



National Unit Specification: general information

UNIT Fundamental Electrical Systems (SCQF level 5)

CODE F5D7 11

SUMMARY

This Unit is designed for candidates with little or no prior knowledge of electrical systems but who wish to gain some basic knowledge of such systems. Candidates may be school leavers or adults wishing to gain an insight into the fundamentals of electrical supply, distribution, control and protection.

The aim of this Unit is to introduce candidates to fundamental electrical systems from generation to the point of utilisation within premises.

On successful completion of this Unit candidates will be able to understand the purposes of High Voltage (HV) electrical plant and distribution systems and be able to identify the component parts of these basic systems. Candidates will also be able to describe the need for isolation, control and protection of Low Voltage (LV) installations and recognise the components parts of these systems.

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

OUTCOMES

- 1 Describe and draw HV electricity generating and transmission systems.
- 2 Describe and draw HV electrical distribution systems.
- 3 Describe and draw LV isolation, control and protection systems within an electrical installation.

Administrative Information

Superclass: XJ

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National Unit Specification: general information (cont)

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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:

- ◆ Standard Grade Mathematics — General Level
- ◆ Standard Grade Technological Studies — General Level
- ◆ Standard Grade Science — General Level

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.

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

- ◆ Communication (SCQF level 5)

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

National Unit Specification: statement of standards

UNIT Fundamental Electrical Systems (SCQF level 5)

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

Describe and draw HV electricity generating and transmission systems.

Performance Criteria

- (a) Describe correctly the purpose of HV electrical generators and transformers.
- (b) Describe correctly the need for HV electrical transmission systems.
- (c) Identify correctly the component parts of a typical HV transmission system.
- (d) Draw neatly a labelled HV generating and transmission system showing all voltage levels.

OUTCOME 2

Describe and draw HV electrical distribution systems.

Performance Criteria

- (a) Describe correctly the purpose of HV distribution systems.
- (b) Identify correctly the component parts of HV distribution systems.
- (c) Describe correctly both radial and ring distribution systems.
- (d) Draw neatly both radial and ring distribution systems naming all component parts and showing all voltage levels.

OUTCOME 3

Describe and draw LV isolation, control and protection systems within an electrical installation.

Performance Criteria

- (a) Describe correctly the need for electrical isolation within LV installations.
- (b) Describe correctly the need to control the energy supply within LV installations.
- (c) Describe correctly the need to provide electrical protection within LV installations.
- (d) Draw neatly a schematic diagram showing clearly the isolation, control and protection components of an electrical installation.

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 evidence should be produced to demonstrate that the candidate has achieved Outcomes 1, 2 and 3 to the standards specified in the Outcomes and Performance Criteria. The evidence should be produced under supervised, controlled conditions and the assessment should be conducted under closed-book conditions.

An appropriate method of assessment may be in the form of one integrated assessment occasion lasting 1 hour 30 minutes or through the assessment of individual Outcomes with each of the three Outcome assessments lasting no more than 30 minutes.

An appropriate form of assessment could be in the form of a candidate-generated report which integrates the Performance Criteria of ALL the Outcomes or a series of three separate reports, covering each Outcome, which may be combined to give an integrated report.

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 is a mandatory Unit within the National Certificate in Electrical Engineering at SCQF level 5. This Unit can also be delivered on a free-standing basis.

The aim of this Unit is to introduce candidates to fundamental electrical systems from generation to the point of utilisation within premises. They will be able to understand the purposes of High Voltage (HV) electrical plant, transmission and distribution systems, including the National Grid network, and be able to identify the component parts of these basic systems.

Candidates will also be able to identify the need for isolation, control and protection of Low Voltage (LV) installations and recognise the component parts of these systems.

The content and context of this Unit should provide candidates with an overview of the fundamental electrical system of generation, transmission, distribution, isolation, control and protection, from the generating station to the installation within a consumer's premises.

It should identify the component parts of the overall system and describe the purpose of each and its role within the system. Both HV and LV parts of the system should be identified and the voltage levels on each part of the system should be stated along with the reasons for these voltage values.

This Unit could be delivered either in a classroom or a laboratory setting. If this Unit is delivered in a laboratory setting then centres may wish to provide candidates with a safety induction session at the start of the Unit. Safety should be emphasised throughout the delivery of the Unit. Candidates must wear appropriate Personal Protective Equipment (PPE) while working in a practical electrical environment.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Although much of the content of this Unit is of a descriptive nature, it should be delivered in an environment which relates to the topic of electrical generation and distribution systems. This could be in a classroom or laboratory setting in which the environmental emphasis is placed on such electrical systems.

Delivery of the Unit content could utilize relevant industrial case studies, and drawings/layouts of practical systems. The use of relevant videos or DVD recordings showing transmission and distribution systems, and the requirements of electrical installations would also be appropriate.

Opportunities should be provided to allow candidates to visit various premises to gain first-hand knowledge of electricity generating and plant and transformers and the distribution, isolation, control and protection equipment.

National Unit Specification: support notes (cont)

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Candidates should be encouraged to discuss and debate the various issues raised by the subject content in order that this interaction might stimulate their thought processes and reinforce the learning.

The Outcomes should be delivered in the sequence given in the 'statement of standards'.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Although skills in *Communication* are not formally assessed candidates should be supported in the presentation of written and oral work to a standard acceptable in industry. Skills in analysing and evaluating sources which provide background information on the fundamentals of electrical supply, distribution, control and protection should encourage candidates to consult and apply reference materials from a range of paper based and/or Internet sites. Evaluation of materials should include a check on relevance and currency. Candidates should be expected to present ideas accurately and coherently, using formal structures and appropriate terminology. Aids could be provided to support correct spelling and punctuation in written work.

Discussions on basic systems and the need for isolation, control and protection of Low Voltage installations could provide useful opportunities to enhance oral skills as the class group work together to examine case studies, listening to and using vocational terminology in practical communication with others.

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 communications 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)*.

The assessment of this Unit could take the form of a candidate-generated report, containing the Performance Criteria specified in the Unit Outcomes ie:

- ◆ HV generation and transmission systems
- ◆ HV distribution systems
- ◆ LV isolation, control and protection systems

Alternatively, three separate reports may be produced, one for each Outcome, to cover all of the Performance Criteria contained within the Outcomes. The combination of these separate reports would constitute an integrated report covering the complete Unit.

National Unit Specification: support notes (cont)

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The report/s should be structured round a series of questions relating to the various Performance Criteria.

Each report would take no longer than 30 minutes to produce and the single, integrated report would be produced within a time limit of 1 hour 30 minutes.

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