is also a charge for postage and packing. Please check the cost when you order.

How to obtain National Occupational Standards

To obtain the National Occupational Standards go to www.ukstandards.org.uk.

Professional development and training

Edexcel supports UK and international customers with training related to NVQ and BTEC qualifications. This support is available through a choice of training options offered in our published training directory or through customised training at your centre.

The support we offer focuses on a range of issues including:

- planning for the delivery of a new programme
- planning for assessment and grading
- developing effective assignments
- building your team and teamwork skills
- developing student-centred learning and teaching approaches
- building functional skills into your programme
- building effective and efficient quality assurance systems.

The national programme of training we offer can be viewed on our website (www.edexcel.com/training). You can request customised training through the website or by contacting one of our advisers in the Training from Edexcel team via Customer Services to discuss your training needs.

The training we provide:

- is active
- is designed to be supportive and thought provoking
- builds on best practice
- may be suitable for those seeking evidence for their continuing professional development.

Annexe A: Progression pathways

The Edexcel qualification framework for the engineering sector

Level	General qualifications	Diplomas	BTEC vocationally-related qualifications	BTEC specialist qualification/ professional	NVQ/competence
8					
7					
6					We have too many qualifications to list in this space. Please go to www.edexcel.com for further information.

Level	General qualifications	Diplomas	BTEC vocationally-related qualifications	BTEC specialist qualification/ professional	NVQ/competence
5			Edexcel BTEC Level 5 HND Diploma in Manufacturing Engineering Edexcel BTEC Level 5 HND Diploma in Mechanical Engineering Edexcel BTEC Level 5 HND Diploma in Operations Engineering Edexcel BTEC Level 5 HND Diploma in Electrical/Electronic Engineering Edexcel BTEC Level 5 HND Diploma in General Engineering Edexcel BTEC Level 5 HND Diploma in Automotive Engineering Edexcel BTEC Level 5 HND Diploma in Aeronautical Engineering		We have too many qualifications to list in this space. Please go to www.edexcel.com for further information.

Level	General qualifications	Diplomas	BTEC vocationally-related qualifications	BTEC specialist qualification/ professional	NVQ/competence
4			Edexcel BTEC Level 4 HNC Diploma in Manufacturing Engineering Edexcel BTEC Level 4 HNC Diploma in Mechanical Engineering Edexcel BTEC Level 4 HNC Diploma in Operations Engineering Edexcel BTEC Level 4 HNC Diploma in Electrical/Electronic Engineering Edexcel BTEC Level 4 HNC Diploma in General Engineering Edexcel BTEC Level 4 HNC Diploma in Automotive Engineering Edexcel BTEC Level 4 HNC Diploma in Aeronautical Engineering		We have too many qualifications to list in this space. Please refer to www.edexcel.com for further information.

Level	General qualifications	Diplomas	BTEC vocationally-related qualifications	BTEC specialist qualification/ professional	NVQ/competence
3		Edexcel Level 3 Diploma in Engineering	Edexcel BTEC Level 3 Certificate, Subsidiary Diploma, Diploma and Extended Diploma in Engineering Edexcel BTEC Level 3 Diploma and Extended Diploma in Mechanical Engineering Edexcel BTEC Level 3 Diploma and Extended Diploma in Manufacturing Engineering Edexcel BTEC Level 3 Diploma and Extended Diploma in Operations and Maintenance Engineering Edexcel BTEC Level 3 Diploma and Extended Diploma in Electrical/Electronic Engineering Edexcel BTEC Level 3 Diploma and Extended Diploma in Aeronautical Engineering		We have too many qualifications to list in this space. Please go to www.edexcel.com for further information.

Level	General qualifications	Diplomas	BTEC vocationally-related qualifications	BTEC specialist qualification/ professional	NVQ/competence
2	GCSE Engineering GCSE Manufacturing	Edexcel Level 2 Diploma in Engineering	Edexcel BTEC Level 2 Certificate, Extended Certificate and Diploma in Engineering		We have too many qualifications to list in this space. Please go to www.edexcel.com for further information.
1		Edexcel Level 1 Diploma in Engineering	Edexcel BTEC Level 1 Award, Certificate and Diploma in Engineering		We have too many qualifications to list in this space. Please go to www.edexcel.com for further information.
Entry					

Annexe B: Quality assurance

Key principles of quality assurance

- A centre delivering Edexcel qualifications must be an Edexcel recognised centre and must have approval for qualifications that it is offering.
- The centre agrees, as part of gaining recognition, to abide by specific terms and conditions relating to the effective delivery and quality assurance of assessment. The centre must abide by these conditions throughout the period of delivery.
- Edexcel makes available to approved centres a range of materials and opportunities to exemplify the processes required for effective assessment and provide examples of effective standards. Approved centres must use the guidance on assessment to ensure that staff who are delivering Edexcel qualifications are applying consistent standards.
- An approved centre must follow agreed protocols for: standardisation of assessors; planning, monitoring and recording of assessment processes; internal verification and recording of internal verification processes and dealing with special circumstances, appeals and malpractice.

Quality assurance processes

The approach to quality assured assessment is made through a partnership between a recognised centre and Edexcel. Edexcel is committed to ensuring that it follows best practice and employs appropriate technology to support quality assurance processes where practicable. The specific arrangements for working with centres will vary. Edexcel seeks to ensure that the quality-assurance processes it uses do not inflict undue bureaucratic processes on centres, and works to support them in providing robust quality-assurance processes.

The learning outcomes and assessment criteria in each unit within this specification set out the standard to be achieved by each learner in order to gain each qualification. Edexcel operates a quality-assurance process, designed to ensure that these standards are maintained by all assessors and verifiers.

For the purposes of quality assurance, all individual qualifications and units are considered as a whole. Centres offering these qualifications must be committed to ensuring the quality of the units and qualifications they offer, through effective standardisation of assessors and internal verification of assessor decisions. Centre quality assurance and assessment processes are monitored by Edexcel.

The Edexcel quality-assurance processes will involve:

- gaining centre recognition and qualification approval if a centre is not currently approved to offer Edexcel qualifications
- annual visits to centres by Edexcel for quality review and development of overarching processes and quality standards. Quality review and development visits will be conducted by an Edexcel quality development reviewer
- annual visits by occupationally competent and qualified Edexcel Standards Verifiers for sampling of internal verification and assessor decisions for the occupational sector
- the provision of support, advice and guidance towards the achievement of National Occupational Standards.

Centres are required to declare their commitment to ensuring quality and appropriate opportunities for learners that lead to valid and accurate assessment outcomes. In addition, centres will commit to undertaking defined training and online standardisation activities.

Annexe C: Centre certification and registration

Edexcel Standards Verifiers will provide support, advice and guidance to centres to achieve Direct Claims Status (DCS). Edexcel will maintain the integrity of Edexcel QCF NVQs through ensuring that the awarding of these qualifications is secure. Where there are quality issues identified in the delivery of programmes, Edexcel will exercise the right to:

- direct centres to take action
- limit or suspend certification
- suspend registration.

The approach of Edexcel in such circumstances is to work with the centre to overcome the problems identified. If additional training is required, Edexcel will aim to secure the appropriate expertise to provide this.

What are the access arrangements and special considerations for the qualification in this specification?

Centres are required to recruit learners to Edexcel qualifications with integrity.

Appropriate steps should be taken to assess each applicant's potential and a professional judgement should be made about their ability to successfully complete the programme of study and achieve the qualification. This assessment will need to take account of the support available to the learner within the centre during their programme of study and any specific support that might be necessary to allow the learner to access the assessment for the qualification. Centres should consult Edexcel's policy on learners with particular requirements.

Edexcel's policy on access arrangements and special considerations for Edexcel qualifications aims to enhance access to the qualifications for learners with disabilities and other difficulties (as defined by the 1995 Disability Discrimination Act and the amendments to the Act) without compromising the assessment of skills, knowledge, understanding or competence. Please refer to *Access Arrangements and Special Considerations for BTEC and Edexcel NVQ Qualifications* for further details. www.edexcel.com.

Semta

Engineering

NVQ Level 2, 3 and 4

QCF Unit Assessment Strategy

Version 4. 1st January 2011

Contents

Introduction

[Semta], the Sector Skills Council for the Science Engineering Manufacturing Technologies Sector, has produced this QCF Unit Assessment Strategy to:

- ßassist Assessors, Internal Verifiers and External Verifiers
- encourage and promote consistent assessment of NVQ units
- promote cost effective assessment plans.

This document also provides definitions for:

- the qualifications and experience required for Assessors and Verifiers
- the assessment environment and notes on simulation/replication
- access to units.

and requirements relating to:

- carrying out assessments
- performance evidence
- assessing knowledge and understanding.

The importance and value in which employers and learners place on undertaking NVQ units will provide a key measure of [Semta's] success with this unit assessment strategy. Another key success factor will be [Semta's] partnership with the relevant Awarding Organisations.

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 to the assessment being carried out, will not be required to achieve the QCF Level 3 Award as they are still 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, systems and procedures within which the assessment and verification is taking place.

Specific technical requirements for internal and external verifiers

Internal and external verifiers of this qualification must be able to demonstrate that have verifiable, sufficient and relevant industrial experience, and must have a working knowledge of the processes, techniques and procedures that are used in the relevant sector/occupation.

The tables on the following page show the recommended levels of technical competence for assessors, internal verifiers, and external verifiers.

Technical Requirements for Assessors and Verifiers

Position	Prime activity requirements	Support activity requirements	Technical requirements (see notes)
Assessor	Assessment Skills	IV Systems	Technical *competence* in the areas covered by the QCF units being assessed
Internal Verifier	Verification Skills	Assessment Knowledge	Technical *understanding* of the areas covered by the qualifications
External Verifier	Verification skills	Assessment Understanding	Technical *awareness* of the areas covered by the qualifications

Notes

1. Technical *competence* is defined here as a combination of practical skills, knowledge, and the ability to apply both of these, in familiar and new situations, within a real working environment.
2. Technical *understanding* is defined here as having a good understanding of the technical activities being assessed, together with knowledge of relevant Health & Safety implications and requirements of the assessments.
3. Technical *awareness* is defined here as a general overview of the subject area, sufficient to ensure that assessment and portfolio evidence are reliable, and that relevant Health and Safety requirements have been complied with.
4. The competence required by the assessor, internal verifier and external verifier, in the occupational area being assessed, is likely to exist at three levels as indicated by the shaded zones in the following table.

Technical Competence / required by:	An ability to *discuss* the general principles of the competences being assessed	An ability to *describe* the practical aspects of the competence being assessed	An ability to *demonstrate* the practical competences being assessed
Assessor			
Internal Verifier			
External Verifier			

Assessment Environment

The evidence put forward for this unit 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, which impose pressures which are 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 the specific Awarding Organisation 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 withemergencies, 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 take the same form as in the workplace.

Access to Assessment

There are no entry qualifications or age limits required by learners to undertake the NVQ units unless this is a legal requirement of the process or the environment. Assessment is open to any learner who has the potential to achieve the assessment criteria set out in the units. Aids or appliances, which are designed to alleviate disability, may be used during assessment, providing they do not compromise the standard required.

Carrying Out Assessment

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.

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 maybe 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.

together with:

- 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 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 learners 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 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. Awarding Organisations may choose other methods, which must be supported by a suitable rationale.

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.

Awarding Organisations may choose other methods, which must be supported by a suitable rationale.

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 learners 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.

Quality Control of Assessment

General

There are two major points where an Awarding Organisation interacts with the Centre in relation to the External Quality Control of Assessment for a qualification and these are:

- Approval — When a Centre take on new qualifications, the Awarding Organisation, normally through an External Verifier (EV) ensures that the Centre is suitably equipped and prepared to deliver the new qualification;
- Monitoring — Throughout the ongoing delivery of the qualification the Awarding Organisation, through EV monitoring and other mechanisms must maintain and the quality and consistency of assessment of the qualification.

Approval

In granting Approval, the Awarding Organisation, normally through its External Verifiers (EV) Must ensure that the prospective Centre:

- Meets any procedural requirements specified by the Awarding Organisation;
- Has sufficient and appropriate physical and staff resources;
- Meets relevant health and safety and/or equality and access requirements;
- Has a robust plan for the delivery, assessment and QA for the qualifications.

Awarding Organisation's may decide to visit the Centre to view the evidence provided. The Awarding Body must have a clear rationale for the method(s) deployed.

Monitoring

The Awarding Organisation, through EV monitoring and other mechanisms must ensure:

- that a strategy is developed and deployed for the ongoing Awarding Organisation monitoring of the Centre. This strategy must be based on an active risk assessment of the Centre. In particular the strategy must identify the learner, assessor and IV sampling strategy to be deployed and the rationale behind this;
- that the Centre's internal quality assurance processes are effective in candidate assessment;
- that sanctions are applied to a Centre where necessary and that corrective actions are taken by the Centre and monitored by the Awarding Organisation/EV;
- that reviews of Awarding Organisation's external auditing arrangements are undertaken.

Awarding Organisations are required to provide to SEMTA, on request, details of the strategies, rationales and reviews detailed above.

Additional Notes:

It is recognised that some Awarding Organisations provide supplementary guidance and documentation to centres to support the quality of assessment and verification practice of N/SVQs.

Annexe E: Additional requirement for qualifications that use the term 'NVQ' in a QCF qualification title

Please go to www.ofqual.gov.uk to access the document *'Operating rules for using the term 'NVQ' in a QCF qualification title'*.

5214db191011WORDPROC:LT:PD:NVQ COMPETENCE:N026808 EDEXCEL L3 NVQ DIP IN ENG WOODWORKING, PATTERN N MODEL MAKING.DOC.1-288/1

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