National Added Value Unit Specification

Unit title: Making a Finished Product from Metal (National 4)

SCQF: level 4 (6 SCQF credit points)

Unit code: to be advised

Unit outline

This is the Added Value Unit in the Practical Metalworking (National 4) Course. The general aim of this Unit is to enable the learner to provide evidence of added value for the Practical Metalworking (National 4) Course through the successful completion of a practical activity which will allow the learner to demonstrate challenge and application.

Learners who complete this Unit will be able to:

1 Produce a finished artefact in metal

This Unit is a mandatory Unit of the Practical Metalworking (National 4) Course and is also available as a free-standing Unit. The Unit Specification should be read in conjunction with the *Course Support Notes*, which provide advice and guidance on delivery and assessment approaches. Exemplification of the assessment in this Unit is given in the *National Assessment Resource*.

Recommended entry

Entry to this Unit is at the discretion of centre. It is recommended that the learner should be in the process of completing, or have completed, the Units of the Practical Metalworking (National 4) Course:

- Practical Metalworking: Bench Skills (National 4)
- Practical Metalworking: Machine Processes (National 4)
- Practical Metalworking: Fabrication and Thermal Joining Techniques (National 4)

Equality and inclusion

This Unit Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information please refer to the *Course Support Notes.*

Standards

Outcomes and assessment standards

Outcome 1

The learner will:

1 Produce a finished artefact in metal by:

1.1 Selecting, with guidance, and using a range of common metalworking tools and equipment
1.2 Using, with guidance, bench skills in marking out, cutting and shaping metalwork components
1.3 Using, with guidance, machine processes in marking out, cutting and shaping metalwork components
1.4 Using, with guidance, fabrication and joining techniques in fabricating and joining metalwork components
1.5 Manufacturing, with guidance, a finished product to given drawings and to standards
1.6 Working in accordance with recognised procedures and safe working practices
1.5 Keeping a weekly progress diary for the project. Information should include tasks completed, areas that have been an issue for the learner, and strengths and weaknesses

Evidence Requirements for the Unit

This Added Value Unit will be internally assessed by the teacher/lecturer.

Evidence for this Unit will be generated through a practical activity in which learners will manufacture a finished artefact in metal. Learners will read and interpret working drawings and outline specification information. They will check materials supplied against the requirements of the drawings. They will mark out, cut, shape and fit metal sections and sheet materials in readiness for fabrication and joining. They will assemble, fit and fix the components into a whole to form the product.

The product will be made using a minimum of five component parts. The practical activity will require learners to use skills and apply knowledge selected from the lists contained in the 'Further mandatory information on Course coverage section' of this document. The artefact will require the learner to provide evidence of bench skills, machine processes and fabrication and joining techniques.

The use of at least one thermal joining technique is mandatory in the practical activity.

The working drawings for the practical activity will not detail every aspect of the product. This will allow the task to be sufficiently open and flexible to allow for personalisation and choice. It will thus allow learners to demonstrate practical creativity.

During the practical activity, learners must follow recognised procedures and safe working practices. All work must be completed to standards.

Learners will provide evidence of:

- selecting, with guidance, metalworking tools and equipment appropriate for tasks
- checking, with guidance, materials supplied against the working drawings
- confirming that metalworking tools and equipment are in good condition and safe working order before, during and after use
- using tools and equipment, with guidance, safely and in accordance with good practice
- working in accordance with recognised procedures and safe working practices
- carrying out good practice in terms of sustainability and recycling

Practical creativity should be detailed in the progress diary.

The standards and tolerances applicable to the artefact are as follows:

- each component part must be marked out in accordance with the working drawings and with four functional dimensions within tolerance of +/- 1 mm on linear sizes
- the thermal joining within the manufacture of the product must be reasonably consistent in quality and form; there is no minimum length requirement for this work
- the overall product must be assembled, joined and fitted in accordance with the working drawings with six functional dimensions within tolerance of +/- 1 mm on linear sizes

The practical activity task will be sufficiently open and flexible to allow for personalisation and choice. It will thus also allow learners to demonstrate practical creativity.

Learners at National 4 level are expected to require a reasonable level of guidance and support throughout practical activities. All learners should be provided with a clear outline of the assessment, including when and how they will be assessed. The teacher/lecturer should offer the learner guidance on an appropriate choice of activity, including questions/tasks/prompts which will lead learners through the assignment in clear stages. It would be reasonable for the activity choice the learner makes to be one where the teacher/lecturer has some expertise and has resources available to enable the learner to more successfully meet the Assessment Standards.

Further information is provided in the exemplification of assessment in the *National Assessment Resource*. Advice and guidance on possible approaches to assessment is provided in the *Course Support Notes.*

Development of skills for learning, skills for life and skills for work

Please refer to the Course Specification for information about skills for learning, skills for life and skills for work.

Further mandatory information on Course coverage for the Practical Metalworking (National 4) Course

The following gives details of mandatory skills, knowledge and understanding for the Practical Metalworking (National 4) Course. Assessment of this Added Value Unit will involve selecting appropriate skills, knowledge and understanding from those listed below, in line with the Evidence Requirements above. This list of skills, knowledge and understanding also provides the basis for the assessment of all the Units in the Course.

For the Unit *Bench Skills*	**For the Unit *Bench Skills***
Skills	**Knowledge and Understanding**
Measuring and marking out including the use of marking out equipment	Identification of and uses of marking out equipment: ♦ scriber ♦ rule ♦ try square ♦ engineer's square ♦ dividers ♦ oddleg callipers ♦ centre punch ♦ witness marks Units of measurement Datum Functional dimensions
Measuring including the use of measuring tools	Identification of and uses of measuring tools: ♦ rule ♦ inside callipers ♦ outside callipers ♦ digital vernier ♦ micrometer ♦ digital micrometer Units of measurement
Use of fitting tools	Identification and uses of fitting tools (including associated processes): ♦ hammers ♦ chisels ♦ files ♦ saws ♦ taps and dies for tapping and threading ♦ riveting set

Skills	Knowledge and understanding
Use of sheet metal tools and machines	Identification and uses of sheet metal tools and machines (including associated processes): ♦ bending equipment including folding bars ♦ shears ♦ notchers ♦ hide mallets ♦ hammers ♦ safe edge ♦ tin snips ♦ pop riveter ♦ spot welder
Reading and interpretation of working drawings, pictorial drawings and diagrams	Knowledge and understanding of: ♦ orthographic projection ♦ scale ♦ dimensioning (linear) ♦ basic drawing conventions including: line types, centre lines, hidden detail
	Identification and uses of a small variety of common metalworking materials: ♦ metals and alloys ♦ common sections ♦ sheet materials
	Safe working practices and systems for workshop generally and individual activities as applicable

For the Unit *Machine Processes*	For the Unit *Machine Processes*
Skills	**Knowledge and understanding**
Skills in the use of: ♦ centre lathe for plain turning, parallel turning, facing, chamfering, centre drilling and drilling generally ♦ pedestal drill for drilling and counter-sinking And if available and appropriate: ♦ milling machines for vertical or horizontal milling work ♦ grinderettes for cutting and grinding ♦ hand-held router for simple routing tasks	Knowledge and understanding of the applications/uses of the following machine tools: ♦ centre lathe ♦ pedestal drill ♦ grinderettes ♦ hand-held and bench router ♦ grinding machine ♦ vertical and horizontal milling machines ♦ CNC milling machine ♦ CNC routers ♦ industrial cutting processes including laser cutters and plasma cutters Knowledge and understanding of the applications/uses of the following machine tools: ♦ cutting tools ♦ knurling tools ♦ chucks ♦ chuck keys ♦ morse tapers ♦ revolving centres ♦ machine vices ♦ safety equipment
Tool and equipment inspection: ♦ reporting faults ♦ general condition before, during and after use ♦ position and condition of guards ♦ position and condition of guards ♦ position of cutting tools on machine tools ♦ security of work holding	Knowledge and understanding of: ♦ fault reporting systems ♦ routine tool and equipment inspections
Reading and interpretation of working drawings, pictorial drawings and diagrams	Knowledge and understanding of: ♦ orthographic projection ♦ scale ♦ dimensioning (linear and radial) ♦ basic drawing conventions including: line types, centre lines, hidden detail

Skills	Knowledge and understanding
	Identification and uses of a small variety of common metalworking materials: ♦ metals and alloys ♦ common sections ♦ sheet materials
	Safe working practices and systems for workshop generally and individual activities as applicable

For the Unit *Fabrication and Thermal Joining Techniques*	For the Unit *Fabrication and Thermal Joining Techniques*
Skills	**Knowledge and understanding**
Skills in the use of: ♦ hot-forming techniques including twisting, drawing down and flattening ♦ hot-bending techniques including metal bar bending, metal strip bending (including on edge) ♦ thermal joining techniques including welding, soldering and brazing ♦ mechanical fixing techniques including screw-fixing and proprietary fixings ♦ proprietary metalwork adhesives	Knowledge and understanding of the following techniques, including associated tools and equipment: ♦ hot-forming techniques including twisting, drawing down and flattening ♦ hot-bending techniques including metal bar bending, metal strip bending (including on edge) ♦ manufacture and use of jigs in forming and bending ♦ thermal joining techniques including welding, soldering and brazing ♦ mechanical fixing techniques including screw-fixing and proprietary fixings ♦ proprietary metalwork adhesives Knowledge and understanding of materials and techniques: ♦ the metals that are associated with different fabrication and joining techniques ♦ the fabrication and joining techniques that are associated with different metals
	Safe working practices and systems for workshop generally and individual activities as applicable

Administrative information

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Superclass: to be advised

History of changes

Version	Description of change	Authorised by	Date