-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

NATIONAL CERTIFICATE MODULE: UNIT SPECIFICATION

GENERAL INFORMATION

-Module Number- **4110033** **-Session- 1993-94**

-Superclass- **XL**

-Title- **ELECTRICAL INSTALLATION: AN INTRODUCTION TO INDUSTRIAL ELECTRONICS (x1$^{1}/_{2}$)**

-DESCRIPTION-

GENERAL COMPETENCE FOR UNIT: Applying the knowledge and skills required for the assembly of electronic circuits in the electrical installation industry.

OUTCOMES

1. identify a range of electronic components;

2. produce a wiring diagram from an electronic circuit diagram;

3. test a range of electronic components used in the electrical installation industry;

4. assemble and test a working electronic power control circuit;

5. assemble and test a logic circuit.

CREDIT VALUE: 1.5 NC Credits

ACCESS STATEMENT: There is no access statement for this module.

For further information contact: Committee and Administration Unit, SQA, Hanover House, 24 Douglas Street, Glasgow G2 7NQ.

This specification is distributed free to all approved centres. Additional copies may be purchased from SQA (Sales and Despatch section) at a cost of £1.50 (minimum order £5).

NATIONAL CERTIFICATE MODULE: UNIT SPECIFICATION

STATEMENT OF STANDARDS

UNIT NUMBER: 4110033

UNIT TITLE: ELECTRICAL INSTALLATION: AN INTRODUCTION TO INDUSTRIAL ELECTRONICS

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

OUTCOME

1. IDENTIFY A RANGE OF ELECTRONIC COMPONENTS

PERFORMANCE CRITERIA

(a) Correct identification is made of the electronic components presented, according to the information supplied.

RANGE STATEMENT

Types of components: resistors; capacitors; inductors; transformers; switches; relays; diodes; transistors; thyristors; TRIAC; DIAC; L.E.D's; audible indicators.

Methods of presentation: actual components; representation on circuit diagrams.

Information sources: British Standards circuit symbols for components and conductors; markings; colour codes; pin connections; physical appearance.

EVIDENCE REQUIREMENTS

Evidence of competence in identifying electronic components:

(i) from circuit diagrams;
(ii) from physical characteristics.

Oral or written evidence of knowledge and understanding of:

(i) British Standards circuit symbols for components and conductors;
(ii) differentiating features of types of electronic components.

OUTCOME

2. PRODUCE A WIRING DIAGRAM FROM AN ELECTRONIC CIRCUIT DIAGRAM

PERFORMANCE CRITERIA

(a) The wiring diagram produced correctly translates the required information from the circuit diagram.
(b) Correct interpretation and use are made of relevant British Standards symbols.
(c) The wiring diagram produced is neat, clear and accurately labelled.

RANGE STATEMENT

Component features of wiring diagrams: supply connections; output connections; components; component references (letters, numbers); wiring; joints; terminations.

EVIDENCE REQUIREMENTS

Evidence of competence in preparing a wiring diagram from a circuit diagram.

Oral or written evidence of knowledge and understanding of:

(i) British Standards symbols used in wiring and circuit diagrams for electrical installations;
(ii) methods for transferring information from a circuit diagram to a wiring diagram.

OUTCOME

3. TEST A RANGE OF ELECTRONIC COMPONENTS USED IN THE ELECTRICAL INSTALLATION INDUSTRY

PERFORMANCE CRITERIA

(a) The execution of a functional test is correct in terms of method, sequence of operations and selection of appropriate instruments.
(b) Components tested are confirmed as operational and safe for use, or as defective.
(c) Safe working practices are followed when carrying out tests on electronic components.

RANGE STATEMENT

Components: resistors; capacitors; diodes; L.E.D's; transistors; thyristors; TRIAC; transformers; inductors; relays; switches; audible indicators.

EVIDENCE REQUIREMENTS

Evidence of competence in establishing the viability of electronic components for use in electrical installation, by testing with instruments. Evidence of identification of both satisfactory and defective components should be obtained, in addition to evidence of competence in conducting testing procedures under working conditions.

Oral or written evidence of knowledge and understanding of:

(i) testing procedures and testing instrument selection for electronic components;
(ii) factors governing selection or rejection of components;
(iii) current relevant regulations and codes of practice governing electronic component testing for electrical installation.

OUTCOME

4. ASSEMBLE AND TEST A WORKING ELECTRONIC POWER CONTROL CIRCUIT

PERFORMANCE CRITERIA

(a) The assembly of the circuit is correct to the agreed specification and the wiring diagram.
(b) Soldered joints are neat and sound.
(c) The operation of the circuit is satisfactory.
(d) Safe working practices are followed during the assembly of the circuit.
(e) The assembled circuit is tested and confirmed as safe.

RANGE STATEMENT

Types of circuit: basic electronic power control circuits connected to a controlled outlet.

EVIDENCE REQUIREMENTS

Evidence of competence under working conditions in assembling and testing a working electronic power control circuit.

OUTCOME

5. ASSEMBLE AND TEST A LOGIC CIRCUIT

PERFORMANCE CRITERIA

(a) Logic functions are correctly identified from British Standards symbols.
(b) Correct identification of gates is made by testing of input/output levels.
(c) The assembly of the logic circuit is correct in accordance with the stated requirements and the circuit diagram.
(d) The operation of the assembled circuit is confirmed as satisfactory in accordance with the required function, by the correct use of testing procedures.
(e) The construction of truth tables is accurate for the logic gates and for the logic circuit.
(f) Correct assembly and testing procedures are carried out for the given circuit.

RANGE STATEMENT

The range statement for this outcome is fully expressed within the performance criteria.

EVIDENCE REQUIREMENTS

Evidence of competence in:

(i) testing input/output levels;
(ii) assembling and testing a logic circuit;
(iii) constructing truth tables for logic gates and circuits.

Oral or written evidence of knowledge and understanding of three-input logic circuits and functions.

ASSESSMENT RECORDS

In order to achieve this unit, candidates are required to present sufficient evidence that they have met all the performance criteria for each outcome within the range specified. Details of these requirements are given for each outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of support notes).

Accurate records should be made of assessment instruments used showing how evidence is generated for each outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should be kept. These records will be available for external verification.

SPECIAL NEEDS

In certain cases, modified outcomes and range statements can be proposed for certification. See references at end of Support Notes.

NATIONAL CERTIFICATE MODULE: UNIT SPECIFICATION

SUPPORT NOTES

UNIT NUMBER 4110033

UNIT TITLE ELECTRICAL INSTALLATION: AN INTRODUCTION TO INDUSTRIAL ELECTRONICS

SUPPORT NOTES: This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

NOTIONAL DESIGN LENGTH: SQA allocates a notional design length to a unit on the basis of time estimated for achievement of the stated standards by a candidate whose starting point is as described in the access statement. The notional design length for this unit is 60 hours. The use of notional design length for programme design and timetabling is advisory only.

PURPOSE The unit would primarily be offered to candidates working in electrical installation or a related industry. It is aimed at candidates whose normal place of work would be a site or similar environment and who are receiving complementary work experience in the industry.

SQA publishes summaries of NC units for easy reference, publicity purposes, centre handbooks, etc. The summary statement for this unit is as follows:

This module will help you to acquire knowledge of electrical/electronic components and how they are used in electrical installation. On completion of the module you will be able to assemble a basic electronic power circuit.

CONTENT/CONTEXT The candidate successfully completing this module will require underpinning knowledge and skills relating to analogue and digital electronics.

The unit deals with the practical application of a thorough knowledge of basic digital electronics to the requirements of electrical installation for electronic power control circuits.

The following information may be helpful to tutors/trainers with regard to specific outcomes.

Corresponding to Outcomes 1-5:

Outcomes 1 & 2	deal with the identification of analogue circuits and the relationship between a circuit diagram and a wiring/layout diagram. Underpinning knowledge will also be required regarding handling procedures and precautions and polarity of components. The candidate will require to be thoroughly conversant with British Standards circuit symbols for components and conductors and current IEE and other relevant regulations.
Outcome 3	Underpinning knowledge will be required of component handling precautions, heat sinks and insertion procedures, and of continuity tests.
Outcomes 4 & 5	The candidate will require a thorough knowledge of testing procedures in connection with electronic power control circuits and digital circuits, of AND, OR, NAND and NOR logic gates and NOT function, as well as British Standards and ANSI gate symbols. The use of logic tutor boards is recommended to reduce the complexity of wiring circuits, and the use of logic probes to measure logic states in circuits is encouraged. Comparison can be made with equivalent hard-wired conventional circuits.

APPROACHES TO GENERATING EVIDENCE Knowledge and skills in identifying and testing components should be developed in context throughout the module and not taught in isolation. Wherever possible the more abstract elements should be exemplified through practical application and the teaching should be related to the candidate's own work experience.

Hands-on experience following practical demonstration would be of value in all aspects of the delivery of this module, following an initial grounding in the basic principles.

A project approach to Outcomes 1-4 is recommended and it is suggested that this could take the form of a simple project to control the output from an electrical appliance or portable tool, which could present opportunities for group work.

Employers and supervisors should be encouraged to reinforce the knowledge gained with appropriate practical experience and to assist in evidence gathering wherever practicable.

The safety aspects of practical installation should be stressed.

ASSESSMENT PROCEDURES The assessment of Outcomes 2-4 could be linked and candidates could progress from the production of a wiring diagram to the assembly and testing of a control circuit from the diagram.

Use should be made of a checklist to record the candidate's practical activities and this should be related to the performance criteria and the stated range for each outcome.

All evidence, including supplementary knowledge evidence, should be recorded and made available to the external verifier as required.

RECOGNITION Many SQA NC units are recognised for entry/recruitment purposes. For up-to-date information see the SQA guide 'Recognised and Recommended Groupings'.

REFERENCES

1. Guidelines for Module Writers.
2. SQA's National Standards for Assessment and Verification.
3. For a fuller discussion on assessment issues, please refer to SQA's Guide to Assessment.
4. Procedures for special needs statements are set out in SQA's guide 'Students with Special Needs'.