

**-SQA- SCOTTISH QUALIFICATIONS AUTHORITY**

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**NATIONAL CERTIFICATE MODULE DESCRIPTOR**

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<b>-Module Number-</b>	<b>4110361</b>	<b>-Session-</b>	<b>1991-92</b>
<b>-Superclass-</b>	<b>TH</b>		

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<b>-Title-</b>	<b>ELECTRICAL INSTALLATION METHODS: WIRING SYSTEMS AND TESTING PROCEDURES</b>
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**-DESCRIPTION-**

Purpose

This module is designed to enable the student to acquire an understanding of electrical installation methods involving: sheathed wiring, metal and plastic conduit and trunking, mineral insulated metal sheathed cable, the factors affecting the choice of a wiring system and the relevant regulations for each wiring method, and basic testing procedures.

It is aimed at students from other disciplines, i.e. from non-electrical backgrounds, who have a need for a thorough understanding of the above processes but are not required to develop the practical skills of installation.

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Preferred Entry Level	No formal entry requirements
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Outcomes	The student should:
	<ol style="list-style-type: none"><li>1. describe the installation methods for PVC sheathed wiring;</li><li>2. describe the installation methods for metal and plastic conduit;</li><li>3. describe the installation methods for metal and plastic trunking;</li><li>4. describe the installation methods for mineral insulated metal sheathed cables;</li><li>5. explain the applications, advantages and limitations of the above mentioned systems;</li><li>6. describe basic testing procedures for the above mentioned systems.</li></ol>

Assessment  
Procedures

Acceptable performance in the module will be satisfactory achievement of all the Performance Criteria specified for each Outcome.

The following abbreviations are used below:

PC Performance Criteria  
IA Instrument of Assessment

**Note:** The Outcomes and PCs are mandatory and cannot be altered. The IA may be altered by arrangement with SQA. (Where a range of performance is indicated, this should be regarded as an extension of the PCs and is therefore mandatory.)

**OUTCOME 1**

**DESCRIBE THE INSTALLATION METHODS FOR PVC SHEATHED WIRING**

PCs

- (a) The described installation methods are in accordance with the requirements of PVC sheathed wiring systems.
- (b) The description of the installation methods makes accurate reference to:
  - (i) the methods of testing continuity of circuit protective conductor;
  - (ii) the method of testing insulation resistance.
- (c) The described methods are correct in terms of:
  - (i) the location of the cable;
  - (ii) the method of fixing of the cable;
  - (iii) protection against mechanical damage.
- (d) The described methods of installation are in accordance with current IEE regulations.

IA Restricted Response

The student will be set a restricted response exercise to test the knowledge required to describe the installation methods for PVC sheathed wiring.

The student will be required to describe the method of installing PVC sheathed wiring:

- (i) on the surface of a wall which will subsequently be plastered over;
- (ii) in the void between a plasterboard ceiling and a wooden floor.

Satisfactory achievement of the Outcome will be based on the student attaining all the Performance Criteria.

**OUTCOME 2 DESCRIBE THE INSTALLATION METHODS FOR METAL AND PLASTIC CONDUIT**

- PCs
- (a) The described installation methods are in accordance with the requirements of metal and plastic conduit systems.
  - (b) The described installation methods are correct in terms of:
    - (i) gauge and corrosion protection of the conduit;
    - (ii) the method of fixing the conduit;
    - (iii) the methods of cutting and threading;
    - (iv) the methods of jointing, terminating, bending and setting;
  - (c) The described installation methods are in accordance with current IEE regulations.
  - (d) The conduit capacity is in compliance with the IEE regulations.

**IA Short Answers**

The student will be set an exercise consisting of short answer questions to describe the installation methods for metal and plastic conduit.

The student will be required to answer 15 questions on the installation methods of metal and plastic conduit systems, with specific reference to IEE regulations. The questions will be allocated as follows:

- |       |                          |     |
|-------|--------------------------|-----|
| (i)   | type of conduit          | - 2 |
| (ii)  | fixing of conduit        | - 3 |
| (iii) | cutting and threading    | - 2 |
| (iv)  | jointing and terminating | - 3 |
| (v)   | bending and setting      | - 2 |
| (vi)  | conduit capacity         | - 1 |
| (vii) | IEE regulations          | - 2 |

Satisfactory achievement of the Outcome will be based on the student attaining all the Performance Criteria. This will be demonstrated by the student answering all the questions correctly.

**OUTCOME 3                    DESCRIBE THE INSTALLATION METHODS FOR METAL AND PLASTIC TRUNKING**

- PCs
- (a) The described installation methods are in accordance with the requirements of metal and plastic trunking systems.
  - (b) The described installation methods are correct in terms of:
    - (i) the type of trunking;
    - (ii) the joining, bending and fixing of the trunking.
  - (c) The described installation methods are in accordance with current IEE regulations.
  - (d) The trunking capacities are in compliance with the IEE regulations.

**IA    Short Answers**

The student will be set an exercise consisting of short answer questions to test the knowledge required to describe the installation methods for metal and plastic trunking.

The student will be required to answer 7 questions on the installation methods of metal and plastic trunking systems with specific reference to IEE Regulations. The questions will be allocated as follows:

- |       |                             |     |
|-------|-----------------------------|-----|
| (i)   | type of trunking            | - 2 |
| (ii)  | joining, bending and fixing | - 2 |
| (iii) | trunking capacities         | - 1 |
| (iv)  | IEE regulations             | - 2 |

Satisfactory achievement of the Outcome will be based on the student attaining all the Performance Criteria.

**OUTCOME 4                    DESCRIBE THE INSTALLATION METHODS FOR MINERAL INSULATED METAL SHEATHED CABLES**

- PCs
- (a) The described installation methods are in accordance with the requirements of mineral insulated metal sheathed cable systems.
  - (b) The described installation methods are correct in terms of:
    - (i) the structure of the cable;
    - (ii) the methods of terminating and fixing.
  - (c) The described installation methods are in accordance with current IEE regulations.

## IA Short Answers

The student will be set an exercise consisting of short answer questions to test the knowledge required to describe the installation methods for mineral insulated metal sheathed cables.

The student will be required to answer 10 questions on the installation methods for mineral insulated metal sheathed cable systems, with specific reference to IEE regulations. The questions will be allocated as follows:

- |       |                        |     |
|-------|------------------------|-----|
| (i)   | structure of cable     | - 2 |
| (ii)  | terminating and fixing | - 6 |
| (iii) | IEE regulations        | - 2 |

Satisfactory achievement of the Outcome will be based on the student attaining all the Performance Criteria.

**OUTCOME 5****EXPLAIN THE APPLICATIONS, ADVANTAGES AND LIMITATIONS OF THE ABOVE MENTIONED SYSTEMS**

PCs

- (a) The explanation is correct in terms of:
- (i) covering all relevant aspects of each system;
  - (ii) being clear and concise;
  - (iii) assessment of the suitability of each system for installation in different locations.
- (b) The explanation makes accurate and relevant reference to factors affecting the choice of installation.

## IA Restricted Response

The student will be set a restricted response exercise to test the knowledge required to explain the applications, advantages and limitations of the systems mentioned in Outcomes 1-4.

The student will be required to:

- (i) outline the advantages and limitations of each of the four wiring systems and the typical applications for each system;
- (ii) list six factors which affect the choice of installation method.

Satisfactory achievement of the Outcome will be based on the student attaining all the Performance Criteria.

**OUTCOME 6            DESCRIBE BASIC TESTING PROCEDURES FOR THE ABOVE MENTIONED SYSTEMS**

PCs

- (a) The description is correct in terms of:
- (i) the type of instrument to be used for each test;
  - (ii) the expected readings.
- (b) The description is in accordance with current safety regulations.

**IA    Structured Questions**

The student will be set an exercise consisting of structured questions to test the knowledge required to describe basic testing procedures for the above mentioned systems.

The student will be presented with examples/illustrations of:

- (i) a PVC sheathed wiring system;
- (ii) a metal or plastic conduit system;
- (iii) a metal or plastic trunking system;
- (iv) a mineral insulated metal sheathed cable system;

and required to give a clear outline of the testing procedures appropriate to each system.

Satisfactory achievement of the Outcome will be based on the student attaining all the Performance Criteria.

**The following sections of the descriptor are offered as guidance.  
They are not mandatory.**

### CONTENT/CONTEXT

Corresponding to Outcomes 1-6:

1. components, accessories associated with sheathed wiring. Methods of termination and installing techniques. Earth continuity. Use of junction box. IEE Regulations applicable to sheathed wiring.
2. common sizes, types, lengths and accessories associated with metal and plastic conduit systems. Methods of joining, bending, fixing, termination and ensuring earth continuity. Conduit capacities, IEE Regulations applicable to conduit installations.
3. common sizes, types, lengths and accessories associated with metal and plastic trunking. Methods of joining, bending, fixing, terminating and ensuring earth continuity. Applications. IEE Regulations applicable to metal and plastic trunking installations.
4. common sizes, types and accessories. Tools. Methods of terminating and fixing. Bending. Different temperature terminations. Methods of protecting M.I.M.S. cable from corrosion. IEE Regulations applicable to M.I.M.S. cables and installations.
5. type and size of installation, adverse conditions, degree of mechanical protection required, ambient temperature, possible future extensions, need for rewiring, cost of installation (materials and labour).  
  
Advantages and disadvantages of each system. Applications. Consideration of limitations of each system and the salient features.
6. Test of continuity of circuit protective conductor (copper and steel).  
Test of insulation resistance (PVC sheathed cable and mineral insulated cable).  
Types of instruments used for testing. Expected readings. Precautions to be taken during testing.

**SUGGESTED LEARNING AND TEACHING APPROACHES**

Discussion, project/assignment, example and demonstration.

Practical examples of each type of system, and "hands on" experience following practical demonstrations would be an advantage.

Students should be continually referred to the relevant IEE Regulations.

The students should be encouraged to reproduce diagrams and sketches of installations and to supplement verbal description with simple illustrations.

The use of slides, films, visual aids, manufacturers' catalogues and questionnaires is recommended.

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