

## National Unit Specification: general information

<b>UNIT</b>	Machine Processes – Metal (Intermediate 1)
<b>NUMBER</b>	D179 10
<b>COURSE</b>	Engineering Craft Skills (Intermediate 1)

### SUMMARY

Candidates will learn how to operate a range of machine tools and manufacture an artefact involving their use.

### OUTCOMES

- 1 Use marking-out tools and equipment.
- 2 Demonstrate knowledge of common machine tools and equipment.
- 3 Perform basic operations on a pedestal drill and a centre lathe.
- 4 Manufacture an artefact from a working drawing.

### RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have had some previous experience of practical skills, including reading engineering drawings.

### CREDIT VALUE

1 credit at Intermediate 1.

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### Administrative Information

<b>Superclass:</b>	XF
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## **National Unit Specification: general information (cont)**

**UNIT**      Machine Processes – Metal (Intermediate 1)

### **CORE SKILLS**

There is no automatic certification of core skills or core skills components in this unit.

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

## **National Unit Specification: statement of standards**

### **UNIT        Machine Processes – Metal (Intermediate 1)**

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

#### **OUTCOME 1**

Use marking-out tools and equipment.

##### **Performance criteria**

- (a) The construction of datums is correct.
- (b) The workpiece is marked out correctly in accordance with the given working drawing.
- (c) Three functional dimensions are within the permitted limits.

##### **Evidence requirements**

Performance evidence that the candidate can mark out a workpiece to meet the performance criteria, on three functional sizes, with tolerances of  $\pm 1$  mm on two linear sizes.

#### **OUTCOME 2**

Demonstrate knowledge of common machine tools and equipment.

##### **Performance criteria**

- (a) Identification of common machine tools and their related equipment is correct.
- (b) Machines and equipment are matched correctly to applications.

##### **Note on range for the outcome**

Machine tools: centre lathe, grinding machine, pedestal drill, milling machine.

##### **Evidence requirements**

Written and/or oral evidence that the candidate can score a minimum of 11/20 in identifying types of machine equipment and processes associated with them.

## **National Unit Specification: statement of standards (cont)**

### **UNIT        Machine Processes – Metal (Intermediate 1)**

#### **OUTCOME 3**

Perform basic operations on a pedestal drill and a centre lathe.

##### **Performance criteria**

- (a) Drilling and countersinking on the pedestal drill meets specified requirements.
- (b) The centre lathe operations of parallel turning, facing and chamfering are performed to specified standards.

##### **Evidence requirements**

Performance evidence that the machines have been operated to meet the requirements of the performance criteria.

#### **OUTCOME 4**

Manufacture an artefact from a working drawing.

##### **Performance criteria**

- (a) An artefact is produced in accordance with the working drawing.
- (b) Appropriate machines and equipment are used correctly.
- (c) The accuracy achieved is within specified tolerances.
- (d) The quality of the machined finish complies with stated standards.
- (e) All safety practices and procedures are observed correctly in the use of machine tools and in the manufacture of an artefact.

##### **Evidence requirements**

Performance evidence that the candidate can manufacture an artefact to meet the performance criteria. For PC (c) the accuracy should be achieved on at least three functional sizes to tolerances of  $\pm 0.5$  mm on diameter and  $\pm 1$  mm on linear. Compliance with safe practices and procedures should be recorded from observation.

## **National Unit Specification: support notes**

### **UNIT        Machine Processes – Metal (Intermediate 1)**

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

This unit develops knowledge and skills in common metalworking machines and equipment, and their uses.

Candidates attempting this unit will mainly be in post-16 education, although it may also be undertaken by some adult returners and perhaps some candidates in the 14 to 16 curriculum.

Candidates require little prior experience, but will be expected to produce good practical work. Artefacts produced should have personal appeal to candidates, but must also provide challenge and stimulation.

Apart from developing basic machining skills, this unit should emphasise the need for safe working practices and a disciplined approach to achieving quality work. As part of a course in the post-16 curriculum, the candidates should be required to act and perform as adults and, accordingly, the tasks set should be challenging to the candidates at the level at which they are working. The candidates will be required to operate machinery and equipment to a code of practice – with a degree of independence – and it is essential that a mature and responsible approach is taken by the candidate.

Artefacts will be produced to working drawings and should where possible involve integration of previous experience, for example Bench Skills – Metal (Int 1).

Prior knowledge of reading simple drawings is assumed.

### **GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT**

Content:

- equipment: knowledge of cutting tools, knurling tools, chucks, chuck keys, morse tapers, revolving centres, machine vices and safety equipment
- applications: knowledge of parallel turning, facing, chamfering, drilling, countersinking, centre drilling, grinding

This unit balances practical activity with knowledge and understanding that can be transferred to more complex machinery in industrial situations at a later date. The context should relate to industrial applications whenever possible.

## **National Unit Specification: support notes (cont)**

### **UNIT          Machine Processes – Metal (Intermediate 1)**

#### **GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT**

##### ***Using special marking-out techniques***

The need for special marking-out techniques for certain precision work and irregular components should be discussed. Marking-out of larger products and repetitive marking-out should also be discussed.

##### ***Performing routine user checks on tools and machinery prior to their use***

The candidate should be responsible for ensuring that the machinery to be used is set up appropriately, with all safety equipment in place prior to use. Similarly, the inspection of hand tools and reporting of defects should become a routine event in this course.

##### ***Operating common machine tools in accordance with safe working practice***

The candidate should use as many machines and items of equipment as possible (a minimum of two), and artefacts that are produced to given working drawings should embody as wide a range as possible.

Drilling-machine operations should involve at least one activity whereby the machine vice is clamped to the table. This will ensure that the candidates have practical experience of workholding of this type.

Morse tapers should be used to hold larger drills, rather than the 'Jacobs' chuck. Use of morse tapers to locate lathe centres should be identified.

Centre lathe operations could include: parallel turning, facing, taper turning using a compound slide, drilling and knurling, although this range might well be extended according to needs. Machined finishes should be without significant defects and probably best gauged against exemplar pieces, visually and by thumbnail check.

##### ***Adhering to safe working practices at all times***

Safe working practices will be demonstrated and highlighted by the teacher/lecturer throughout the course, but the opportunity should be taken here to ensure that the candidates are aware that their approach to this topic is being monitored and will continue to be monitored throughout the course.

Care of tools and recognition of the hazards of tool defects with regard to quality of work and possible hazards to the user will be a recurrent theme in the course, and the topic should be further reinforced in this unit.

## **National Unit Specification: support notes (cont)**

### **UNIT          Machine Processes – Metal (Intermediate 1)**

#### **GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT**

Whenever possible, the dynamic nature of this course should not be hindered by overburdening assessment of the candidate.

The candidate should be aware that certain performances are being monitored constantly and recorded on an observation checklist, and that finished artefacts will be tested against the stated criteria for accuracy and quality. Lengthy written tests are not required for tool, process or equipment recognition and use. Short-answer tests that are mainly of a visual nature will be provided. Another technique would be to display the tools and equipment, and ask the candidates to write or state their names and uses.

#### ***Approaches to generating evidence***

Assessment evidence for this unit should be able to be drawn from the manufacture of one or two artefacts that perhaps also include reinforcement and additional evidence for other units in the course. Examples of this might be additional practice and evidence in reading drawings, measuring and marking-out and fitting skills. A manufacturing plan could also be produced as a matter of good practice, but would not be required for assessment purposes in this unit. In situations where candidates fail to achieve the required standard of performance in one area, this weakness can be targeted in the next part of the course when the next artefact is manufactured, or perhaps in the course assessment project itself.

In situations where candidates fail to achieve the required standard of performance in more than one area, it may be necessary to provide tasks aimed specifically at the areas to be reassessed.

Some candidates may require additional support and help to ensure success in the manufacturing process. However, candidates must also be aware that the overall course assessment takes into account the amount of practical assistance given by the teacher/lecturer and that a degree of independence is ultimately expected from the candidate.

#### **SPECIAL NEEDS**

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).