SCOTTISH QUALIFICATIONS AUTHORITY

National Unit Specification: general information

UNIT Fabrication Skills: Sheet Metal (Higher)

NUMBER D7SP 12

COURSE

SUMMARY
Acquiring skills in the use of fabrication tools, equipment and related processes to manufacture sheet metal components whose templates and patterns have been produced by pattern development.

OUTCOMES
1 Interpret drawings and specifications for the manufacture of fabricated components.
2 Demonstrate the use of measuring and marking out equipment and relative procedures for the manufacture of templates and patterns for fabricated components.
3 Identify and demonstrate the safe use of tools and equipment to manufacture fabricated components whose patterns and templates have been produced by pattern development.
4 Test to ensure a quality fabricated component.

RECOMMENDED ENTRY
Access to this unit is at the discretion of the centre, however it would be beneficial if the candidate has prior experience in workshop operations and an understanding of basic pattern development. This may be evidenced by possession of the following NC units or similar qualifications or experience.

EE19 11 Introductory Fabrication Skills
D0PW 12 Surface Development and Pattern Drawing: Basic
EA0V 11 Introduction to Metal Inert Gas (MIG) Welding
ED8N 11 Fastening and Joining: Non Thermal Methods

Administrative Information

Superclass: XD

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CREDIT VALUE
1 Credit at Higher.

CORE SKILLS
Information on the automatic certification of any core skills in this unit is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT Fabrication Skills: Sheet Metal (Higher)

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
Interpret drawings and specifications for the manufacture of fabricated components.

Performance criteria
a) The identification of the method of pattern development is correct in terms of the fabricated component shape.
b) The identification of the functional dimensions required for manufacture is correct in relation to the specification.
c) The sequence of operations drawn up prior to manufacture is logical in relation to the specification and instructions.

Note on range for the outcome
Fabricated components: rectangular; circular and transitional between parallel planes; maximum thickness of 3mm.
Specifications: written; graphical.

Evidence requirements
Please refer to *Evidence requirements for the unit* at the end of the Statement of Standards.

OUTCOME 2
Demonstrate the use of measuring and marking out equipment and relative procedures for the manufacture of templates and patterns for fabricated components.

Performance criteria
a) The construction of datums is correct in relation to the specification.
b) The marking out of the appropriate template/pattern using the allowances for metal thickness is correct in relation to the specification.
c) The identification of all functional dimensions is correct with regard to tolerance.
d) The use of the appropriate method of pattern development is correct in terms of component shape.

National Unit Specification: statement of standards

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Note on range for the outcome
Fabricated components: rectangular; circular and transitional between parallel planes; maximum thickness of 3mm.
Measuring equipment: ruler; tape.
Marking out equipment: dividers; trammels.

Evidence requirements
Please refer to *Evidence requirements for the unit* at the end of the Statement of Standards.

OUTCOME 3
Identify and demonstrate the safe use of tools and equipment to manufacture fabricated components whose patterns and templates have been produced by pattern development.

Performance criteria
a) The selection and use of tools and equipment to safely cut material is correct in relation to the specification.
b) The selection and use of tools to safely bend and form material is correct in relation to the specification.
c) The selection and use of tools and equipment to safely fasten and join material is correct in relation to the specification.

Note on range for the outcome
Fabricated components: rectangular; circular and transitional between parallel planes; maximum thickness of 3mm.
Cutting tools and equipment: snips; shears; drills; guillotine; thermal.
Bending and forming tools and equipment: folders; rolls.
Fastening and joining tools and equipment: mechanical; thermal.

Evidence requirements
Please refer to *Evidence requirements for the unit* at the end of the Statement of Standards.

OUTCOME 4
Test to ensure a quality fabricated component.

Performance criteria
a) The visual inspection of the component is correct in relation to specification.
b) The dimensional inspections are correct in relation to specification.

National Unit Specification: statement of standards (cont)

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Note on range for the outcome
Inspection equipment: rule; tape; engineer square; vernier height gauge.

Evidence requirements
Please refer to *Evidence requirements for the unit* at the end of the Statement of Standards.

EVIDENCE REQUIREMENTS FOR THE UNIT

Outcome 1
Written evidence for PCs (a) and (b) of the candidate's ability to interpret drawings and specifications for each component.

Written/graphical evidence for PC (c) of the candidate's ability to produce an operations sheet for each component.

Outcome 2
Performance evidence to demonstrate that the candidate can use the equipment to correctly and accurately produce a template/pattern for each component using the appropriate method of pattern development.

Outcome 3
Performance evidence to demonstrate the candidate's ability to identify and demonstrate the safe use of tools and equipment to correctly and accurately manufacture each component.

Outcome 4
Performance evidence to demonstrate that the candidate can accurately test each component. Written/graphical evidence to demonstrate that the candidate can record the evidence produced during the test on each component.

National Unit Specification: support notes

UNIT Fabrication Skills: Sheet Metal (Higher)

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

On completion of this unit the candidate will have gained the skills to manufacture components such as ducts, hoods and transition pieces having rectangular and circular cross sections up to a maximum thickness of 3mm. These will encompass rectangular to rectangular, circular to circular and a combination of components as used in industrial practice. The candidate will be able to understand drawings and manufacturing instructions, mark out the templates and patterns required, cut, form, manufacture and assess the quality of a component.

The candidate should achieve the level of competency of someone who is required to manufacture a component accurately. They should be able to use tools and equipment safely and correctly.

The unit could be taken concurrently with DOPW 12 Surface Development and Pattern Drawing: Basic.

Corresponding to Outcomes 1-4:

Outcome 1

Hands-on examination of drawings including recognition of functional dimensions and tolerances. Operation sheets could be developed from models beginning with simple exercises. Emphasis should be placed on the importance of operation sheets being appropriately designed and in a logical sequence.

Outcome 2

The basic first step of establishing datums as references should be emphasised throughout this outcome. Hands-on templating with constant checking, ie the diagonals of a rectangle to ensure squareness, and reference back to datums should permeate all activity. Knowledge of pattern development will be required to produce accurate templates of the components. Templating could at the discretion of the tutor be carried out on template paper then transferred onto metal.

Outcome 3

This outcome is the core of the module although dependent on outcomes 1 and 2 being correctly carried out and it is entirely hands-on. In the initial stages each tool, operation or process should be fully explained and demonstrated. Terminology and procedures should be introduced in the context of the components. Safety and safe working practices should encompass all activities. Three exercises must be carried out. These exercises may be incorporated. They should be suitable for the candidate's background and prior to commencement should have a stated time, tolerance and workmanship standard made known to the candidate.

National Unit Specification: support notes (cont)

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Outcome 4
For candidates to comment critically on their work is a salutary process. Hopefully they will realise the interdependence of quality with skill and time and that the experience will make them become self-critical of any future work that they may do. Tutors should emphasise to candidates that quality checks begin with themselves and not an inspector and is the first step towards pride in craftsmanship. The preparation of checklists could be a group activity with each candidate applying the criteria to their own components.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

The delivery of the unit should be in a workshop. A set of completed exercises should be made available for candidates to see and be used as exemplars for quality. Equipment posters, charts, tables, videos, work visits etc. should be made available to underpin practical knowledge. Suitable manufacturing materials such as Low Carbon Steel, Stainless Steel or Aluminium may be chosen and should relate to the vocational bias of the candidate. Hands-on activities should be used throughout all four outcomes.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

It is recommended that the assessment of this unit be approached in an integrated way with worksheets/drawings covering outcomes 1-4 developed as a complete project rather than as four separate outcomes. Examples of assessments that could be used are as follows:

Outcome 1
A minimum of ten questions should be required for performance criteria (a) and (b). Performance criterion (c) requires an operation sheet to be designed and completed.

Outcome 2
An observation checklist for each of the three components should be used for the outcome. Candidates should have each performance criterion checked before proceeding to work on the next.

Outcome 3
Three separate and distinct checklists should be used in this outcome each having a full list of tools and equipment used in the manufacture of each component. Candidates should use a wide range of tools and equipment as is available.

Outcome 4
A completed checklist by each candidate for each component together with their completed components should be submitted. Honesty and accuracy is required.

Satisfactory achievement of the unit is based on all the performance criteria in all the outcomes being met.

National Unit Specification: support notes (cont)

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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 special 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).