



National Unit Specification: general information

UNIT Graphical Engineering Communication (SCQF level 6)

CODE F5JG 12

SUMMARY

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

This Unit is designed to allow candidates to develop their knowledge, understanding and skills in graphical engineering communication. During the delivery of the Unit candidates will learn to extract and interpret information from documents used in engineering. They will also develop the knowledge and skills to create detailed, two dimensional drawings in both First and Third Angle Projection which include both auxiliary and sectional views. Candidates will also learn how to produce fully developed engineering assembly drawings.

This Unit is suitable for candidates who are training to be fabrication and welding, manufacturing, mechanical, maintenance or multi-disciplinary technicians.

OUTCOMES

- 1 Extract and interpret information from documents used in engineering.
- 2 Create detailed, two-dimensional engineering drawings in different orthographic projections.
- 3 Create a two-dimensional engineering assembly drawing.

Administrative Information

Superclass: VF

Publication date: March 2009

Source: Scottish Qualifications Authority

Version: 01

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National Unit Specification: general information (cont)

UNIT Graphical Engineering Communication (SCQF level 6)

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- ◆ the Unit *Graphical Engineering Communication* at SCQF level 5
- ◆ Standard Grade Graphic Communication at credit level
- ◆ appropriate Industrial Experience in the field of engineering

CREDIT VALUE

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

**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

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

- ◆ Communication (SCQF level 6)
- ◆ Problem Solving (SCQF level 6)

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

National Unit Specification: statement of standards

UNIT Graphical Engineering Communication (SCQF level 6)

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

Extract and interpret information from documents used in engineering.

Performance Criteria

- (a) Select correctly graphical symbols from written information.
- (b) Identify and define correctly information represented by graphical symbols.
- (c) Apply correctly drawing abbreviations to engineering drawings.
- (d) Draw correctly conventional representations of given components and features.
- (e) Interpret and apply correctly the dimensional limits of a feature.

OUTCOME 2

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

Performance Criteria

- (a) Draw two-dimensional drawings correctly to current engineering drawings Standards.
- (b) Detail correctly dimensions, symbols and abbreviations necessary for manufacture.
- (c) Complete correctly borders, projection symbol and title block.
- (d) Draw correctly different views in one plane.

OUTCOME 3

Create a two-dimensional engineering assembly drawing.

Performance Criteria

- (a) Draw accurately an engineering assembly drawing with all components correctly assembled to current engineering draughting standards.
- (b) Draw correctly all relevant dimensions on the engineering assembly drawing.
- (c) Complete correctly borders, projection symbol and title block.
- (d) Construct correctly a parts list referencing parts to the engineering assembly drawing.

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.

Outcome 1

Written and/or recorded oral evidence is required for Outcome 1 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 1 must not exceed one hour and candidates must have access to current Standards.

With regard to Outcome 1:

- ◆ candidates must select four graphical symbols from written information
- ◆ candidates must identify and define three graphical symbols
- ◆ candidates must apply six engineering drawing abbreviations
- ◆ candidates must draw four conventional representations of given components or features
- ◆ candidates must for one given feature interpret and apply all dimensional limits

Outcomes 2 and 3

Product evidence is required for both Outcomes 2 and 3 and should demonstrate that a candidate has achieved the Outcomes and Performance Criteria.

The evidence for both Outcomes 2 and 3 must be produced manually using appropriate draughting equipment. Assessments must be conducted under supervised, open-book conditions. Total assessment time for Outcome 3 must not exceed one hour. Candidates must have access to current Standards while undertaking the assessments to Outcomes 2 and 3.

With regard to Outcome 2:

- ◆ candidates must produce one detailed, two-dimensional engineering drawing in First Angle Projection
- ◆ candidates must produce one detailed, two-dimensional engineering drawing in Third Angle projection
- ◆ one of the above drawings must contain an auxiliary view and the other a sectional view

National Unit Specification: statement of standards (cont)

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- ◆ candidates must complete the following details on each drawing:
 - three views in total
 - the correct projection symbol
 - fully dimensioned
 - three drawing symbols
 - four abbreviations to current relevant Standards

- ◆ each completed drawing must also contain the following information:
 - drawn by
 - date drawn
 - drawing title
 - material
 - scale

With regard to Outcome 3:

- ◆ candidates must complete one engineering assembly drawing with a minimum of TWO component parts
- ◆ the drawings must contain borders, projection symbol, a completed title block, overall dimensions and a parts list

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

UNIT Graphical Engineering Communication (SCQF level 6)

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, Manufacturing Engineering and Mechanical Engineering at SCQF level 6, but may also be offered on a free standing basis.

The aim of this Unit is to allow candidates to develop their knowledge, understanding and skills in graphical engineering communication. On successful completion of the Unit candidates will be able to extract and interpret information from documents used in engineering. They will also have developed the knowledge and skills to create detailed, two dimensional engineering drawings in both First and Third Angle Projection containing both auxiliary and sectional views. Candidates will also have learnt to produce fully developed engineering assembly drawings.

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 6 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 6 Unit so that drawing skills can be developed both on paper and on the computer screen.

In Outcome 1 candidates should be introduced to the very important skill of correctly extracting and interpreting information from engineering documents (eg current Standards, manufacturers' instruction manuals, engineering textbooks etc). Candidates should learn to select graphical symbols, identify and define information represented by graphical symbols and apply abbreviations commonly used in engineering drawings. Engineering graphical symbols may be chosen to suit the engineering discipline area being studied by the candidate. Candidates should also learn about conventional representations of components and features thereby extending their engineering drawing knowledge. They should also be introduced to dimensional limits of a feature which may include classes of fit, built in clearance and tolerance.

In Outcome 2 candidates should be provided with opportunities to develop the knowledge and skills to create detailed, two-dimensional engineering drawings in both First and Third Angle Projections. Components drawn should be of sufficient complexity to reflect the standard of drawing expected of a candidate at SCQF level 6. Examples of such drawings are shown in the Assessment Support Pack for this Unit. As part of the delivery of the Outcome candidates should be taught how to produce both auxiliary and section views of a component.

National Unit Specification: support notes (cont)

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In Outcome 3 candidates should be provided with opportunities to develop the knowledge and skills to produce engineering assembly drawings which should include related parts lists. Lecturers should emphasise the important purpose that such drawings play in communicating information to a range of users.

Candidates must have access to current revisions of the relevant drawing Standards throughout the delivery of the Unit.

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.

In Outcome 1 exemplar drawings of components, assemblies and circuit diagrams may be used to show good draughting practice compliant with current Standards.

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
- ◆ 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 complex graphic data underpins the competencies assessed in the Unit as candidates extract information from engineering documents and create detail and assembly drawings. They will interpret, select and apply an extended range of numerical concepts, graphic symbols and abbreviations used in engineering contexts, carrying out calculations and measurements. Formative opportunities to practise skills in handling complex numerical and graphical information should focus on Numeracy as a practical tool to be used in work related contexts.

National Unit Specification: support notes (cont)

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As they undertake the Unit candidates will be required to extract and analyse information from engineering documentation and to interpret technical instructions. Skills in accessing and evaluating a range of general information sources could also be developed, in order that candidates are able to consult and evaluate current safety legislation and technical advice. Skills in written communication are not formally assessed but candidates should record information objectively, using correct terminology and accurate annotation. Formative work for the Unit could include discussion with the assessor and class group around workplace practice. Such an approach could improve oral and evaluative skills and be particularly beneficial to candidates with no industrial experience.

Elements of the Core Skill of *Problem Solving*, that is, Planning and Organising, Critical Thinking, and Reviewing and Evaluating, could be enhanced as candidates undertake the Unit. Identifying and interpreting relevant information including use of Standards in technical instructions should inform decisions on methods, resources and techniques to meet requirements. Individual discussions with the assessor could also develop oral communication skills and allow review and evaluation of drawing practice.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

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 extracting and interpreting information from engineering documents and creating two-dimensional engineering drawings and engineering assembly drawings to build their knowledge, understanding, skills and confidence in graphical engineering communication.

Outcome 1 may be assessed by an assessment paper consisting of suitable documents 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 2 may be assessed by two drawing exercises in which candidates create detailed, two dimensional drawings of a component in First and Third Angle Projections. One drawing should include a sectional view and the other drawing an auxiliary view. Centres may choose to limit the time candidates have to complete these two exercises to three hours.

Outcome 3 may be assessed by a drawing exercise in which candidates produce a fully developed, engineering assembly drawing.

Assessment exercises should reflect the candidate's discipline area.

National Unit Specification: support notes (cont)

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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