

## REGULATED QUALIFICATION FRAMEWORK (RQF)

### QUALIFICATION SPECIFICATION

- **LCL Awards Level 3 Certificate in Installing Testing and Ensuring Compliance of Electrical Installations in Dwellings**

#### 1. Objective:

The qualification allows learners to continue to learn, develop and practise the skills required for employment within the electrotechnical sector. The objective of this qualification is for learners to demonstrate they are competent in accordance with legislation, regulations and industry standards;

The target groups for the qualification are those learners who are:

1. Updating occupational competence, continuous professional development and or obtaining a licence to practice
2. Preparing for further learning or training and/or developing knowledge and or skills in a subject area who are existing workers in the occupation seeking to extend their range of work}

#### 2. Qualification Framework:

**The qualification comprises of 8 mandatory Units:**

Unit Title	Unit Reference Number	Type of Unit	Level	Credit Rating
<u>Understand and Apply Health and Safety legislation, practices and procedures in Electrical Installations H/504/4494</u>	LCL-Q3001	Combination	3	4
<u>Understand and apply environmental legislation, working practices and the principles of environmental technology systems associated with Electrical Installations D/504/4493</u>	LCL-Q3002	Combination	3	4
<u>Understand and apply the practices and procedures for overseeing and organising the work environment when installing electrical installations K/504/4898</u>	LCL-Q3003	Combination	3	3
<u>Electrotechnical occupational competence - Approval of Electrical Installations R/504/4491</u>	LCL-Q3004	Combination	3	1
<u>Understanding and applying the principles, practices and procedures for the planning,</u>	LCL-Q3005	Combination	3	3

<u>preparation and selection of wiring systems and electrotechnical equipment T/504/5469</u>				
<u>Understand and apply the principles, practices and legislation for diagnosing and correcting electrical faults in electrical installations M/504/5471</u>	LCL-Q3006	Combination	3	4
<u>Understand and apply the practices and procedures for the installation and connection of wiring systems and electrotechnical equipment T/504/5472</u>	LCL-Q3007	Combination	3	3
<u>Understand and apply the principles, practices and legislation for the inspection, testing, commissioning, approving and certification of electrical installations A/504/5487</u>	LCL-Q3008	Combination	3	5

#### Qualification Structure:

- **LCL Awards Level 3 Certificate in Installing Testing and Ensuring Compliance of Electrical Installations in Dwellings**
  - QAN 601/7876/0
  - QW C00/0752/8
  - The Guided Learning Hours (GLH) are **224 hours**
  - Total Qualification Time (TQT) is **270 hours**
  - The total credit required to achieve the qualification is **27**

#### Condition of certification:

None

### 3. Unit Grading Structure:

The learner is required to successfully achieve a pass in each unit for this qualification to be awarded.

#### 4. Unit specifications:

##### **LCL-Q3001: Understand and Apply Health and Safety legislation, practices and procedures in Electrical Installations**

Assessment Method {M/C-O/L - LE}

##### **Learning Outcome 01: The learner will know how relevant Health and Safety legislation applies in the workplace**

*The learner will demonstrate knowledge of:*

1.1. Their own roles and responsibilities and those of others with regard to current relevant legislation including:

- The Health and Safety at Work Act
- The Electricity at Work Regulations
- The Management of Health and Safety at Work Regulations
- Workplace (Health and Safety and Welfare) Regulations
- Control of Substances Hazardous to Health (COSHH) Regulations
- Working at Height Regulations
- Personal Protective Equipment at Work Regulations
- Manual Handling Operations Regulations
- Provision and Use of Work Equipment Regulations
- Control of Asbestos at Work Regulations
- Environmental Protection Act
- The Hazardous Waste Regulations
- The Electrical and Electronic Equipment Waste Regulations

1.2. Health and Safety risks which may be present and the requirements of current health and safety legislation for the range of work operations when installing wiring systems and electrotechnical equipment in dwellings including:

- Preparation and planning
- Installation
- Termination and connection
- Inspection, testing and commissioning
- Fault diagnosis and rectification
- Maintenance

##### **Learning Outcome 02: The learner will be able to apply relevant Health and Safety legislation in the workplace**

The learner will be able to:

- 2.1. Identify which workplace health and safety procedures are relevant to the working environment and comply with their duties and obligations as defined by current legislation and organisational procedures
- 2.2. Produce a risk assessment and method statement in accordance with organisational procedures and the limits of their responsibility
- 2.3. Work within the requirements of:
  - Risk assessments
  - Method statements
  - Safe systems of work

**Learning Outcome 03:** The learner will know the procedures for dealing with health and safety in the work environment

*The learner will be able to:*

- 3.1. The procedures that should be followed in the case of accidents which involve injury, including requirements for the treatment of electric shock/electrical burns
- 3.2. The procedures which should be followed when emergency situations occur in the workplace, including:
  - Procedures for summoning emergency services
  - Information that emergency services require
  - Alarm and evacuation procedures
  - Designated escape routes
  - Firefighting procedures
  - Application of First Aid
- 3.3. The limitations of their responsibilities in terms of health and safety in the workplace
- 3.4. The actions to be taken in situations which exceed their level of responsibility for Health and Safety in the workplace
- 3.5. The procedures that should be followed in accordance with the relevant health and safety regulations for reporting health, safety and/or welfare issues in the workplace
- 3.6. The appropriate responsible persons to whom health and safety and welfare related matters should be reported, including:
  - Employer
  - Employees
  - Customer/Client
  - Safety Officers
  - H&S Executive/Inspectors
  - Environmental Health Officers

**Learning Outcome 04:** The learner will be able to assess the work environment for hazards and identify remedial actions in accordance with Health and Safety legislation

*The learner will be able to:*

- 4.1. Identify unsafe situations and conditions and take remedial actions
- 4.2. Assess the work environment and revise work practices accordingly to take into account hazards which could cause harm, including the handling of potentially hazardous:
  - Materials
  - Tools
  - Equipment
- 4.3. Identify any hazards which may present a high risk and report their presence to relevant persons who have overall responsibility for health and safety in the workplace
- 4.4. Apply measures to control health and safety hazards in accordance with the limits of their capabilities and job responsibility
- 4.5. Select and use correct Personal Protective Equipment and protection measures to ensure the health and safety of themselves and others in the work environment

**Learning Outcome 05:** The learner will know the procedures and practices for establishing a safe working environment

*The learner will demonstrate knowledge of:*

- 5.1. Define what is meant by the term hazard in relation to Health and Safety legislation in the workplace
- 5.2. The appropriate protective clothing and equipment that is required for identified work tasks
- 5.3. The first aid facilities that must be available in the work area in accordance with health and safety regulations and their application
- 5.4. The safe practices and procedures when using:
  - Access Equipment (PASMA requirements)
  - Portable power tools (e.g. Cartridge gun, drills, Grinders)
  - Tools and materials storage facilities
  - Dangerous substances e.g. cutting compounds and adhesives
- 5.5. The warning signs for the seven main groups of hazardous substance, as defined by The Chemical (Hazard Information and Packaging for Supply) Regulations (CHIP)
- 5.6. The practices and procedures for addressing hazards in the work place such as;
  - Temporary electrical supplies
  - Trailing leads/cables
  - Slippery or uneven surfaces
  - Presence of dust and fumes
  - Handling and transporting equipment or materials
  - Contaminants and irritants
  - Fire
  - Working at height
  - Working in confined spaces
  - Hazardous malfunctions of equipment
  - Improper use and storage of tools and equipment
- 5.7 Identify the correct type of fire extinguisher for a particular types of fire
- 5.8 The situations where asbestos may be encountered, including:
  - Asbestos in decorative finishes (Artex, plaster, floor tiles)
  - Asbestos in accessories (flash guards and matting in fuse carriers and on distribution board covers)
  - Asbestos in insulation storage compartments, vessels and pipework
- 5.9 The procedures for dealing with the suspected presence of asbestos in the workplace

**Learning Outcome 06:** The learner will be able to apply methods and procedures to ensure work on site is in accordance with Health and Safety legislation

*The learner will be able to:*

- 6.1 Demonstrate personal conduct and behaviour around the workplace, to ensure that the health and safety of themselves and others is not endangered
- 6.2 Apply procedures to ensure the safe use, maintenance and storage of tools, plant and equipment as stipulated in
  - Workplace policies (company and site)
  - Supplier and manufacturer information and instructions
- 6.3 Comply with hazard warning, mandatory instruction and prohibition notices
- 6.4 Apply procedures to ensure the safety of the work location through the correct use of guards and notices
- 6.5 Use access equipment correctly
- 6.6 Demonstrate the correct procedures to follow in the event of injury to themselves or others, including:

- Application of basic first aid procedures
- Notification of emergency services
- Reporting of incidents

**LCL-Q3002: Understand and apply environmental legislation, working practices and the principles of environmental technology systems associated with Electrical Installations**

Assessment Method {M/C-O/L - LE}

**Learning Outcome 01:** The learner will know the environmental legislation, working practices and principles which are relevant to work activities

*The learner will demonstrate knowledge of:*

1.1. The current, relevant legislation for processing waste, including:

- Environmental Protection Act
- The Hazardous Waste Regulations
- Pollution Prevention and Control Act
- Control of Pollution Act
- The Control of Noise at Work Regulations
- Packaging (Essential Requirements) Regulations
- Environment Act
- The Waste Electrical and Electronic Equipment Regulations

1.2. What is meant by the term environment.

1.3. The ways in which the environment may be affected by work activities:

- Land contamination
- Air pollution
- Pollution of water courses

1.4. The requirements for electrical installations in dwellings as outlined in relevant sections of the Building Regulations and the Code for Sustainable Homes

1.5. The materials and products that are classed as:

- Hazardous to the environment
- Recyclable

1.6. The organisational procedures for processing materials that are classed as:

- Hazardous to the environment
- Recyclable

**Learning Outcome 02:** The learner will be able to apply environmental legislation, working practices and principles for electrical installations

*The learner will be able to:*

2.1. Demonstrate workplace procedures for the safe handling, storage and disposal of hazardous materials and products, in accordance with any of the following:

- Environmental Protection Act
- The Hazardous Waste Regulations
- Pollution Prevention and Control Act
- Control of Pollution Act
- The Control of Noise at Work Regulations
- Packaging (Essential Requirements) Regulations
- Environment Act
- The Waste Electrical and Electronic Equipment Regulations

- 2.2. Demonstrate work practices and procedures which are in accordance with the requirements for electrical installations in dwellings as specified in the relevant sections of the Building Regulations and the Guide for Sustainable Homes
- 2.3. Demonstrate appropriate organisational procedures for reporting environmental hazards

**Learning Outcome 03:** The learner will know how work methods and procedures can reduce material wastage and impact on the environment

*The learner will demonstrate knowledge of:*

- 3.1. The installation methods that can help to reduce material wastage
- 3.2. Why it is important to report any hazards to the environment that arise from work procedures
- 3.3. Environmentally friendly materials, products and procedures that can be used in the installation of wiring systems and electrotechnical equipment in dwellings

**Learning Outcome 04:** The learner will be able to apply work methods and procedures to reduce material wastage and the impact of work activities on the work environment

*The learner will be able to:*

- 4.1. Demonstrate prefabrication and installation methods which can help to reduce material wastage
- 4.2. Identify and use environmentally friendly materials, products and procedures for the installation and maintenance of wiring systems and electrotechnical equipment in dwellings

**Learning Outcome 05:** The learner will know how and where environmental technology systems can be applied in relation to electrical installations

*The learner will demonstrate knowledge of:*

- 5.1. The fundamental operating principles of the following environmental technology systems:
  - Solar photovoltaic, including function of inverters
  - Wind energy generation (Micro)
  - Micro hydro generation
  - Heat pumps
  - Combined heat and power (CHP) including micro-CHP
  - Solar thermal hot water heating
- 5.2. The applications and limitations of the following environmental technology systems:
  - Solar photovoltaic
  - Wind energy generation (Micro and macro)
  - Micro hydro generation
  - Heat pumps
  - Combined heat and power (CHP) including micro-CHP
  - Solar thermal hot water heating
- 5.3. The Local Authority Building Control requirements which apply to the installation of environmental technology systems in relation to electrical installations in dwellings

**Learning Outcome 06:** The learner will know the safety requirements of photovoltaic (SPV) installations

*The learner will demonstrate knowledge of:*

- 6.1. The requirements for positioning, fixing and connecting the following components
  - A.C isolator

- D.C isolator
- inverter
- D.C cabling from P.V module to D.C isolator
- D.C cabling from D.C isolator to inverter

6.2. Other safety considerations, including;

- PV modules cannot be switched off and that measures are necessary to ensure contact cannot be made with live connections.
- recognise that voltage is generated at low light levels and can lead to risk of electric shock
- PV modules as current limiting devices not damaged by short circuits and therefore not liable to be protected by fuses.

6.3. Methods of verifying and securing (locking off) circuit isolation.

**LCL-Q3003: Understand and apply the practices and procedures for overseeing and organising the work environment when installing electrical installations.**

*Assessment Method {M/C- O/L - LE}*

**Learning Outcome 01:** The learner will be able to apply the types of technical and functional information that is available for the installation of electrotechnical systems and equipment

*The learner will be able to:*

1.1. Specify sources of technical and functional information which apply to electrotechnical installations, including:

- Manufacturer information and data
- Supplier information and data
- Information from their employing organisation
- Installation specifications
- Specifications, drawings and diagrams

1.2. Interpret technical and functional information and data from:

- Manufacturer information and data
  - Materials
  - Components
  - Equipment
  - Measuring and test instruments
- Supplier information and data
  - Materials
  - Components
  - Equipment
  - Measuring and test instruments
- Information from their employing organisation
- Installation specifications
- Client/customer specifications
- Specifications, drawings and diagrams
- Records and certificates for –
  - Inspection
  - Testing
  - Installation completion

1.3. Interpret technical and functional information relating to electrotechnical products or equipment:

- Operation
- Controls



- Settings
  - Adjustments
- 1.4. Confirm the work site requirements and procedures in terms of:
- Services provision
  - Ventilation provision.
  - Waste disposal procedures
  - Equipment and material storage
  - Health and Safety requirements
  - Access by personnel
- 1.5. Identify equipment and systems that are compatible to site operations and requirements

**Learning Outcome 02:** The learner will know the procedures for supplying technical and functional information to relevant people

*The learner will demonstrate knowledge of:*

- 2.1 The limits of their responsibility for supplying technical and functional information to:
- Clients
  - Customers
  - Site managers
- 2.2 The organisational policies/procedures for the handover and demonstration of electrotechnical systems and equipment, including requirements for confirming and recording handover
- 2.3 The appropriateness of different customer relations methods and procedures
- 2.4 The methods of providing technical and functional information appropriate to the needs of:
- Clients
  - Customers
  - Site managers
- 2.5 The importance of ensuring that:
- Information provided is accurate and complete
  - Information is provided clearly, courteously and professionally
  - Copies of information provided are retained
  - The installation, on completion, functions in accordance with the specification, is safe and complies with industry standards
- 2.6 The methods for checking that relevant persons have an adequate understanding of the technical and non-technical information provided, including appropriate Health and Safety information

**Learning Outcome 03:** The learner will be able to provide relevant people with technical and functional information for work on electrical systems and equipment

*The learner will be able to:*

- 3.1. Identify the relevant people who need to be supplied with technical and functional information
- 3.2. Identify any additional information that may also be required such as:
- Health and Safety information
  - Isolation procedures for products/equipment in case of emergencies
- 3.3. Liaise with relevant people to determine the information they require to ensure that systems, equipment or components can be operated safely and effectively
- 3.4. Identify appropriate technical and functional information that is required for the work activity

**Learning Outcome 04:** The learner will know the requirements for overseeing Health and Safety in the work environment

*The learner will demonstrate knowledge of:*

4.1. The applicable Health and Safety requirements with regard to overseeing the work of others

4.2. The procedures for:

- Interpreting risk assessments
- Applying method statements
- Monitoring changing conditions in the workplace
- Complying with site organisational procedures
- Managing Health and Safety on site
- Organising the safe and secure storage of tools and materials

**Learning Outcome 05:** The learner will be able to oversee Health and Safety during work on electrical installations

*The learner will be able to:*

5.1 Produce risk assessments and method statements, to cover their own work and others working in the area (colleagues and other operatives) in accordance with their level of responsibility

5.2 Follow procedures to confirm that work is being completed in accordance with Health and Safety legislation and industry standards

**Learning Outcome 06:** The learner will understand the requirements for liaising with others when organising and overseeing work activities

*The learner will demonstrate knowledge of:*

6.1. The techniques for the communication with others for the purpose of:

- Motivation
- Instruction
- Monitoring
- Cooperation

6.2. The methods of determining the competence of operatives for whom they are responsible, such as;

- Checking competency scheme registration cards
- Checking technical qualifications
- Written references from previous employers
- Informal monitoring of performance on site

6.3. Their role in terms of:

- Responsibility for other staff
- Liaison with their employer
- Communication with –
  - Customers
  - Clients
  - Site managers
  - Sub-contractors (where appropriate)
  - Other trades
  - The public

6.4. The appropriate methods for communicating with and responding to others, including:

- Customers
- Clients

- Site managers
- Sub-contractors (where appropriate)
- Other trades
- The public

6.5. The procedures for re-scheduling work to co-ordinate with changing conditions in the workplace and to coincide with other trades

6.6. The organisational procedures for completing the documentation that is required during work operations

**Learning Outcome 07:** The learner will be able to Co-ordinate liaison with other relevant persons during work activities

*The learner will be able to:*

7.1 Comply with approved procedures to ensure effective co-ordination with other workers/contractors, including steps to resolve issues which are outside the scope of their job role

7.2 Apply communication techniques that are clear, accurate and appropriate to the situation

**Learning Outcome 08:** The learner will know the requirements for organising and overseeing work programmes for the installation

*The learner will demonstrate knowledge of:*

8.1 How to plan:

- Work allocations
- Duties of operative for whom they are responsible
- Coordination with other services and personnel

8.2 The procedures for carrying out work activities that will:

- Maintain the safety of the work environment
- Maintain cost effectiveness
- Ensure compliance with programmes of work

8.3 The industry standards that are relevant to activities carried out during the installation of electrotechnical systems and equipment in dwellings, including the current editions of:

- Management of Health and Safety Regulations
- Health & Safety at Work Act
- Electricity at Work Regulations
- Building Regulations (2010) – Parts A, B, C, E, F, L, M, P
- BS 7671 Requirements for Electrical Installations
- BS EN Graphical Symbols

8.4 Their responsibilities within the scope of the work programme.

8.5 How to determine the estimated time required for the completion of work activities taking into account influential factors such as;

- The deployment and availability of suitable personnel
- The delivery and availability of equipment, components and material
- Weather conditions
- Work to be completed by other trades
- Specification variations

8.6 The possible consequences of not:

- Completing work within the estimated time
- Meeting the requirements of the programme of work
- Using the specified materials

- Installing materials and equipment as specified
- 8.7 The methods of producing and illustrating work programmes such as;
- Bar charts
  - Spread sheets
  - Critical Path Analysis

**Learning Outcome 09:** The learner will know the requirements for organising the provision and storage of resources that are required for work activities  
*The learner will demonstrate knowledge of:*

- 9.1. The installation specification and work programme to identify resource requirements for the following:
- Materials
  - Components
  - Equipment
  - Labour
  - Tools
  - Measuring and test instruments
- 9.2. The material schedule to confirm that materials available are:
- The right type
  - Fit for purpose
  - In the correct quantity
- 9.3. The storage and transportation requirements for all materials required in the work location
- 9.4. The procedures to ensure the safe and effective storage of materials, tools and equipment in the work location

**Learning Outcome 10:** The learner will be able to organise and oversee work activities and operations  
*The learner will be able to:*

- 10.1 Organise operatives by allocating duties and responsibilities to make the best use of their competence
- 10.2 Monitor the work of operatives to ensure it is in accordance with:
- Industry working practices
  - Programme of work
  - Health and Safety requirements
- 10.3 Apply the correct procedures when a non-compliance is identified during the completion of work activities

**LCL-Q3004: Electrotechnical occupational competence - Approval of Electrical Installations**  
*Assessment Method {M/C-O/L – LE}*

**Learning Outcome 01:** The learner will be able to interpret specifications, drawings and diagrams  
*The learner will be able to:*

- 1.1. Interpret specifications and technical data for the inspection and functional testing of:
- Protective Earthing Systems
  - A ring final circuit
  - A general lighting circuit
  - Three-phase motor circuit
  - Intruder alarm circuit

**Learning Outcome 02:** The learner will be able to undertake risk assessments

*The learner will be able to:*

- 2.1. Review safe working practices
- 2.2. Undertake a risk assessment
- 2.3. Complete risk assessment documentation in accordance with organisational procedures

**Learning Outcome 03:** The learner will be able to carry out the safe isolation of electrical circuits and a complete electrical installation

*The learner will be able to:*

- 3.1. Locate correct means of isolation
- 3.2. Follow correct procedures for the isolation of electrical circuit(s) and complete electrical installations
- 3.3. Isolate circuit (s) in correct sequence
- 3.4. Select correct test and measuring instruments
- 3.5. Correctly test for the presence of an electrical supply

**Learning Outcome 04:** The learner will be able to complete the visual inspection, initial verification and certification of an electrical installation

*The learner will be able to:*

- 4.1. Comply with correct procedures
- 4.2. Record relevant findings on correct documentation
  - Electrical Installation Certificates
  - Minor Electrical Installation Works Certificates
  - Schedules of Inspections
  - Schedules of Test results

**Learning Outcome 05:** The learner will be able to complete the testing and certification of an electrical installation in accordance with industry requirements

*The learner will be able to:*

- 5.1. Select and use the correct measuring instruments
- 5.2. Confirm instruments function accurately
- 5.3. Measure the continuity of protective conductors
- 5.4. Measure the continuity of ring final circuit conductors
- 5.5. Measure the insulation resistance of the installation and its circuits
- 5.6. Confirm the polarity of the installation's electrical outlets and components
- 5.7. Determine the installation's earth fault-loop impedance (EFLI)
- 5.8. Determine the installation's prospective fault current (PFC)
- 5.9. Carry out functional tests on the installation's equipment and components
- 5.10. Complete the correct documentation in accordance with statutory and non-statutory regulations
  - Electrical Installation Certificates
  - Minor Electrical Installation Works Certificates
  - Schedules of Inspections
  - Schedules of Test results

**Learning Outcome 06:** The learner will be able to diagnose, and recommend how to rectify, electrical faults in an electrical installation in accordance with industry requirements

*The learner will be able to:*

- 6.1. Undertake an assessment of risk accordingly
- 6.2. Carry out safe isolation in the correct sequence as appropriate to fault diagnosis procedures
- 6.3. Select and use correctly, fit for purpose tools, equipment and instruments
- 6.4. Carry out relevant checks and preparations
- 6.5. Locate faults from given information
- 6.6. Advise how the identified faults can be rectified

**LCL-Q3005: Understanding and applying the principles, practices and procedures for the planning, preparation and selection of wiring systems and electrotechnical equipment**

*Assessment Method {M/C-O/L-LE}*

**Learning Outcome 01:** The learner will know electrical supply and distribution systems for a consumer supply

*The learner will demonstrate knowledge of:*

- 1.1. How electricity is generated and transmitted for consumption in dwellings
- 1.2. The features and characteristics of a generation and transmission system including:
  - Power Stations – fossil fuel; hydro; oil; nuclear
  - Super-Grid and Standard Grid system
  - Transformers
  - Transmission voltages
  - Sub-stations
  - Above and below ground distribution
- 1.3. The main characteristics of:
  - Single phase electrical supplies
  - Three phase electrical supplies
  - Three phase and neutral supplies
  - Earth-fault loop path
- 1.4. The operating principles, applications and limitations of the following types of transformer:
  - Core
  - Double-wound
  - Auto
- 1.5. The relationship between kVA, kVAr and kW
- 1.6. The characteristics and applications, of the following systems:
  - TN-S
  - TN-C-S
  - TT
  - IT

**Learning Outcome 02:** The learner will know the principles of internal and external earthing arrangements for electrical installations for buildings, structures and the environment

*The learner will demonstrate knowledge of:*

- 2.1 The key principles relating to earthing and bonding
- 2.2 The key principles relating to the protection of electrical systems, including:

- Automatic disconnection and the implications of exposed and extraneous conductive parts within a building forming a circuit to the mass of earth or Main Earthing Terminal (MET) under fault conditions
  - The basic principles of shock protection, circuit overload and short-circuit protection
    1. Maximum disconnection times for different types of circuit
    2. Discrimination between protective devices
    3. Fault current capacities of devices
- 2.3 The operating principles, applications and limitations of protective devices, including:
- RCDs/RCBOs
  - Fuses (BS3036, re-wireable, BS88 HBC)
  - CBs (thermal, magnetic and combined tripping)
- 2.4 What is meant by the following terms relating to earthing and the function of earth protection:
- Earth fault loop impedance
  - Protective multiple earthing (PME)

**Learning Outcome 03:** The learner will be able to confirm the electrical supply is in accordance with the installation specification

*The learner will be able to:*

- 3.1. Verify the compatibility of the electrical supply to the requirements of the installation specification
- 3.2. Identify the earthing arrangement for the electrical installation

**Learning Outcome 04:** The learner will know the principles for selecting cables, cable carriers, circuit protection devices, electrotechnical equipment and accessories for electrical installations

*The learner will demonstrate knowledge of:*

- 4.1. How external influences can affect the choice of wiring systems and enclosures
- 4.2. The current ratings for different circuit protection devices
- 4.3. The procedure for selecting appropriate overcurrent protection devices
- 4.4. What is meant by diversity factors and explain how a circuits maximum demand is established after diversity factors are applied
- 4.5. The procedure for selecting a suitable type and size of cable, including:
  - Calculating the current demand of single- phase circuits
  - The environment where the cable is to be installed
  - Selecting a protective device
  - Applying factors for –
    - Grouping
    - Thermal insulation
    - Ambient temperature
    - Installation condition or protective device type
  - Establishing the installation method
  - Selecting a suitably sized cable
  - Checking voltage drop is not excessive
  - Determining circuit disconnection times, as relevant,  $R1 + R2$ ,  $Z_e$  and  $Z_s$
  - Considering thermal constraints
- 4.6. The cable-carrying capacity of conduit and trunking as appropriate to the size and number of cables to be installed in accordance with BS7671
- 4.7. The constructional features, applications, advantages and limitations of the following types of cable:
  - Thermosetting insulated cables including flexes

- Single and multicore thermoplastic (PVC) and thermosetting insulated cables
  - PVC/PVC flat profile cable
  - SWA PVC cable
  - Armoured/braided flexible cables and cords
  - Fire resistant cable
- 4.8. The constructional features, applications, advantages and limitations of the following types of cable and conductor containment systems:
- Conduit (PVC and Metallic)
  - Trunking (PVC and Metallic)
- 4.9. How the following environmental factors can affect the selection of wiring systems and enclosures, associated equipment and accessories, including:
- Ambient temperature
  - Effect of moisture on insulation
  - Corrosive substances
  - UV rays
  - Damage by animals
  - Mechanical stress and vibration damage
  - Aesthetic considerations
  - Exposure to the elements
- 4.10. The types of wiring systems, associated equipment and accessories used for:
- Lighting systems
  - Power systems (final circuits)
  - Distribution systems (sub mains)
  - Environmental control/building management systems (including heating and cooling systems)
  - Security systems – Fire Alarm/Prevention; Unlawful Entry; Emergency Lighting

**Learning Outcome 05:** The learner will be able to confirm that planned work is in accordance with the installation specification

*The learner will be able to:*

- 5.1. Verify that cable types and sizes meet the requirements of the installation specification
- 5.2. Verify that protective devices meet the requirements of the installation specification
- 5.3. Verify that enclosures, equipment and accessories meet the requirements of the installation specification

**LCL-E3006: Understand and apply the principles, practices and legislation for diagnosing and correcting electrical faults in electrical installations**

*Assessment Method {M/C-O/L-LE}*

**Learning Outcome 01:** The learner will know the relationship between different electrical properties and A.C electrical circuits and equipment.

*The learner will demonstrate knowledge of:*

- 1.1 How to Identify and determine the values of:
  - Resistance
  - Resistivity
  - Power
  - Frequency
  - Current
  - Voltage



- Energy
- Impedance
- Power Factor
- Actual Power
- Reactive Power
- Apparent Power

1.2 The electrical instruments used for the measurement of different electrical values including:

- Resistance
- Power
- Frequency
- Current
- Voltage
- Energy
- Impedance

**Learning Outcome 02:** The learner will know the principles, regulatory requirements and procedures for completing the safe isolation of electrical circuits and complete electrical installations

*The learner will demonstrate knowledge of:*

2.1 The correct procedure for completing safe isolation with regard to:

- Carrying out safe working practices
- Correctly identifying circuit(s) to be isolated
- Identifying suitable points of isolation
- Selecting correct test and proving instruments in accordance with relevant industry guidance and standards
- Applying correct testing methods
- Selecting locking devices for securing isolation
- Placing of warning notices
- Applying correct sequence for the safe-isolation of an electrical circuit and complete electrical installation

2.2 The implications of carrying out safe isolations to:

- Other personnel
- Customers/clients
- Public
- Building systems (loss of supply)

2.3 The implications of not carrying out safe isolations to:

- Self
- Other personnel
- Customers/clients
- Public
- Building systems (Presence of supply)

2.4 The Health and Safety requirements which apply when diagnosing and correcting electrical faults in electrotechnical systems and equipment in dwellings including those which cover:

- Working in accordance with risk assessments/ permits to work/method statements
- Safe use of tools and equipment
- Safe and correct use of measuring instruments
- Provision and use of PPE
- Reporting of unsafe situations

**Learning Outcome 03:** The learner will be able to confirm safety of the system and equipment prior to diagnosing and correcting electrical faults in accordance with statutory and non-statutory regulations  
*The learner will be able to:*

- 3.1. Carry out safe isolation procedures in accordance with regulatory requirements for electrical installations
- 3.2. Ensure the health and safety of themselves and others within the work location during inspection, testing and commissioning
- 3.3. Select and use appropriate warning notices and barriers
- 3.4. Check the safety of electrical systems prior to the commencement of diagnosing and correcting electrical faults

**Learning Outcome 04:** The learner will know how to complete the reporting and recording of electrical fault diagnosis and correction work on electrical installations  
*The learner will demonstrate knowledge of:*

- 4.1. The procedures for reporting and recording information on electrical fault diagnosis and correction work
- 4.2. The procedures for informing relevant persons about information on electrical fault diagnosis and correction work and the completion of relevant documentation
- 4.3. Why it is important to provide relevant persons with information on fault diagnosis and correction work clearly, courteously and accurately

**Learning Outcome 05:** The learner will know how to complete the preparatory work prior to fault diagnosis and correction work on electrical installations  
*The learner will demonstrate knowledge of:*

- 5.1. The safe working procedures that should be adopted for completion of fault diagnosis and correction work, including:
  - Effective communication with others in the work area
  - Use of barriers
  - Positioning of notices
  - Safe isolation
- 5.2. The logical stages of fault diagnosis and correction work that should be followed:
  - Identification of symptoms
  - Collection and analysis of data
  - The use of sources/types of information such as the IET Wiring Regulations, Installation Certificates, Installation Specifications, drawings/diagrams, manufacturer's information and operating instructions
  - Maintenance records
  - Experience (personal and of others)
  - Checking and testing (e.g. supply, protective devices)
  - Interpreting results/information
  - Fault correction
  - Functional testing
  - Restoration
- 5.3 Identify and describe common symptoms of electrical faults, including:
  - Loss of supply
  - Low voltage
  - Operation of overload or fault current devices

- Component/equipment malfunction/failure
  - Arcing
- 5.4 The causes of the following types of faults:
- High resistance
  - Transient voltages
  - Insulation failure
  - Excess current
  - Short-circuit
  - Open Circuit
- 5.5 The types of faults and their likely locations in:
- Wiring Systems
  - Terminations and connections
  - Equipment/accessories
- 5.6 The special precautions that should be taken with regard to the following:
- Lone working
  - Electro-static discharge (friction, induction, separation)
  - Electronic devices (damage by over voltage)
  - IT equipment (e.g. shutdown, damage)

**Learning Outcome 06:** The learner will know the procedures and techniques for diagnosing electrical faults on electrical installations

*The learner will demonstrate knowledge of:*

- 6.1 The dangers of electricity in relation to the nature of fault diagnosis work
- 6.2 How to identify supply voltages
- 6.3 How to select the correct test instruments (in accordance with HSE guidance document GS 38) for fault diagnosis work, including:
- Voltage indicator
  - Low resistance ohm meter
  - Insulation resistance testers
  - EFLI and PFC tester
  - RCD tester
  - Tong tester/clamp on ammeter
- 6.4 How to confirm test instruments are fit for purpose, functioning correctly and are correctly calibrated
- 6.5 The appropriate documentation that is required for fault diagnosis work and explain how and when it should be completed
- 6.6 Why carrying out fault diagnosis work can have implications for customers and clients
- 6.7 The procedures for carrying out the following tests and their relationship to fault diagnosis:
- Continuity
  - Insulation resistance
  - Polarity
  - Earth fault loop impedance
  - RCD operation
  - Current and voltage measurement
- 6.8 Whether test results are acceptable and state the actions to take where unsatisfactory results are obtained.

**Learning Outcome 07:** The learner will be able to carry out procedures to identify faults on electrical installations

*The learner will be able to:*

- 7.1. Use effective methods of communication to ascertain clear and detailed information about reported faults and any components which require replacing
- 7.2. Identify and use appropriate system specification documents which relate to the electrotechnical systems and equipment being worked upon
- 7.3. Report information about potential disruption that may be a consequence of fault diagnosis and correction work to relevant people, such as:
  - Other workers/colleagues
  - Customers/clients
- 7.4. Assess the safe working practices which apply in the working environment to confirm that it is safe for fault identification work to take place
- 7.5. Perform suitable diagnostic tests on the installed electrotechnical systems to successfully identify faults including:
  - Loss of supply
  - Overload
  - Short-circuit and earth fault
  - Transient voltage
  - High resistance joints
  - Component, accessory or equipment faults
- 7.6. Use appropriate methods for locating faults on electrical systems and equipment, including:
  - Procedures and sequences – logical approach
  - Safe working practices
  - Interpretation of data
- 7.7. Use appropriate tools and instruments correctly to complete fault diagnosis work, including:
  - Voltage indicator
  - Low resistance ohm meter
  - Insulation resistance testers
  - EFLI and PFC tester
  - RCD tester
  - Tong tester/clamp on ammeter
- 7.8. Confirm test instruments are fit for purpose, functioning correctly and are correctly calibrated

**Learning Outcome 08:** The learner will know the procedures and techniques for correcting faults in electrical installations

*The learner will demonstrate knowledge of:*

- 8.1. The factors which can affect fault correction, repair or replacement, including:
  - Cost
  - Availability of replacement parts
  - Down time (planning)
  - Legal and personal responsibility (e.g. contracts, warranties, relevant personnel)
  - Access to installation
  - Provision of emergency or stand by supplies
- 8.2. The procedures for functional testing and identify tests that can verify fault correction, including:
  - Continuity
  - Insulation resistance

- Polarity
  - Earth fault loop impedance
  - RCD operation
  - Values of current and voltage
- 8.3. The appropriate documentation that is required for fault correction work and explain how and when it should be completed
- 8.4. How and why relevant people need to be kept informed during completion of fault correction work including:
- Other workers/colleagues
  - Customers/clients
- 8.5. The methods for restoring the condition of building fabric including:
- Brickwork
  - Plastering
  - Decorative finishing's
- 8.6. The methods to ensure the safe disposal of any waste and that the work area is left in a safe and clean condition

**Learning Outcome 09:** The learner will be able to correct faults on electrical installations

*The learner will be able to:*

- 9.1. Confirm appropriate repairs, removals and replacements and their implications with relevant people including:
- Other workers/colleagues
  - Customers/clients
- 9.2. Perform fault correction procedures correctly and safely using appropriate tools, equipment and material
- 9.3. Perform the removal and replacement of components and associated equipment from electrotechnical systems to ensure:
- Ease of access to enable future maintenance
  - Accordance with -
    - Relevant regulations
    - Manufacturer's instructions
    - Organisational procedures
- 9.4. Apply appropriate procedures to ensure electrotechnical systems, equipment and components are left safe, in accordance with industry regulations, if the fault cannot be corrected immediately
- 9.5. Perform appropriate inspection and testing procedures to confirm that systems, equipment and components are functioning correctly after completion of fault correction work
- 9.6. Record test results and other appropriate information regarding the fault correction work clearly and accurately and report to relevant people, such as:
- Other workers/colleagues
  - Customers/clients
  - Representatives of other services

**LCL-Q3007: Understand and apply the practices and procedures for the installation and connection of wiring systems and electrotechnical equipment**

*Assessment Method {M/C-O/L-LE}*

**Learning Outcome 01:** The learner will know the procedures for checking the work location prior to the commencement of work activities

*The learner will demonstrate knowledge of:*

- 1.1. The preparations that should be completed before electrical installation work starts, including:
  - Interpretation of specifications to produce accurate material and equipment requisites
  - Identification and selection of material, equipment and components compatible to installation specification
  - Confirmation of site readiness for installation
  - Confirmation that tools, equipment and instruments are fit for purpose
  - Confirmation of provision for secure site storage of tools, equipment, materials and components
  - Identification of suitable access equipment
  - Identification of suitable installation, fixing and fitting methods
  - Identification of points in the installation programme where co-ordination with other trades and personnel may be necessary
- 1.2. How to check for any pre-existing damage to customer/client property:
  - Dwelling wall/floor fabric
  - Equipment and components
  - Dwelling décor and floor finishes
  - and why it is important to do this prior to commencement of any work activity
- 1.3. The actions that should be taken if pre-existing damage to customer/client property is identified
- 1.4. The methods for protecting the fabric and structure of the dwelling before and during installation work

**Learning Outcome 02:** The learner will be able to prepare the working environment for the installation of wiring systems, enclosures and associated equipment

*The learner will be able to:*

- 2.1. Ensure the Health and Safety of themselves and others within the work location
- 2.2. Identify and use suitable personal protective equipment throughout the completion of work activities
- 2.3. Complete preparatory work for the installation of electrical systems, enclosures and associated equipment, to include:
  - Interpretation of installation specifications to produce material and equipment requisites
  - Identification and selection of material, equipment and components which are compatible with the installation specification
  - Identification of suitable methods, procedures and practices
  - Confirmation of site readiness for installation work to begin
  - Confirmation of secure site storage facilities for tools, equipment, materials and components
  - Confirmation that safe isolation has been carried out (if appropriate) in accordance with regulatory requirements
  - Completion of a Risk Assessment

**Learning Outcome 03:** The regulatory requirements which apply to the installation of wiring systems, associated equipment and enclosures

*The learner will be able to:*

- 3.1. Specify the main requirements of the following topics in accordance with the current version of the IET Wiring Regulations and describe how they impact upon the installation of wiring systems, associated equipment and enclosures in dwellings:
- Selection and erection of wiring systems, associated equipment and enclosures
  - Isolation and switching
  - Protection against fire
  - Protection against electric shock
  - Special locations
  - Segregation
- 3.2. Specify the requirements of the following Building Regulations for the installation of electrotechnical systems and equipment in dwellings;
- Part A
  - Part B
  - Part C
  - Part E
  - Part F
  - Part L
  - Part M
  - Part P

**Learning Outcome 04:** The learner will be able to interpret appropriate information for the installation of wiring systems, enclosures and associated equipment

*The learner will be able to:*

- 4.1. Use information and documentation that is current and relevant to the work required, including:
- Installation specifications
  - Work schedules
  - Work programmes
  - Regulatory documents (including current version of the IET Wiring Regulations and relevant Guidance Notes)
  - Method statements
  - Manufacturer's instructions
- 4.2. Use documentation to confirm that materials and equipment is of the correct quantity and is free from damage, including:
- Materials schedules
  - Operating instructions
  - Tools and instruments
- 4.3. Use appropriate procedures to record:
- Contract variations
  - Site instructions
- 4.4. Demonstrate that authorisation has been obtained from the relevant person(s) prior to commencement of the work, including:
- Other workers
  - Customers/clients

4.5. Produce a record of any pre-work damage or defects to existing equipment or building features, and report to the relevant person (Customer; Client; Site Manager; Line Manager)

**Learning Outcome 05:** The learner will know the practices, procedures and regulatory requirements for completing the safe isolation of electrical circuits and complete electrical installations

*The learner will demonstrate knowledge of:*

5.1. The procedure for completing safe isolation with regard to:

- Carrying out safe working practices
- Correctly identifying circuit(s) to be isolated
- Identifying suitable points of isolation
- Selecting correct test and proving instruments in accordance with relevant industry guidance and standards
- Applying correct testing methods
- Selecting locking devices for securing isolation
- Placing of warning notices
- Applying correct sequence for the safe-isolation of an electrical circuit and complete electrical installation

5.2. The implications of carrying out safe isolation to:

- Other personnel
- Customers/clients
- Public
- Building systems (loss of supply)

5.3. The implications of not carrying out safe isolation to:

- Self
- Other personnel
- Customers/clients
- Public
- Building systems (Presence of supply)

**Learning Outcome 06:** The learner will know the practices and procedures for installing wiring systems, associated equipment, enclosures and accessories

*The learner will demonstrate knowledge of:*

6.1. The procedures for selecting and safely using appropriate hand tools, power tools and adhesives for electrical installation work

6.2. The procedures for selecting and safely using equipment for measuring and marking out for wiring systems, equipment and enclosures

6.3 The criteria for selecting and safely using tools and equipment for fixing and installing wiring systems, associated equipment and enclosures

6.4 The criteria for selecting and safely using fixing devices for wiring systems, associated equipment and enclosures, giving consideration to:

- Load bearing capacity
- Fabric of structure
- Environmental considerations
- Aesthetic considerations

6.5 The installation methods and procedures to ensure that:

- Wiring systems, enclosures, cables and accessories are securely fixed and installed



- The mechanical integrity of wiring systems is maintained in accordance with the installation specification and statutory and non-statutory regulations

#### 6.6 The methods and techniques for restoring the building fabric

**Learning Outcome 07:** The learner will be able to install wiring systems, enclosures, associated equipment and accessories safely, in accordance with the installation specification

*The learner will be able to:*

- 7.1. Ensure that the planned locations for the wiring system(s) and its associated equipment are compatible with other site services requirements
- 7.2. Use different measuring and marking out techniques which are appropriate to the wiring system, wiring enclosure and/or associated equipment that is being installed
- 7.3. Ensure that the planned locations are visually acceptable and in accordance with the installation specification
- 7.4. Produce a planned programme of work for the fitting and fixing of wiring systems, wiring enclosures, associated equipment and accessories in accordance with:
  - A safe system of work
  - Co-ordination with other trades
  - Relevant regulations (e.g. IET Wiring Regulations; Building Regulations)
  - Installation specification
  - Manufacturers' instructions
- 7.5. Install the following in accordance with the IET Wiring Regulations, the installation specification and agreed planned programme of work:
  - Thermosetting insulated cables including flexes
  - Single and multicore thermoplastic (PVC) and thermosetting insulated cables
  - PVC/PVC flat profile cable
  - SWA/PVC cable
  - Armoured/braided flexible cables and cords
  - Fire resistant cable
- 7.6. Install the following in accordance with the IET Wiring Regulations, the installation specification and agreed planned programme of work:
  - Conduit (PVC and Metallic)
  - Trunking (PVC and Metallic)
- 7.7. Install the following types of electrical equipment and accessories, in accordance with the IET Wiring Regulations, the installation specification, manufacturers' instructions and the agreed planned programme of work:
  - Isolators and switches
  - Socket-outlets
  - Consumer units
  - Earthing fault and overcurrent protective devices
  - Luminaires
  - Auxiliary equipment (e.g. heating/water system components)
- 7.8. Dispose of unwanted material and equipment in accordance with site procedures and statutory requirements

**Learning Outcome 08:** The learner will know the procedures and applications of different methods of terminating and connecting conductors, cables, and flexible cords in electrical wiring systems and equipment

*The learner will demonstrate knowledge of:*

8.1. The advantages, limitations and applications of the following connection methods:

- Screw
- Crimped
- Non-screw compression

8.2. The procedures for proving that terminations and connections are electrically and mechanically sound

8.3. The consequences of terminations not being electrically and mechanically sound in terms of:

- High resistance joints
- Corrosion and erosion

**Learning Outcome 09:** The learner will know the procedures and applications of different methods of terminating and connecting conductors, cables, and flexible cords in electrical wiring systems and equipment

*The learner will demonstrate knowledge of:*

9.1 The Health and Safety requirements appropriate to terminating and connecting conductors, cables and flexible cords in electrical wiring systems and equipment, including:

- Selection and use of tools
- PPE
- Risk assessment
- Reporting of unsafe situations
- Adherence to relevant statutory and non-statutory regulations

9.2 The techniques and methods for the safe and effective termination and connection of:

- Thermosetting insulated cables including flexes
- Single and multicore thermoplastic (PVC) and thermosetting insulated cables
- PVC/PVC flat profile cable
- SWA/PVC cable
- Armoured/braided flexible cables and cords
- Fire resistant cable

**Learning Outcome 10:** The learner will be able to confirm any variations to the installation specification or planned programme of work

*The learner will be able to:*

10.1. Confirm that, where variations to the installation specification and/or work programme have been identified, appropriate action has been taken after agreement of relevant persons (e.g. Customer; Client; Site Manager)

10.2. Verify that the completed system meets specified requirements in terms of ensuring that components and equipment are of the correct type, fit for purpose and are installed in accordance with the IET Wiring Regulations, the installation specification and as appropriate, with manufacturer instructions.

**LCL-Q3008: Understand and apply the principles, practices and legislation for the inspection, testing, commissioning, approving and certification of electrical installations**

*Assessment Method {M/C-O/L-LE}*

**Learning Outcome 01:** The learner will know the procedures and regulatory requirements and for completing the safe isolation of an electrical circuit and complete electrical installations in preparation for inspection, testing and commissioning

*The learner will demonstrate knowledge of:*

- 1.1. The requirements of the Electricity at Work Regulations 1989 for the safe inspection of electrical systems and equipment, in terms of those carrying out the work and those using the building during the inspection
- 1.2. The correct procedure for completing safe isolation with regard to:
  - Carrying out safe working practices
  - Correctly identifying circuit(s) to be isolated
  - Identifying suitable points of isolation
  - Selecting correct test and proving instruments in accordance with relevant industry guidance and standards
  - Applying correct testing methods
  - Selecting locking devices for securing isolation
  - Placing of warning notices
  - Applying correct sequence for the safe-isolation of an electrical circuit and complete electrical installation
- 1.3. The implications of carrying out safe isolations to:
  - Other personnel
  - Customers/clients
  - Public
  - Building systems (loss of supply)
- 1.4. The implications of not carrying out safe isolations to:
  - Self
  - Other personnel
  - Customers/clients
  - Public
  - Building systems (Presence of supply)
- 1.5. The Safety requirements which apply when inspecting, testing and commissioning electrical installations and circuits including those which cover:
  - Working in accordance with risk assessments / permits to work / method statements
  - Safe use of tools and equipment
  - Safe and correct use of measuring instruments
  - Provision and use of PPE
  - Reporting of unsafe situations

**Learning Outcome 02:** The learner will be able to confirm safety of the system and equipment prior to completion of inspection, testing and commissioning in accordance with statutory and non-statutory regulations

*The learner will be able to:*

- 2.1. Carry out safe isolation procedures in accordance with regulatory requirements for electrical installations
- 2.2. Ensure the health and safety of themselves and others within the work location during inspection, testing and commissioning
- 2.3. Check the safety of electrical systems prior to the commencement of inspection, testing and commissioning

**Learning Outcome 03:** The learner will know the principles and regulatory requirements for inspecting, testing, commissioning and approving electrical installations

*The learner will demonstrate knowledge of*

- 3.1. The purpose of and requirements for initial verification and periodic inspection of electrical installations
- 3.2. The requirements of the relevant documents associated with the inspection, testing and commissioning of an electrical installation, including;
  - Electricity at Work Regulations 1989
  - IET wiring Regulations
  - IET Guidance Note 3
  - IET On-Site-Guide
  - Electricity Safety, Quality and Continuity Regulations
  - Building Act 1984
  - Building (Amendment) Regulations 2012
- 3.3. The information that is required to correctly conduct the initial verification of an electrical installation in accordance with the IET Wiring Regulations and IET Guidance Note 3
- 3.4. The requirements for complying with the following:
  - Building regulations for the installation of electrotechnical systems and equipment in dwellings;
    - Part A
    - Part B
    - Part C
    - Part E
    - Part F
    - Part L
    - Part M
    - Part P
- 3.5. The requirements of notification to "Local Authority Building Control"
- 3.6. The applications and limitations of the electrical components listed below when used in electrical installations in dwellings;
  - Contactors
  - Relays
  - Solenoids
  - Over-current protection devices
  - Fuses (HRC, cartridge and re-wireable)
  - Circuit - breakers
  - RCD's

- RCBO's

3.7. The relationship between resistance, inductance, capacitance and impedance

3.8. The relationship between kW, kVAr, kVA and Power Factor

**Learning Outcome 04:** The learner will know the regulatory requirements and procedures for completing the inspection of electrical installations

The learner will demonstrate knowledge of:

4.1. The items to be checked during the inspection process for given electrotechnical systems and equipment, and their locations as detailed in the IET Wiring Regulations

4.2. What human senses (sight, touch etc) can be used during the inspection process

4.3. The items of an electrical installation that should be inspected in accordance with IET Guidance Note 3

4.4. The requirements for the inspection of the following:

- Earthing conductors
- Circuit protective conductors
- Protective bonding conductors
  - main bonding conductors
  - supplementary bonding conductors
- Isolation
- Type and rating of overcurrent protective devices

**Learning Outcome 05:** The learner will be able to inspect electrical installations

The learner will be able to:

5.1. Assess whether the safe system of work is appropriate to the work activity

5.2. Carry out a visual inspection in accordance with the requirements of the installation specification, the IET Wiring Regulations and IET Guidance Note 3, that includes:

- The installation methods of wiring systems and equipment
- The selection of conductors, cables and cords
- The selection of protective and isolation devices
- Routing and identification/labelling of conductors, cables and flexible cords
- Presence of means of earthing
- Presence of protective conductors and bonding
- Isolation
- Type and rating of overcurrent protective devices

5.3. Complete a Schedule of Inspections in accordance with the IET Wiring Regulations and IET Guidance Note 3

**Learning Outcome 06:** The learner will be able understand the regulatory requirements and procedures for the safe testing and commissioning of electrical installations

The learner will be able to:

6.1. Confirm the tests to be carried out on an electrical installation in accordance with the IET Wiring Regulations and IET Guidance Note 3

6.2. Identify the correct instrument for the test to be carried out in terms of:

- The instrument is fit for purpose
- Identifying the right scale/settings of the instrument appropriate to the test to be carried out

6.3. Specify the requirements for the safe and correct use of instruments to be used for testing and commissioning, including:

- Checks required to prove that test instruments and leads are safe and functioning correctly
  - The need for instruments to be regularly checked and calibrated and that this must be done in accordance with the requirements of the IET Wiring Regulations and other relevant guidance documents (HSE guidance document GS38)
- 6.4. Explain why it is necessary for test results to comply with standard values and state the actions to take in the event of unsatisfactory results being obtained
- 6.5. Explain why testing is carried out in the exact order as specified in the IET Wiring Regulations and IET Guidance Note 3
- 6.6. State the reasons why it is necessary to verify the continuity of circuit protective conductors, earthing conductors, bonding conductors and ring final circuit conductors
- 6.7. Specify the methods for verifying the continuity of circuit protective conductors and ring final circuit conductors and interpreting the obtained results
- 6.8. State the effects that:
- Cables connected in parallel can have on insulation resistance values
  - Variations in cable length can have on insulation resistance values
- 6.9. Interpret the procedures for completing insulation resistance testing, including:
- Precautions to be taken before conducting insulation resistance tests
  - Methods of testing insulation resistance
  - The required test voltages and minimum insulation resistance values for circuits operating at various voltages
- 6.10. Explain why it is necessary to verify polarity
- 6.11. Interpret the procedures for testing to identify correct polarity
- 6.12. Specify the methods for measuring earth electrode resistance and correctly interpreting the results
- 6.13. Identify the earth fault loop paths for the following systems:
- TN-S
  - TN-C-S
  - TT
  - IT
- 6.14. State the methods for verifying protection by automatic disconnection of the supply, including:
- The measurement of the earth fault loop impedance ( $Z_s$ ) and external impedance ( $Z_e$ )
  - Establishing  $Z_e$  from enquiry
  - Calculate the value of  $Z_s$  from given information
  - Comparing  $Z_s$  and the maximum tabulated figures as specified in the IET Wiring Regulations
- 6.15. Specify the methods for determining prospective fault current
- 6.16. Specify the methods for testing the correct operation of residual current devices (RCD's)
- 6.17. Explain why having the correct phase sequence is important
- 6.18. State the need for functional testing and identify items which need to be checked
- 6.19. Specify the methods used for verification of voltage drop
- 6.20. State the cause of volt-drop in an electrical installation
- 6.21. State the appropriate procedures for dealing with customers and clients during the commissioning and certification process, including:
- Ensuring the safety of customers and clients during the completion of work activities
  - Keeping customers and clients informed during the process
  - Labelling electrical circuits, systems and equipment that are yet to be commissioned
  - Providing customers and clients with all appropriate documentation upon work completion

**Learning Outcome 07:** The learner will know the procedures and requirements for the completion of electrical installation certificates and related documentation for electrical installations

*The learner will demonstrate knowledge of:*

7.1. The purpose of and relationship between:

- An Electrical Installation Certificate
- A Minor Electrical Installation Works Certificate
- Schedule of Inspections
- Schedule of Test results

7.2. The information that must be contained within;

- An Electrical Installation Certificate
- A Minor Electrical Installation Works Certificate
- Schedule of Inspections
- Schedule of Test results

7.3. The certification process for a completed installation and identify the responsibilities of different relevant personnel in relation to the completion of the certification process

7.4. The procedures and requirements, in accordance with the IET Wiring Regulations, IET Guidance Note 3 and where appropriate customer/client requirements for the recording and retention of completed;

- Electrical Installation Certificates
- Minor Electrical Installation Works Certificates
- Schedules of Inspections
- Schedules of Test Results

**Learning Outcome 08:** The learner will be able to test electrical installations

*The learner will be able to:*

8.1. Select the test instruments and their accessories for the following tests:

- Continuity
- Insulation resistance
- Polarity
- Earth fault loop impedance
- Prospective fault current
- RCD operation
- Functional testing

8.2. Carry out the following tests in accordance with the installation specification and the IET Wiring Regulations and manufacturer's instructions:

- Continuity (e.g. CPC; Ring Final Circuit)
- Insulation resistance
- Polarity
- Earth fault loop impedance
- Prospective fault current
- RCD operation
- Functional testing

8.3. Verify test results and report all findings to relevant persons, as appropriate, including:

- Representatives of other services/colleagues
- Customers/clients

8.4. Complete in accordance with the IET Wiring Regulations and IET Guidance Note 3;

- Electrical Installation Certificates
- Minor Electrical Installation Works Certificates

- Schedules of Inspections
  - Schedules of Test results
- 8.5. Conform in accordance with the IET Wiring Regulations and IET Guidance Note 3, and where appropriate customer/client requirements to the procedures and requirements for the recording and retention of completed;
- Electrical Installation Certificates
  - Minor Electrical Installation Works Certificates
  - Schedules of Inspections
  - Schedules of Test results

---

**Learning Outcome 09:** The learner will be able to commission and approve electrical installations in accordance with statutory and non-statutory regulations

*The learner will be able to:*

---

- 9.1. Clarify the commissioning procedures with relevant persons on site, including:
- Representatives of other services/colleagues
  - Customers/clients
- 9.2. Carry out the commissioning of circuits, equipment and components to confirm functionality, fit for purpose and safety in accordance with:
- The installation specification
  - IET Wiring Regulations
  - Manufacturer's instructions
  - Maintenance schedules
  - Health and Safety requirements
- 9.3. Demonstrate to the customer/client that the operation of the circuits, equipment and components are in accordance with the installation specification and customer/client requirements.
- 9.4. Complete the handover of electrotechnical systems and equipment to relevant persons including the provision of accurate and complete documentation regarding the completed inspection, testing, commissioning and customer satisfaction
- 9.5. Carry out the approval of electrical installations in dwellings in accordance with the procedures for notifying "Local Authority Building Control"
- 

## 5. National Occupational Standard:

The Units used in this qualification have a direct relationship with the National Occupational Standards and the MTC for the areas of work contained within.

## 6. RQF Descriptor Level 3:

**Knowledge descriptor:** *(the holder can)*

- *Has factual, procedural and theoretical knowledge and understanding of a subject or field of work to complete tasks and address problems that while well-defined, may be complex and non-routine.*
- *Can interpret and evaluate relevant information and ideas.*
- *Is aware of the nature of the area of study or work.*
- *Is aware of different perspectives or approaches within the area of study or work.*



**Skills Descriptor:** *(the holder can)*

- *Identify, select and use appropriate cognitive and practical skills, methods and procedures to address problems that while well defined, may be complex and non-routine.*
- *Use appropriate investigation to inform actions.*
- *Review how effective methods and actions have been.*

**7. Prior qualifications, knowledge, skill or understanding which the learner is required to have before taking this qualification.** (Pre-requisites): None prescribed.

**8. Units which a learner must have completed before the qualification will be awarded and any optional routes.**

Learners must complete the 8 mandatory units before the qualification will be awarded. See Section 4.0 above.

**9. Other requirements which a learner must have satisfied before the learner will be assessed or before the qualification will be awarded.**

Where detailed in the Unit Specification, the learner must have demonstrated a sufficiency of supervised work practice and gained sufficient experience to enable a successful assessment outcome to be achieved.

**10. The design and delivery of the examination associated with these units are based on the following documents;**

BS7671 (current version)  
Guidance note 3  
Health & Safety Regulations  
Electricity at Work Regulations  
Building Regulations

**11. The criteria against which learners' level of attainment will be measured.**

The Learning Outcomes and Assessment Criteria against which learners' level of attainment will be measured are detailed in Section 4 of this specification.

**12. Planned exemptions:**

Learners holding a regulated qualification such as: LCL Awards Level 3 Award in the Initial Verification and Certification of Electrical Installations or an equivalent may omit assessment 4 and assessment 6, Task 1.

Learners holding a regulated qualification such as: the Level 4 Award in the Design and Verification of Electrical Installations may omit assessment 7.

**13. Specimen assessment materials:** None

**14. Specified levels of attainment:** Learners must pass all the mandatory units for the qualification to be awarded.

**15. Other information:** None

**SSA: 5.2 Construction**  
**Review Date: 31st Aug 2024**

## **Assessment and Examination Terminology**

**AC** – *Approved Centre; an examination conducted either at the approved centre or a location approved by the centre, using staff approved by the centre to conduct the examination.*

**CBSR** – **Closed Book** *Short Response; Short response written questions will be set by the awarding organisation and administered and marked locally at the approved centre by approved markers. Learners will be prohibited from using industry normative or informative documents.*

**CE** – *Customer Evidence; evidence provided by a customer in the form of a written witness statement confirming a competent performance by the learner. That evidence may also be provided by an employing supervisor or manager of the learner. Witness statements that relate to a technical competence will only be accepted from a person technically competent in that particular activity to provide the statement.*

**IK** – *Inferred Knowledge; inferred knowledge is assessed as part of a performance assessment by a centre approved assessor. To deem the learner as having sufficient knowledge the learner must satisfactorily pass the performance assessment.*

**LE** – *Learner Evidence; learner generated evidence is for example documented recordings of readings, calculations or the production of a risk assessment or other procedural document.*

**MCQ/MRQ** – *Multiple Choice/Multiple Response; set by the awarding organisation and administered and marked locally or electronically. Learners will be able to answer multi-choice/Multiple Response questions using reference to appropriate industry normative or informative sources.*

**O/L** – *Online; a secure cloud-based assessment system (XAMS) and Ecordia.*

**OP** – *Observed Performance; the assessment of a learner's performance by an approved assessor either in the learner's work place or at the approved centre or a location approved by the centre.*

**OQ** – *Oral Questions; oral questions may be asked by an assessor as part of a performance assessment or knowledge examination to confirm the understanding of the criteria by the learner.*

**PA** – *Performance Assessment; a performance assessment conducted either in the learner's work place or at the approved centre or a location approved by the centre.*

**RWE** – *Realistic Work Environment; an area at the approved centre or a location approved by the centre which replicates and has the features of a Work Place. The learner must not be permitted to be familiar with the simulated environment prior to undertaking assessment.*

**WP** – *Work Place; is the naturally occurring environment in which the learner works, typically that would be in a customer's premise where work is being paid for by the customer.*