National Unit Specification: general information

UNIT Engineering Workshop Skills (SCQF level 5)

CODE F5WA 11

SUMMARY

This Unit may form part of a National Qualification Group Award or may be offered on a free-standing basis.

This predominantly practical Unit is designed to provide candidates with knowledge and skills in engineering workshop skills. During delivery of the Unit, candidates will learn to interpret and extract information from engineering drawings in relation to performing engineering workshop skills. They will also learn how to select and use tools to mark out profiles for given specifications. Candidates will also develop the knowledge and skills to select and use engineering tools to produce components to given specification. Throughout the delivery of the Unit candidates will learn and apply current health and safety requirements and safe working practices as they produce components.

This Unit is suitable for candidates training to be manufacturing, mechanical or multi-disciplinary engineering fitters or technicians but may also be delivered to candidates who are being introduced to engineering workshop skills for the first time.

OUTCOMES

1 Interpret drawings in relation to engineering workshop skills.
2 Carry out marking out operations to given engineering drawing specifications.
3 Manufacture components to given engineering drawing specifications.
4 Comply with current Health and Safety regulations and safe working practices.

RECOMMENDED ENTRY

Entry to the Unit is at the discretion of the centre. While candidates do not require any previous knowledge of engineering workshop skills some practical engineering craft experience would be an advantage.

Administrative Information

Superclass: XA

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National Unit Specification: general information (cont)

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CREDIT VALUE

1 credit at SCQF level 5 (6 SCQF credit points at SCQF level 5*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

There is no automatic certification of Core Skills in this Unit.

This Unit provides opportunities for candidates to develop aspects of the following Core Skills:

Problem Solving (SCQF level 5)

Numeracy (SCQF level 5)

Working with Others (SCQF level 5)

These opportunities are highlighted in the Support Notes of this Unit Specification.

National Unit Specification: statement of standards

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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 SQA.

OUTCOME 1

Interpret drawings in relation to engineering workshop skills.

Performance Criteria

(a) Drawing conventions and abbreviations are identified correctly in terms of current British Standards.
(b) Detailed dimensioning and tolerances are interpreted correctly from given engineering drawings.
(c) Technical information relating to the manufacture of given component(s) is correctly sourced and extracted from appropriate documentation.

OUTCOME 2

Carry out marking out operations to given engineering drawing specifications.

Performance Criteria

(a) Prepare work piece materials correctly for marking out operations.
(b) Select and use equipment correctly to mark out profiles accurately.
(c) Check profiles to ensure they conform with given engineering drawing specifications.

OUTCOME 3

Manufacture components to given engineering drawing specifications.

Performance Criteria

(a) Select and use tools correctly to manufacture components to given specifications.
(b) Select and use measuring equipment correctly to verify components conform to given specifications.

OUTCOME 4

Comply with current Health and Safety regulations and safe working practices.

Performance Criteria

(a) Use appropriate Personal Protective Equipment correctly.
(b) Use machine guards correctly dependent on operations.
(c) Comply fully with safety requirements, good housekeeping and appropriate tool/equipment storage.
(d) Cooperate effectively with others in engineering workshops.

National Unit Specification: statement of standards (cont)

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EVIDENCE REQUIREMENTS FOR THIS UNIT

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

Written and/or recorded oral, product and performance evidence supplemented with an assessor observation checklist(s) should be produced to demonstrate that a candidate has achieved all Outcomes and Performance Criteria.

Candidate evidence may be gathered using a single, holistic assessment covering all four Outcomes. Alternatively, Outcome 1 may be assessed separately from Outcomes 2, 3 and 4. The assessment of Outcome 4 must always be integrated with Outcomes 2 and 3.

Outcome 1 (Written and/or Oral Recorded Evidence)

Assessment of Outcome 1 must be taken at a single assessment event lasting 30 minutes. The candidate should be supplied with appropriate engineering drawing(s), charts and technical data as part of this assessment. Assessment must be conducted under supervised, closed-book conditions in which candidates may use reference materials provided by the centre but are not allowed to bring their own notes, handouts, textbooks or other materials into the assessment.

With regard to Outcome 1:

- candidate will correctly identify four drawing conventions and abbreviations from a given selection
- candidate is given a component drawing and asked to extract four pieces of information relating to dimensions and tolerances
- candidate is asked to source and extract information on internal and external threads from charts and technical data sheets for a minimum of two given thread sizes

Outcomes 2, 3 and 4 (Product and Performance Evidence)

The assessment of Health and Safety and safe working practices in Outcome 4 must always be integrated with the practical assessments in Outcomes 2 and 3 and all other practical work activities undertaken by candidates while taking this Unit.

For Outcomes 2, 3 and 4 each candidate will require to prepare, mark out and manufacture a minimum of two components from given engineering drawings to a general engineering manufacturing tolerance of ±0.5mm. The components will be manufactured throughout the delivery of the Unit. The components should be prepared, marked out and manufactured under supervised conditions.

National Unit Specification: statement of standards (cont)

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With regard to Outcome 2:

- candidate should prepare the work piece material using a hand file and engineer's square to ensure work piece material is deburred and square. The candidate is also required to select appropriate datum face(s)/edge(s) to suit given specifications and where appropriate a marking out ink should be applied.

- candidate should mark out a minimum of two components with the following features: four straight lines, two circles and two angles. Candidates must use, as a minimum, the following marking out equipment: scriber, rule, surface gauge, angle plate, dividers, protractor and radius gauges.

With regard to Outcome 3:

- for Outcome 3 each candidate will require to manufacture components, which may be mechanically fastened, from given engineering drawings which have as a minimum the following features: two parallel faces, four flat faces, two square faces, one angle, one radius and six drilled holes, of which two should be tapped, two reamed, one counter-bored and one counter sunk. During manufacture of the components candidates must use, as a minimum, the following tools: files, hack saw, engineer's square, drills and reamers, pedestal drill, counter-boring tool, countersink, centre punch, ball pein hammer and sets of taps.

- candidates must use, as a minimum, the following measuring equipment: surface table, vernier height gauge, angle plate, radius gauges, vernier calliper and an engineer's protractor.

For Outcome 4 an observation checklist must be used to record evidence that candidates have complied with the Performance Criteria in the Outcome while undertaking the marking out and manufacturing work in Outcomes 2 and 3.

The Assessment Support Pack for this Unit provides sample assessment material. Centres wishing to develop their own assessments should refer to the Assessment Support Pack to ensure a comparable standard.

National Unit Specification: support notes

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This part of the Unit Specification is offered as guidance. The support notes are not mandatory.

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

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

This Unit forms part of the National Qualification Group Award (NQGA) in Manufacturing Engineering Practice at SCQF level 5, but may also be offered on a free-standing basis.

The aim of this Unit is to provide candidates with knowledge and skills in engineering workshop skills. On successful completion of this Unit the candidate will be able to interpret engineering drawings in relation to undertaking marking out and manufacturing components. The candidate will also be capable of selecting and using tools to accurately mark out profiles. He/she will also have the knowledge and skills to select and use a range of tools to manufacture engineering components. The candidate will also have learnt to apply appropriate Health and Safety requirements and safe working practices while performing marking out and manufacturing skills.

Outcome 1 requires candidates to interpret information such as dimensions and tolerances from engineering drawings while marking out and manufacturing components.

Outcome 2 involves the candidates in preparing work piece materials correctly for marking out purposes and in selecting and using marking out equipment to produce profiles. During the delivery of this Outcome candidates should learn to use such marking out equipment as a scriber, ruler, surface gauge, angle plate, dividers, protractor and radius gauges.

Outcome 3 is intended to allow candidates to develop their engineering hand skills while producing a range of components. During the delivery of the Unit candidates should learn to use tools such as files, hack saw, engineer's square, drills and reamers, pedestal drill, counterboring tool, countersink, centre punches, ball pein hammer and sets of taps. As part of this Outcome candidates should also learn to select and use a range of measuring equipment such as surface table, vernier height gauge, angle plate, radius gauges, vernier calliper and engineer's protractor.

In Outcome 4 emphasis should be placed on getting candidates to apply good Health and Safety procedures and practices while performing marking out and manufacturing skills. Such procedures and practices should include the wearing of Personal Protective Equipment, using guards correctly where appropriate (eg with pedestal drill), using and storing all tools correctly and cooperating with others in an engineering workshop.

National Unit Specification: support notes (cont)

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GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

It is recommended that the Unit is delivered in the same sequence the Outcomes are presented in the National Unit Specification: statement of standards section of the Unit. The Unit should be delivered in an engineering workshop environment suitably equipped with marking out equipment, engineering tools and measuring equipment. Candidates should be provided with access to a range of engineering drawings and other technical data so that they can develop their knowledge and skills in interpreting and extracting information from drawings and other engineering information sources. Delivery of Unit content should be principally by lecturer demonstration followed by candidates practising the skills demonstrated. It is essential that candidates are inducted into current Health and Safety practices and procedures at the start of delivering the Unit and that these are reinforced throughout Unit delivery.

Wall charts, photographs and display boards showing marking out equipment, hand tools and measuring equipment may help candidates to identify such items more easily.

Videos, DVDs etc. on aspects of health and safety, such as dangers in engineering workshops, may also support learning.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Elements of the Core Skill of *Problem Solving*, that is, Critical Thinking, Planning and Organising, will be developed as candidates undertake practical workshop activities. They have to consider regulations and safety requirements as they select tools, equipment and techniques for the efficient manufacture of components. The ability to accurately interpret and apply written and graphic information relevant to standards and specifications is essential to achievement and contextualised reference materials in numeric and graphic formats could support the process.

Although candidates have to demonstrate practical skills independently, formative group activities could be particularly beneficial to those with no industrial experience, enhancing the ability to work with others. Safety issues could be discussed and the nature and scope of team goals, roles and responsibilities identified prior to practical work. Candidates should be given constructive feedback to encourage review and evaluation of their workshop performance including their contribution to team working.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003), SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

National Unit Specification: support notes (cont)

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Centres are encouraged to use formative assessment extensively as it plays a particularly important role in allowing candidates to develop a sound knowledge, understanding and skills in interpreting and extracting engineering information on engineering workshop skills, marking out profiles, manufacturing components and in applying Health and Safety procedures and practices in an engineering workshop.

Assessment of Outcome 1 may involve an engineering drawing(s), charts and technical data and a question paper comprising of short answer/restricted response questions or objective questions or a mixture of both. The assessment paper may be suitable for on-line delivery.

Assessment of Outcomes 2 and 3 may comprise of a series of practical exercises in which the candidates prepare, mark out and manufacture a minimum of 2 components which meet, at least, the minimum features and tolerances stated under the Evidence Requirements for Outcomes 2 and 3. Centres may choose to limit the time candidates have to complete the two components to a maximum of 12 hours. Candidates should also measure and record component measurements to verify they conform to given engineering drawing specifications.

Outcome 4 should be evidenced throughout the whole time candidates are marking out and manufacturing component in an engineering workshop. An observation checklist(s) should be used to record candidate evidence.

DISABLED CANDIDATES AND/OR THOSE WITH ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**