SQA Advanced Unit specification: general information

Unit title: Electrical Installation Skills

Unit code: HV3M 47

Superclass: TH

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Version: 01

Unit purpose

This Unit is designed to introduce candidates to the skills required for the installation of electrical circuits. The Unit allows candidates to develop the necessary knowledge and skills required to interpret electrical diagrams and provide the opportunity to apply these skills in a practical electrical installation.

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

1 Identify the applications of domestic and industrial electrical components and circuits.
2 Install a domestic electrical wiring system in accordance with current wiring regulations.
3 Install an industrial electrical wiring system in accordance with current wiring regulations.

Recommended prior knowledge and skills

It would be an advantage for candidates to have a basic knowledge and understanding of electrical circuitry. This may be evidenced by possession of *Electrical Installation* Units from the National Certificates in Electrical Engineering. 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. 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.

Assessment

The assessment of Outcome 1 should be composed of a suitable balance of short answer and restricted response questions and should be conducted under controlled, supervised conditions. The assessment should be conducted at the same time the candidate is completing the practical assessment of Outcomes 2 and 3.

The assessment of Outcome 2 and 3 should comprise of two practical assignments in which the candidates are asked to install a domestic and industrial electrical wiring system. In the exercise for Outcome 3 the candidate should be asked to manufacture a length of metal trunking and cable tray. The installations should be wired using PVC cable and another wiring system, preferably either steel wire armour or mineral insulated cable.

All the assessments should be carried out at the end of the delivery of the Unit.

SQA Advanced Unit specification: statement of standards

Unit title: Electrical Installation Skills

Unit code: HV3M 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

Identify the applications of domestic and industrial electrical components and circuits.

Knowledge and/or Skills

- Identification of wiring accessories used in a domestic electrical installation
- Identification of wiring components used in industrial or commercial electrical installations
- Identification of the components parts of the supply intake position:
- State an application for each of the above components
- Explanation of the difference between radial and ring circuits
- Explanation of the importance of earthing an electrical system

Evidence Requirements

Evidence for the Knowledge and/or Skills in this Outcome will be provided on a sample basis. The evidence for the identification knowledge and skills should be provided in response to the sample of electrical accessories given to the candidate. Each candidate will be required to demonstrate that they can identify and give an application for a total of 12 of the items listed in the Evidence Requirements below. The exercise will also consist of two questions as evidence to explain both the difference between a radial and ring circuit, and the importance of earthing

In order to ensure the candidate will not foresee what items they will be questioned on, a different sample of the accessories may be required each time the Outcome is assessed.

A candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each of the following items:

- identify domestic wiring accessories: Consumer Unit, mcb, PVC cable, light switch, pendant, socket outlet and switched fused connection Unit.
- identify industrial or commercial wiring accessories: Distribution Board, Isolator, Motor Starter, Metal and Plastic Conduit, Metal and Plastic Trunking, cable tray, steel wire armour cable, MI cable
- Identify the component parts of the supply intake: Fuse and neutral link, kWh meter, isolator

- State an application for the wiring accessories identified above
- Explain the difference between radial and ring circuits
- Explain the importance of earthing an electrical system

Assessment Guidelines

This Outcome may be assessed when the candidates are installing the circuit for Outcome 2 and 3. The identification part of this assessment will consist of a number of components arranged on a table or fixed to a board where the student has to identify specific numbered items and give an application for each component. It is recommended that each centre develops a table or checklist to support the candidate's response. This response sheet will also include the two questions for the remaining two knowledge/skills

This Assessment should be conducted under controlled, supervised conditions.

Outcome 2

Install a domestic electrical wiring system in accordance with current wiring regulations.

Knowledge and/or Skills

- Interpretation of a given circuit diagram and completion of a relevant wiring diagram.
- Installation of a two way lighting circuit to a given layout
- Installation of a socket ring circuit to a given layout
- Testing of the lighting and ring circuits

Evidence Requirements

Candidates will be required to produce evidence to demonstrate their Knowledge and/or Skills by showing that they can interpret the given circuit diagram and safely install and test the installation accurately.

A candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each of the following items:

- complete an appropriate wiring diagram from a given circuit given
- install a two-way controlled lighting circuit to a given layout
- install a socket ring circuit to a given layout
- test the circuits for earth continuity, insulation resistance and polarity and record results before energising

Assessment Guidelines

The assessment of this Outcome must be in the form of a practical installation. The installation should be arranged to contain a number of the accessories and wiring systems which have been included in Outcome 1. The candidate must install a lighting circuit using PVC sheathed cables with the minimum of a two-way lighting circuit switching one light, plus a socket outlet ring circuit containing a minimum of three sockets and one non-fused spur.

It is recommended that centres develop a checklist to support the assessment requirements for each of the Knowledge and/or Skills items including, for the practical activities:

- accessories are positioned accurately
- accessories are installed securely
- wiring systems are manufactured correctly
- wiring systems are installed correctly
- conductor terminations are electrically and mechanically sound

Outcome 3

Install an industrial electrical wiring system in accordance with current wiring regulations.

Knowledge and/or Skills

- Interpret an electric motor layout diagram and mark out the installation accordingly
- Installation of accessories to the layout diagram
- Manufacture of given wiring system
- Termination of conductors to equipment terminals
- Testing the circuit for earth continuity, insulation resistance and polarity before energising

Evidence Requirements

Candidates will be required to produce evidence to demonstrate their Knowledge and/or Skills by showing that they can interpret the diagram given and safely install and test the installation accurately.

A candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each of the following items:

- Interpret an electric motor layout diagram and mark out the installation on a given board or wall
- Install accessories correctly and securely
- Manufacture and install the wiring system
- Terminate the conductors to the equipment so that they are mechanically and electrically sound
- Test the circuit for earth continuity, insulation resistance and polarity and records results before energising

Assessment Guidelines

The assessment of this Outcome must be in the form of a practical installation. It is recommended that the circuit be a 3-phase Direct on Line motor circuit with a remote stop/start station.

The installation should be arranged to contain a number of the accessories and wiring components which are included in Outcome 1. The candidate must install a length of metal trunking, as a joining piece between a Distribution Board and the Motor starter and cable tray, to include a 90° flat bend, within the exercise. The practical assignment should be wired using PVC single cable and either steel wire armour cable or mineral insulated cable.

The termination at the motor starter and motor terminals should be crimped terminations. The candidate should complete a log describing the practical installation activity and providing evidence of his/her understanding of the Knowledge and/or Skills items of Outcome 3.

It is recommended that Centres develop a checklist to support the assessment requirements for each of the Knowledge and/or Skills items including, for the practical activities:

- accessories are positioned accurately
- accessories are installed securely
- wiring systems are manufactured correctly
- wiring systems are installed correctly
- conductor terminations are electrically and mechanically sound

SQA Advanced Unit specification: support notes

Unit title: Electrical Installation Skills

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 the candidate to develop their skills and knowledge in the following areas:-

1 Electrical accessories and wiring systems.
2 Installation of domestic wiring systems.
3 Installation of industrial wiring systems.

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 Identify the applications of domestic and industrial electrical components and circuits (3 hours)

It is recommended that candidates be given the opportunity to handle and examine all the accessories and components named in the knowledge and skills section of the descriptor and outwith so they can relate more clearly information about component and accessory types.

It is recommended that the candidates are shown or demonstrated different applications for the accessories identified.

Accessories should include:

- Consumer Unit
- Distribution Board
- Miniature Circuit Breaker
- Residual Current Device
- Cartridge Fuse
- Metal and Plastic Trunking
- Metal and Plastic Conduit
- Cable Tray

- Steel Wire Armour and Gland
- Mineral Insulated Cable and Gland
- Isolator
- Motor Starter
- Switch Socket
- Light Switch
- Light Pendant
- Fused Connection Unit
- PVC Cable

2 Install a domestic electrical wiring system in accordance with current wiring regulations (17 hours)

The topics listed may be related to a particular domestic installation.

Factors to be considered when choosing a circuit to be drawn should include whether the system is single phase or three phase.

It is recommended that the circuits being drawn will be the systems to be constructed in Outcomes 2 and 3.

Diagrams to be included are:

- Circuit
- Wiring
- Layout

Safety Regulation and safe working practices should be observed at all times while completing the installations.

The circuits to be installed should be constructed using pvc sheathed wiring and a number of accessories from Outcome 1

3 Install an industrial electrical wiring system in accordance with current wiring regulations (20 hours)

Safety Regulations and safe working practices should be observed at all times while completing the installations.

It is recommended that candidates are given the opportunity to work on different types of wiring systems as well as different accessories. The candidate should be encouraged to handle and manufacture lengths of:

- metal trunking
- plastic trunking
- cable tray
- steel wire armour cable
- PVC Single Cable

The circuit being constructed should contain a number of the accessories from Outcome 1. It is recommended that the circuit being wired is a motor circuit with a remote stop/start station.

Guidance on the delivery and assessment of this Unit

This Unit was developed within the Options section of the SQA Advanced Certificate and SQA Advanced Diploma in Electrical Engineering. The Unit is complementary to the SQA Advanced Units *Electricity Power Systems*, *Electrical Safety* and *Electrical Installation Design*.

Details on approaches to assessment are given under Evidence Requirements and Assessment guidelines under each Outcome in the SQA Advanced Unit Specification: statement of standards section. It is recommended that these sections be read carefully before proceeding with assessment of candidates.

Open learning

Due to the practical exercises included in the delivery of this Unit, it would be impractical to deliver this on an open learning basis.

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)*.

Opportunities for developing Core Skills

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

- Using Graphical Information at SCQF level 4
- Planning and Organising at SCQF level 5

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 Installation Skills

This Unit has been designed to provide you with the knowledge and skills to understand and construct a basic electrical installation circuit.

You will study electrical installation circuitry and will learn the types of drawings required.

This Unit will also allow you to develop the practical skills required to enable you to construct basic electrical installations. You will have the opportunity to gain “hands on” experience of constructing electrical installations simulating the processes used in the workplace.

The formal assessment for this Unit will consist of both a written assignment and two practical assignments.

The written assessment will last for 30 minutes and take place under controlled supervised conditions. This assessment will be carried out under closed-book conditions in which the candidate will not be allowed to take any notes, handouts, textbooks, etc into the assessment.

The practical skills assessments will be assessed by means of assignments in which you will be required to satisfactorily complete a series of tasks that will enable you to complete domestic and an industrial circuit to a specified standard. These circuits must also be tested for earth continuity, insulation resistance and polarity before being energised and results logged in an appropriate test sheet.

Both the written and practical assignments will normally be carried out at the end of the delivery of the Unit.