

SEMPEO2-41 - SQA Unit Code FP40 04

Using wood for pattern, modelmaking and other engineering applications



Overview

This standard covers a broad range of basic hand and wood machining competences that will prepare you for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or that will provide a basis for the development of additional skills and occupational competences in the working environment.

You will be expected to prepare for the pattern, modelmaking or engineering woodworking activities by obtaining all the necessary information, documentation, tools and equipment required, and to plan how you intend to carry out the cutting and shaping activities and the sequence of operations you intend to use. You will be required to select the appropriate hand tools and machinery, based on the operations to be carried out and the accuracy to be achieved.

The production of the components will involve roughing out the components using fixed or portable machine tools, and finishing them using hand tools. The components produced will be used to produce patterns for sand castings, moulds for composite manufacture, full size and scale models, frames, cases, storage units, furniture and other structures.

During, and on completion of, the cutting and shaping operations, you will be expected to check the quality of the workpiece, using measuring equipment appropriate to the aspects being checked and the tolerances to be achieved. You will need to be able to recognise material and cutting and shaping defects, to take appropriate action to remedy any faults that occur and to ensure that the finished workpiece is within the drawing requirements. On completion of the activities, you will be expected to return all tools and equipment to the correct locations, and to leave the work area in a safe and tidy condition.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the woodworking activities undertaken. You will need to take account of any potential difficulties or problems that may arise with the activities, and to seek appropriate help and advice in determining and implementing a suitable solution. You will work under a high level of supervision, whilst taking responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide an understanding of your work, and will enable you to apply appropriate hand and wood machining techniques safely. You will understand the cutting and shaping process, and its application, and will know about the equipment, materials and consumables, to the required depth to provide a sound basis for carrying out the activities to the required specification.

SEMPEO2-41 - SQA Unit Code FP40 04

Using wood for pattern, modelmaking and other engineering applications

You will understand the safety precautions required when carrying out the cutting and shaping activities, especially those for using woodworking machines and portable power tools. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Specific Standard Requirements

In order to prove your ability to combine different pattern, model or woodworking operations, at least one of the components produced must be of a significant nature, and must have a minimum of **seven** of the features listed in scope 8.

SEMPEO2-41 - SQA Unit Code FP40 04

Using wood for pattern, modelmaking and other engineering applications

Performance criteria

You must be able to:

- P1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
- P2 plan the pattern, model or engineering woodworking activities before you start them
- P3 obtain the appropriate tools and equipment for the operations, and check that they are in a safe and usable condition
- P4 mark out the components for the required operations, using appropriate tools and techniques
- P5 cut and shape the materials to the required specification, using appropriate tools and techniques
- P6 measure and check that all dimensional and geometrical aspects of the component are to the specification
- P7 deal promptly and effectively with problems within your control, and seek help and guidance from the relevant people if you have problems that you cannot resolve
- P8 leave the work area in a safe and tidy condition on completion of the pattern, modelmaking or engineering woodworking activities

SEMPEO2-41 - SQA Unit Code FP40 04

Using wood for pattern, modelmaking and other engineering applications

Knowledge and understanding

You need to know and understand:

- K1 the health and safety requirements, and safe working practices and procedures required for the pattern, modelmaking or engineering woodworking activities undertaken (including the use of hand tools; working with machinery; operation of machine safety devices; dust extraction, stopping the machine in an emergency; closing the machine down on completion of activities)
- K2 the importance of wearing appropriate protective clothing/equipment (PPE), and of keeping the work area safe and tidy
- K3 the hazards associated with cutting and shaping wood and composite materials, and with the tools and equipment that is used, (such as use of hand power tools, trailing leads or hoses, dust inhalation, damaged or badly maintained tools and equipment, using tools with damaged or poor fitting handles, handling long or wide lengths of material), and how they can be minimised
- K4 the procedure for obtaining the required drawings, job instructions and other related specifications
- K5 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
- K6 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
- K7 how to identify the materials that are to be used (to include colour, grain structure, size), and the common defects that occur in the wood to be used
- K8 the types of defects that would render the materials unfit for use
- K9 the material characteristics and process considerations to be taken into account when marking out wood (such as the importance of colour matching and grain convention when using wood and wood-based materials)
- K10 the principles of marking out, and the types of equipment used (including the range of operations that the various items of marking out equipment are capable of performing)
- K11 how to prepare the materials in readiness for the marking out activities, in order to enhance clarity, accuracy and safety (such as visually checking for defects, preparing the materials, removing sharp corners and edges)
- K12 the use of marking out conventions when marking out the workpiece (including datums, centre lines, cutting guidelines, square and

SEMPEO2-41 - SQA Unit Code FP40 04

Using wood for pattern, modelmaking and other engineering applications

- rectangular profiles, joints, circular and curved profiles, angles, holes which are linearly positioned, boxed and on pitch circles)
- K13 how to select and establish suitable datums; the importance of ensuring that marking out is undertaken from the selected datums; and the possible effects of working from different datums
 - K14 the use of geometrical construction methods applied to marking out
 - K15 ways of laying out the marking out shapes or patterns to maximise the use of materials
 - K16 the various hand tools that are used to cut and shape the materials, and the range of operations they are capable of performing (such as rip saws, tenon saws, fret/bow saws; smoothing planes, jack planes, rebating planes; chisels and gouges; spokeshaves)
 - K17 how to check that the hand cutting tools are in a usable and safe condition; and the procedure for sharpening and adjusting these when required
 - K18 the various machines that are used in wood machining, and the range of operations they are capable of performing (such as sawing, planing, rebating, profiling)
 - K19 the importance of checking that the machinery used is complete and working correctly, that the cutting tools are undamaged and are in a safe and sharp condition, and the procedure for changing, sharpening and adjusting these when required
 - K20 the methods of setting up and operating the equipment and machinery, how to set up and use dust extraction equipment, and the importance of ensuring that this equipment is operating correctly
 - K21 the importance of ensuring that all machine and portable tools are used correctly, PAT tested and within their permitted operating range
 - K22 the various methods used to hold the components that are being shaped, formed or dressed by hand
 - K23 why you need to consider grain direction and construction when cutting and shaping wood and composites
 - K24 the methods used to cut square, angular and circular/curved profiles
 - K25 how different materials require changes to the machining methods (such as roughing and finishing cuts, changes in feed or speeds)
 - K26 how to conduct any necessary checks to ensure the accuracy and quality of the components produced, and the type of equipment that is used
 - K27 when to act on your own initiative and when to seek help and advice from others
 - K28 the importance of leaving the work area in a safe and clean condition on completion of the woodworking activities (such as removing and storing power leads, isolating machines, cleaning the equipment, and removing and disposing of waste)

SEMPEO2-41 - SQA Unit Code FP40 04

Using wood for pattern, modelmaking and other engineering applications

Additional Information

Scope/range related to performance criteria

- You must be able to:*
1. Carry out **all** of the following during the cutting and shaping activities:
 - 1.1 obtain all the necessary information to carry out the cutting and shaping activities (drawings, specifications)
 - 1.2 check that the equipment to be used are fit for purpose, and is in a safe, tested and usable condition (such as hand tools, machines and machine cutting tools)
 - 1.3 ensure that the work area is free from hazards
 - 1.4 ensure that all machine guards and safety devices are correctly positioned
 - 1.5 check that dust extraction equipment is functioning correctly
 - 1.6 set and adjust the machines to produce the components to the required specification
 - 1.7 use safe and approved hand and machine shaping techniques at all times
 - 1.8 maintain the cutting tools in a serviceable condition
 2. Identify and isolate any materials that have defects, to include **all** of the following:
 - 2.1 structural
 - 2.2 dimensional
 - 2.3 cosmetic
 - 2.4 distortion
 3. Use marking out methods and techniques, including:
 - 3.1 direct marking, using instrumentsPlus **one** more of the following:
 - 3.2 use of templates
 - 3.3 tracing/transfer methods
 - 3.4 other specific method
 4. Use a range of marking out equipment, to include **all** of the following:
 - 4.1 pencil
 - 4.2 rule or tape
 - 4.3 square
 - 4.4 dividers, compass or trammels

SEMPEO2-41 - SQA Unit Code FP40 04

Using wood for pattern, modelmaking and other engineering applications

- 4.5 marking knife
 - 4.6 straight edge
 - 4.7 protractor or sliding bevel
 - 4.8 marking gauge
5. Mark out material, to include **all** of the following features:
- 5.1 datum and centre lines
 - 5.2 cutting detail
 - 5.3 hole centring and outlining
 - 5.4 square/rectangular profiles
 - 5.5 circles
- Plus **two** more from the following:
- 5.6 angles
 - 5.7 joints
 - 5.8 curved profiles
 - 5.9 assembly positions
6. Use hand tools to cut and shape materials, to include **all** of the following:
- 6.1 rip saws
 - 6.2 chisels/gouges
 - 6.3 drills/braces
 - 6.4 tenon saws
 - 6.5 jack or smoothing planes
 - 6.6 sanding blocks/paper
- Plus **two** more from the following:
- 6.7 fret/bow saws
 - 6.8 spokeshaves
 - 6.9 portable powered hand tools
 - 6.10 rebating planes
 - 6.11 files/rasps
 - 6.12 other specific hand tools
7. Use fixed and portable machines, to include **all** of the following:
- 7.1 circular saw
 - 7.2 planer/thicknesser
 - 7.3 bench or pedestal drill
- Plus **two** more from the following:
- 7.4 band saw
 - 7.5 morticer/tenoner
 - 7.6 spindle moulder (single or double)
 - 7.7 sander (such as face, belt, bobbin)
 - 7.8 combing machine
 - 7.9 lathe
 - 7.10 router

SEMPEO2-41- SQA Unit Code FP40 04

Using wood for pattern, modelmaking and other engineering applications

- 7.11 other special purpose machine
- 8. Produce components which combine different features and cover **all** of the following profiles:
 - 8.1 flat faces
 - 8.2 angular/tapered faces
 - 8.3 drilled holes
 - 8.4 parallel faces
 - 8.5 curved profiles
 - 8.6 countersunk/counterbored holes
 - 8.7 square facesPlus **six** more from the following:
 - 8.8 plain diameters
 - 8.9 tenons
 - 8.10 concave profiles
 - 8.11 stepped diameters
 - 8.12 mortices
 - 8.13 convex profiles
 - 8.14 tapered diameters
 - 8.15 half lap joints
 - 8.16 dovetail joints
 - 8.17 slots/grooves
 - 8.18 combed joints
 - 8.19 rebates
 - 8.20 other specific joints
- 9. Produce components made from **four** of the following materials:
 - 9.1 soft woods
 - 9.2 blockboard
 - 9.3 hard woods
 - 9.4 hardboard
 - 9.5 plywood
 - 9.6 fibreboard (MDF)
- 10. Use appropriate measuring equipment and tools to check **all** of the following:
 - 10.1 dimensions
 - 10.2 angles/taper
 - 10.3 profile
 - 10.4 flatness
 - 10.5 alignment
 - 10.6 distortion/straightness
 - 10.7 squareness
 - 10.8 position

SEMPEO2-41 - SQA Unit Code FP40 04

Using wood for pattern, modelmaking and other engineering applications

11. Produce components which meet **all** of the following requirements:
 - 11.1 components to be free from false tool cuts, and material defects
 - 11.2 the shape and general tolerances meet the drawing or specification requirements with some dimensional tolerances within +/- 1mm or +/- 0.040"
 - 11.3 flatness and squareness 0.25mm per 25mm or 0.010" per inch
 - 11.4 angles within +/- 2 degrees
 - 11.5 interlocking components (joints) are secure
 - 11.6 components have an appropriate surface texture

SEMPEO2-41 - SQA Unit Code FP40 04

Using wood for pattern, modelmaking and other engineering applications

Developed by	SEMTA
Version number	2
Date approved	December 2011
Indicative review date	December 2016
Validity	Current
Status	Original
Originating organisation	SEMTA
Original URN	41
Relevant occupations	Engineering and manufacturing technologies; Engineering;
Suite	Performing Engineering Operations Suite 2
Key words	engineering, engineering operations, wood, pattern, modelmaking, engineering applications, wood machining, manufacturing, machine tools, hand tools