



National Unit Specification: general information

UNIT Graphical Engineering Communication (SCQF level 5)

CODE F5FP 11

SUMMARY

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

This largely practical Unit is designed to provide candidates with basic knowledge, understanding and skills in graphical engineering communication. During delivery of the Unit candidates will learn to create drawings of engineering components using isometric projection. They will also develop the knowledge and understanding to extract and interpret information from engineering drawings. Candidates will also develop the knowledge, understanding and skills to create detailed, two-dimensional engineering drawings in both First and Third Angle Projections.

This Unit is suitable for candidates who are training to be fabrication and welding, manufacturing, mechanical, maintenance or multi-disciplinary crafts persons but may also be delivered to candidates who are being introduced to graphical engineering communication for the first time.

OUTCOMES

- 1 Create a drawing of an engineering component using isometric projection.
- 2 Extract and interpret information from engineering drawings.
- 3 Create detailed, two-dimensional engineering drawings in different orthographic projections.

Administrative Information

Superclass: VF

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RECOMMENDED ENTRY

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

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

Achievement of this Unit gives automatic certification of the following Core Skill component:

- ◆ Using Graphical Information at 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

Create a drawing of an engineering component using isometric projection.

Performance Criteria

- (a) Draw correctly component measurements to their original size.
- (b) Show correctly nominal dimensions of component features.
- (c) Annotate correctly the drawing to identify the features relevant to the manufacture of the component.

OUTCOME 2

Extract and interpret information from engineering drawings.

Performance Criteria

- (a) Identify correctly orthographic projections.
- (b) Interpret correctly engineering drawing abbreviations.
- (c) Interpret correctly tolerances associated with dimensions.
- (d) Identify correctly graphical symbols.

OUTCOME 3

Create detailed, two-dimensional engineering drawings in different orthographic projections.

Performance Criteria

- (a) Draw two-dimensional drawings correctly to current engineering drafting standards.
- (b) Detail correctly dimensions, symbols and abbreviations necessary for manufacture.
- (c) Complete correctly borders and title block.

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.

Outcomes 1 and 3

Product evidence is required for both Outcomes 1 and 3 and should demonstrate that a candidate has achieved the Outcomes and Performance Criteria.

The evidence for both Outcomes 1 and 3 must be produced manually using appropriate draughting equipment. Assessments must be conducted under supervised, open-book conditions. Total assessment time for Outcome 1 must not exceed one hour.

With regard to Outcome 3:

- ◆ candidates must produce two drawings, one in First Angle Projection and the other in Third Angle Projection
- ◆ each drawing must include the following details:
 - the projection symbol
 - fully dimensioned
 - three drawing symbols
 - four abbreviations to current standards
 - drawn by
 - date drawn
 - drawing title
 - material
 - scale

Outcome 2

Written and/or recorded oral evidence is required for Outcome 2 and should demonstrate that a candidate has achieved the Outcome and Performance Criteria.

Assessment(s) must be conducted under supervised, closed-book conditions in which candidates are not allowed to bring their own notes, handouts, textbooks or other materials into the assessment. Total assessment time for Outcome 2 must not exceed one hour and candidates must have access to current Standards.

With regard to Outcome 2

- ◆ candidates must determine the projection method used in three drawings. Each drawing must have three orthogonal views but must not show the projection symbol.
- ◆ candidates must interpret four drawing abbreviations.

National Unit Specification: statement of standards (cont)

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- ◆ candidates must interpret three tolerances associated with dimensions
- ◆ candidates must identify six graphical symbols

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 Awards in Fabrication and Welding Engineering, Mechanical Maintenance Engineering and Manufacturing Engineering at SCQF level 5, but may also be offered on a free standing basis.

The aim of this Unit is to provide candidates with basic knowledge, understanding and skills in graphical engineering communication. On successful completion of the Unit candidates will have learnt to create drawings of engineering components using isometric projection. They will also have developed the knowledge and understanding to extract and interpret information from engineering drawings. Candidates will also be able to create detailed, two-dimensional, detailed engineering drawings in both First and Third Angle Projections.

As this Unit is designed to teach candidates to create engineering drawings using manual drawing skills it may be delivered prior to the *Computer Aided Draughting (CAD) for Engineers* SCQF level 5 Unit so that candidates have opportunities to develop a range of drawing skills by hand before attempting to transfer these to a CAD system. Alternatively, the Unit may be delivered in parallel with the *Computer Aided Draughting (CAD) for Engineers* SCQF level 5 Unit so that drawing skills can be developed both on paper and on the computer screen.

In Outcome 1 candidates should be introduced to drawing engineering components using isometric projection. Candidates may find it an advantage to use isometric grid paper when drawing components. It is recommended that candidates are given a range of graded exercises to complete so that they can develop their knowledge, skills and confidence in drawing components in isometric projections. Lecturers may also wish to provide candidates with opportunities to develop their three-dimensional free hand sketching skills since this is closely related to isometric projection. Candidates should be encouraged to sketch components neatly, in proportion and showing clearly dimensional and other information.

In Outcome 2 candidates should be taught the differences between First and Third Angle Projection. It is recommended that this is done by providing candidates with examples of drawings, containing three orthogonal views, in both Projections and asking them to decide which Projection each drawing is drawn in. Candidates should also be introduced to a range of engineering symbols, abbreviations and tolerances in current Standards. Symbols may be chosen to suit the engineering discipline area candidates are studying. The emphasis throughout the delivery of the Outcome should be on candidates extracting and interpreting information from engineering drawings correctly (eg tolerances associated with dimensions).

National Unit Specification: support notes (cont)

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In Outcome 3 candidates should be provided with the opportunities to create detailed, two-dimensional drawings in both First and Third Angle Projections. Each drawing produced should contain three different views of the component. Components drawn should be of sufficient complexity to reflect the standard of drawing expected of a candidate at SCQF level 5. Examples of such drawings are shown in the Assessment Support Pack for this Unit. Candidates should be encouraged to produce all engineering drawings neatly, accurately and showing all relevant information.

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 may be delivered by a combination of lectures, lecturer demonstration and graded practical drawing exercises allowing candidates to develop their knowledge, understanding and skills of graphical engineering communication. The Unit should be delivered in an environment with good natural lighting and equipped with drawing boards, draughting equipment and drawing aids.

Good draughting techniques should be reinforced throughout the delivery of the Unit. Such techniques should include (the list is not intended to be exhaustive):

- ◆ using correct pencils when drawing
- ◆ ensuring pencils are sharpened before use
- ◆ using a clean rubber at all times
- ◆ keeping all drawing paper clean
- ◆ ensuring views are proportionally laid out on the paper (not crammed into a corner)
- ◆ ensuring all views are drawn neatly, accurately and in full
- ◆ drawing all dimensional lines neatly, accurately and with well defined arrowheads
- ◆ ensuring all written and dimensional information is legible and accurate
- ◆ ensuring borders are drawn accurately, neatly and in full
- ◆ ensuring title blocks contain accurate and complete information

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Accuracy in calculating, recording and presenting graphic data underpins the competences assessed in the Unit as candidates create engineering drawings and interpret, select and apply graphical symbols.

As they learn effective working practice candidates could be encouraged to demonstrate greater understanding of numerical concepts and graphic symbols used in engineering contexts, carrying out necessary calculations and measurements. Issues which will affect practical work in measuring, recording and drawing could be discussed, and formative opportunities to practise skills in handling numerical and graphical information should focus on Numeracy as a tool to be used in work related contexts.

National Unit Specification: support notes (cont)

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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)*.

Candidates should be encouraged to undertake graded formative assessment exercises involving drawing engineering components in isometric projection, extracting and interpreting information from engineering drawings and creating two-dimensional engineering drawings to build their knowledge, understanding, skills and confidence in graphical engineering communication.

Outcome 1 may be assessed by an assignment involving candidates in drawing an engineering component in isometric projection.

Outcome 2 may be assessed by an assessment paper consisting of suitable drawings and a question paper comprising short answer or objective questions (eg multi-choice questions) or a mixture of both. This assessment may be suitable for on-line delivery.

Outcome 3 may be assessed by two drawing exercises in which candidates create detailed, two dimensional drawings of a component in First and Third Angle Projections. Centres may choose to limit the time candidates have to complete these two exercises to two hours.

Assessment exercises should reflect the candidate's discipline area.

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