SQA Advanced Unit Specification: general information

Unit title: Electrical Safety

Unit code: HV3A 47

Superclass: XJ

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Unit purpose

This Unit is designed to enable candidates to develop knowledge and competence related to safe working practices and work permits. The Unit is intended to raise the candidate's awareness of health and safety practice and to provide opportunities to demonstrate the operation of permit-to-work systems.

On completion of the Unit the candidate should be able to:

1 Explain the features of an operational plan for safe working on electrical systems.
2 Explain the features of electrical distribution and the need for protection and isolation for safe working on 'dead' systems.
3 Demonstrate the features of a permit-to-work system.

Recommended prior knowledge and skills

Candidates should have a broad knowledge and understanding of electrical distribution and control, overcurrent protection and installation design for electrical systems. This may be evidenced by the possession of the following SQA Advanced Units: HT7K 47 *Three Phase Systems*, HV3L 47 *Electricity Power Systems*. However, entry requirements are at the discretion of the centre.

Credit points and level

1 SQA Credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

**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 National 1 to Doctorates.*

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes of this Unit specification.

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

Context for delivery

This Unit was developed for the SQA Advanced Certificate and SQA Advanced Diploma in Electrical Engineering awards. If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

SQA Advanced Unit Specification: statement of standards

Unit title: Electrical Safety

Unit code: HV3A 47

The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain the features of an operational plan for safe working on electrical systems

Knowledge and/or Skills

- Dangers of electricity
- Concepts of Hazard and Risk.
- Features of a Risk Assessment
- Awareness of the Responsibilities of personnel under the provision of the Health and Safety at Work etc. Act 1974 and the Electricity at Work Regulations
- Awareness of the need for safe isolation procedures
- Appreciation of the need for safe working practices
- Features of a typical Operational Plan for safe working on an electrical system

Outcome 2

Explain the features of electrical distribution and the need for protection and isolation for safe working on ‘dead’ systems.

Knowledge and/or Skills

- Distribution system including control equipment, overcurrent protection devices, isolation and switching equipment
- Earthing and the earth fault loop path
- The use of residual current devices for protection and isolation of the system
- Documentation and plans of relevant distribution network
- Features of safe isolation and ‘Locking Off’ procedures
- The use of warning notices for ‘isolated’ and ‘non-isolated’ sections of the system
- The use of test and proving instruments

Evidence Requirements for Outcomes 1 and 2

Evidence for the Knowledge and/or Skills in Outcomes 1 and 2 will be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that she/he can answer correctly questions based on a sample of the items shown under the knowledge and skills items in both Outcomes. In any assessment of the Outcomes **four out of seven** Knowledge and/or Skills items should be sampled from Outcome 1, and **four out of seven** Knowledge and Skills items from Outcome 2.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of four out of seven Knowledge and/or Skills items from Outcome 1, and four out of seven Knowledge and/or Skills items from Outcome 2 are required each time the Unit is assessed.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

Outcome 1

- Describe the dangers associated with electricity
- Describe the distinction between Hazard and Risk
- Describe the features of a risk assessment exercise
- Describe the responsibilities of personnel under the provision of the Health and safety at Work etc. Act 1974, and the Electricity at Work Regulations
- Explain the need for safe isolation procedures
- Explain the need for safe working practices to be carried out
- Describe the features of a typical Operational Plan for safe working on an electrical system

Outcome 2

- Describe a distribution system including control equipment, overcurrent protection devices, isolation and switching equipment
- Explain the need for Earthing and identify the earth fault loop path
- Explain the use of residual current devices for protection and isolation of the system
- Describe the use of documentation and plans of a relevant distribution network
- Describe the practice of safe isolation and ‘Locking Off’
- Explain the use of warning notices for ‘isolated’ and ‘non-isolated’ sections of the system
- Explain the use of test and proving instruments

Evidence should be generated through assessment undertaken in controlled, supervised conditions. Assessment should be conducted under closed-book conditions and as such candidates should not be allowed to bring any textbooks, handouts or notes to the assessment. Candidates will be provided with current codes of practice or other relevant legislative documentation for use during the assessment.

Outcome 3

Demonstrate the features of a permit-to-work system.

Knowledge and/or Skills

- Purpose of a permit-work system
- Activities requiring permit-to-work systems of work
- Identification of dangers associated with working on high voltage systems
- Identification of isolation and earthing points
- Safe isolation, proving dead, and earthing procedures
- Identification of precautions to minimise risk due to specific work activities
- Permit-to-work documentation
- Permit-to-work issuing and cancelling procedures

Evidence Requirements for Outcome 3

Evidence for the Knowledge and/or Skills in Outcome 3 will be provided by the candidate completing an assignment which covers **all** of the Knowledge and/or Skills items. A candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- explain the purpose of a permit-to-work system.
- describe three examples of work activities or environments which would require to be controlled by a permit-to-work system.
- describe three dangers associated with working on a high voltage system (eg clearances, stored charge, induced voltages, identification of cables and equipment).

- For a given case study presented to the candidate in written or practical format, and supported with relevant system diagrams and plans:
  - Locate and document appropriate isolation and earthing points on given documentation (schematic diagrams, layout drawings).
  - Describe safe isolation, proving dead, and earthing of equipment procedures.
  - Identify precautions to minimise risk due to specific work activities (eg PPE, safe procedures for working in confined spaces or at height, presence of gases, lifting heavy equipment).
  - Complete a permit-to-work document.
  - Describe the procedures to be followed when issuing and cancelling a permit-to-work.

Written evidence for the first three Knowledge and/or Skills of this Outcome should be presented in responses to specific questions. Evidence for the remaining Knowledge and/or Skills should be produced by the candidate providing responses to specific questions and completing documentation relevant to the case study. The case study should present the candidate with the task of planning the safe isolation a piece of equipment in preparation for maintenance. Evidence may be gathered in the form of a written or combined written/practical exercise.

SQA Advanced Unit Specification: support notes

Unit title: Electrical Safety

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 has been written in order to allow candidates to develop their knowledge and competence in the following areas:

1 Operational plans for safe working on electrical systems.
2 Protection and isolation for safe working on 'dead' systems.
3 Features of a permit-to-work system appropriate to the safe practices of working on isolated electrical networks.

In designing this Unit, the Unit writer has identified the range of topics expected to be covered by lecturers. The writer has also given recommendations as to how much time should be spent on each Outcome. This has been done to help lecturers decide what depth of treatment should be given to the topics attached to each of the Outcomes. Whilst it is not mandatory for centres to use this list of topics, it is recommended that they do so since the assessment exemplar pack for this Unit is based on the Knowledge and/or Skills and list of topics in each of the Outcomes.

A list of topics for each Outcome is given below. Lecturers are advised to study this list in conjunction with the assessment exemplar pack so that they can get a clear indication of the standard of achievement expected of candidates in this Unit.

1 Explain the features of an operational plan for safe working on electrical systems (10 hours)

The 'operational plan' features should comply with current Codes of Practice and legislation:

- Awareness of dangers to include fire and shock
- Distinction between Hazard and Risk
- Risk Assessment procedures
- Responsibilities of personnel including employers, employees, trainees etc. under the provision of the HSW Act 1974 and the Electricity at Work Regulations 1989
- The need to plan work and assess risks for safe dead and live working
- The need for safe isolation procedures
- Definition of Authorised Person
- The need to restrict access to work areas
- The need for safe working practices
- Features of a typical Operational Plan for safe working on an electrical system

2 Explain the features of electrical distribution and the need for protection and isolation for safe working on 'dead' systems (15 hours)

The delivery of this Outcome should illustrate how elements of an electrical system may be safely isolated to allow safe working on a 'dead' system.

- Features of a distribution system including control equipment, overcurrent protection devices, isolation and switching equipment
- Principles of earthing and the earth fault loop path
- The use of residual current devices for protection and isolation of the system
- Documentation and plans of relevant distribution network
- The need to identify the appropriate section of the network to be isolated
- Practice of isolation and 'Locking Off'
- The need for warning notices for 'isolated' and 'non-isolated' sections of the system
- The need for and use of test and proving instruments
- The need for written procedures indicating the sequence of a safe isolation procedure
- Features of a safe isolation procedure

3 Demonstrate the features of a permit-to-work system (15 hours)

The generic features of a Permit-to-work system should be highlighted in this Outcome and reference should be made to the fact that variations will exist with individual Companies.

- Purpose of a Permit-to-Work system for 'dead' working in the vicinity of 'live' equipment
- Features of a Permit-to-Work system
- Details to be noted on a Permit-to-Work
- The need for supervisory personnel and the identification of their specific duties under the permit-to work
- The need to ensure that all supervisory line responsibilities are securely maintained throughout the work
- Identification of all potentially dangerous substances which might be present in the work area. eg gas, fumes vapour etc
- Procedures to ensure that the work environment is free from dangerous substances
- Identification of all potentially hazardous work activities to be carried out under the permit-to-work
- Measures to minimise risk due to potentially hazardous work activities are identified
- Procedures to ensure that all equipment, circuits, and control devices associated with the work are 'dead' and are correctly isolated
- The need to ensure that a Permit-to-Work is issued for a specific task only and is cancelled on completion of that task
- Production of a relevant Permit-to-Work for work to be carried out on an item of control equipment
- Location of relevant control/protection equipment and circuits on plant as detailed on plans and from documentation
- Location of appropriate isolation points
- Location of appropriate earthing points
- Safe isolation, testing of equipment and proving of test equipment
- Secure locking procedures and the provision for retaining keys in a secure manner

- Fixing of warning notices in appropriate locations and on relevant equipment
- Appropriate precautions to minimize risk due to the implementation of hazardous work activities
- Relevant and complete information is recorded on the Permit-to-Work documentation
- Permit-to-Work documentation is correctly authorised and endorsed by the appropriate personnel

Guidance on the delivery of this Unit

The Unit has been developed within the mandatory section of the SQA Advanced Certificate and SQA Advanced Diploma in Electrical Engineering awards.

Delivery of this Unit should relate to Current Codes of Practice and legislation including the following (or their updated equivalents):

- Health and Safety at Work etc. Act 1974
- Electricity at Work Regulations 1989
- BS 7671: IEE Requirements for Electrical Installations
- HSEE — Publication HS(G)85 Electricity at Work — Safe Working Practices
- HSE — Publication HSR25 Memorandum of guidance on the Electricity at Work Regulations

It is recommended that candidates are provided with the opportunity to carry out a site visit to view the types of plant and equipment that are studied in the Unit. A HV distribution supply substation or switchroom would provide the ideal situation,

Guidance on the assessment of this Unit

The assessment for Outcomes 1 and 2 of this Unit should be combined together into one written assessment paper. This paper should be taken by candidates at one single assessment event that should last one and a half hours. The assessment paper should be composed of a suitable balance of short answer, restricted response and structured questions. This assessment should be conducted under controlled, supervised conditions.

The assessment for Outcome 3 should take the form of an assignment. This assignment may be presented to the candidate as a written or combined written/practical exercise. It may be completed outwith the classroom. Part of the assignment should take the form of a case study in which the candidate is required to plan the safe isolation a piece of equipment in preparation for maintenance The case study may be assessed as a written or combined written/practical exercise and all the documentation must be completed by the candidate.

Assessors should take steps to check that submissions are the candidate's own work.

Assessment Guidelines

Outcomes 1 and 2

The assessment for Outcomes 1 and 2 should be combined together to form one assessment paper. This single assessment paper should be taken at a single assessment event lasting one and a half hours and carried out under supervised, controlled conditions. Such a paper should be composed of an appropriate balance of short answer, restricted response and structured questions.

Outcome 3

The assessment for Outcome 3 should take the form of an assignment exercise. This assignment may be presented to the candidate as a written or combined written/practical exercise. It may be completed outwith the classroom. Part of the assignment should take the form of a case study in which the candidate is required to plan the safe isolation a piece of equipment in preparation for maintenance The case study may be assessed as a written or combined written/practical exercise and all the documentation must be completed by the candidate.

Assessors should take steps to check that submissions are the candidate's own work.

Online and Distance Learning

This Unit may be delivered by distance learning which may incorporate some degree of on-line support. However, with regards to assessment, planning would be required by the centre to ensure the sufficiency and authenticity of candidate evidence. Arrangements would be required to be put in place to ensure that the assessments were conducted under controlled, supervised conditions.

Opportunities for developing Core Skills

There may be opportunities to gather evidence towards the following listed Core Skills or Core Skills components in this Unit, although there is no automatic certification of Core Skills or Core Skills components:

- Written Communication (Reading) at SCQF level 6
- Written Communication (Writing) at SCQF level 4
- Critical Thinking at SCQF level 6

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

History of changes to Unit

Version	Description of change	Date

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

General information for candidates

Unit title: Electrical Safety

This Unit has been designed to allow you to develop an appreciation of electrical safety and to further your knowledge and understanding of the requirements and features of permit-to-work systems in relation to electrical systems.

The Unit will provide you with an appreciation of the need for assessing the risks associated with working with electrical systems and equipment and the importance of ensuring that such systems are properly isolated from the supply prior to any work being carried out. It introduces the concept of an 'operational plan' for safe working on electrical systems and develops the features of such a plan.

It is important that, before you carry out any work on an electrical system, you understand the features of such a system and how its component parts work together. The Unit develops this theme in Outcome 2 which describes the features of such a distribution system and the features of a safe isolation procedure on any relevant section of the network.

Outcome 3 allows you to develop your understanding of permit-to-work systems and highlights the responsibilities and duties of responsible personnel under such systems. You will have the opportunity to complete permit-to-work documents.

On completion of this Unit you should have a good appreciation of the need for and requirements of electrical safety schemes and will be able to implement a generic permit-to-work system.

The formal assessment of this Unit is in two parts. Firstly, you will be expected to undertake a closed, book written assessment on your appreciation of the features of operational plans and electrical distribution systems. Secondly, you will be required to complete an assignment which involves carrying out a case study for situation which requires a permit-to-work system of work.