Electrotechnical

National Occupational Standards

March 2008

Important note:

This document contains National Occupational Standards only.

For the delivery of an NVQ, evidence requirements, assessment guidance and an assessment strategy are required.

This document does not contain - and is not intended to contain - any information on either evidence or assessment.

Contents

EL1. APPLY HEALTH & SAFETY LEGISLATION AND WORKING PRACTICES

UNIT DESCRIPTOR

This unit is about maintaining a healthy and safe working environment across the range of installation or maintenance work, this involves being able to use safe procedures when working with others and use safe working practices.

The person carrying out this work must possess the skills and knowledge to ensure that their own actions do not create any health and safety risks, they do not ignore hazards with significant risk in the workplace and that they take sensible action to put things right

There are many potential hazards within our industry. This unit is designed to ensure that those that work within it are aware of the potential dangers, likely hazards and where to source: safety information, appropriate regulations and apply them to the workplace and the people who operate within it.

This unit is about identifying the hazards and risks that are associated with the job. Typically these will focus on the working environment, the tools and equipment that are used, materials and substances that are used, working practices that do not follow laid-down procedures, and manual lifting and carrying techniques.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Identify which workplace health and safety procedures are relevant to their working environment and ensure that they comply with their duties and obligations as defined by current, relevant legislation

2. Present themselves in the workplace suitably prepared for the activities to be undertaken

3. Where appropriate, produce a risk assessment and method statement for the work to be carried out

4. Review their own working practices and working environment for hazards which could cause serious harm, including the handling of potentially hazardous materials, tools and equipment

5. Follow the workplace policies and suppliers' or manufacturers' instructions for the safe use and maintenance of tools, plant and equipment

6. Control those health and safety hazards within their capability and job responsibility limits

7. Report to the relevant persons responsible for health and safety in the workplace, those hazards which may present a high risk

8. Ensure personal conduct around the workplace does not endanger the health and safety of themselves or other persons

9. Follow correct procedures in the event of injuries to self and others

10. Take remedial action(s) where work methods do not comply with risk assessment requirements

11. Demonstrate work processes, production and installation processes which comply with health and risk assessment safety requirements

12. Comply with hazard warning and prohibition notices

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know, understand and apply as appropriate:

a) The roles and responsibilities of themselves and others under the Health and Safety at Work Act 1974 and other current legislation (e.g. The Management of Health and Safety at Work Regulations; Workplace Health and Safety and Welfare Regulations; Personal Protection at Work Regulations; Manual Handling Operations Regulations; Provision and Use of Work Equipment Regulations; Display Screen at Work Regulations; Construction (Design and Management) Regulations; Control of Noise at Work Regulations; Control of Asbestos Regulations 2006)

The person carrying out this work must know and understand:

b) The particular health and safety risks which may be present in their own job role (the tools, materials and equipment that they use, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures) and the requirements of current health and safety legislation for the range of work operations

c) How to recognise potential asbestos containing materials in the workplace

d) The procedures for dealing with a suspected presence of asbestos in the workplace

e) Public health concerns associated with their workplace

f) Safe practices when carrying out work

g) How to locate relevant health and safety information for their tasks, and the sources of expert assistance when help is needed

h) What constitutes a hazard in the workplace (such as electricity, slippery and uneven surfaces, dust and fumes, handling and transporting, contaminants and irritants, fire, working at height, environment, dangerous occurrences, hazardous malfunctions, improper use and storage of tools and equipment)

i) The importance of remaining alert to the presence of hazards in the whole work place

j) The responsible persons to whom to report health and safety matters

k) Emergency procedures in the workplace, including procedures for summoning emergency services and the information they require, alarm and evacuation procedures, escape routes and fire fighting procedures

l) The first aid facilities that exist within their work area and within the organisation in general, and the procedures to be followed in the case of accidents involving injury

m) How to read, understand and work to, or produce, general risk assessments and method statements and how to apply them in the workplace

n) The warning signs for the seven main groups of hazardous substances defined by Classification, Packaging and Labelling of Dangerous Substances Regulations

o) Safety precautions including the protective clothing and equipment that is available for their areas of activity

p) The methods of protecting customer's property within the types of locations in which installation or maintenance work is carried out and how to report damage arising from work operations, should this arise

Important note: According to the Health and Safety at Work Act:

Employers must safeguard so far as is reasonably practicable, the health, safety and welfare at work of all the people who work for them and 'other persons'. This applies in particular to the provision and maintenance of safe plant and systems of work, and covers all machinery, equipment and substances used.

Employees also have a duty under the Act to take reasonable care to avoid harm to themselves or to others by their working practices, and to co-operate with employers and others in meeting statutory requirements. The Act also requires employees not to interfere with or misuse anything provided to protect their health, safety or welfare in compliance with the Act.

The Health and Safety at Work Act 1974 is the main piece of legislation under which nearly all the other regulations are made. It is for this reason that only this piece of legislation is specifically referred to in this Unit.

EL2. APPLY ENVIRONMENTAL LEGISLATION, WORKING PRACTICES AND PRINCIPLES (ELECTROTECHNICAL SERVICES)

UNIT DESCRIPTOR

The unit covers a key area which focuses on the need for the person carrying out the work to adopt a positive attitude to using practices and procedures which protect the environment and promote efficient use of resources.

The person carrying out this work should be aware of the implications for the environment of work processes, and procedures, and where the job specification permits, should ensure that materials used minimise risks to the environment.

The person completing the work should also be aware of appropriate environmental technologies and should be able to advise on how such technologies could be utilised.

They should be aware of how their work relates to the environment and that all waste materials produced as a result of their work and which are their responsibility to dispose of, are dealt with according to current, relevant legislation.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Apply work procedures which are environmentally friendly

2. In accordance with organisational procedures, identify and report materials, products or equipment that could potentially cause damage to the environment

3. Ensure that relevant people are advised of all system or component operating procedures that are intended to protect the environment

4. Handle potentially hazardous materials in a manner which complies with health and safety requirements

5. Follow workplace procedures and current, relevant legislation for the safe handling, storage and disposal of hazardous materials and products

6. Identify working practices that may harm the environment

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know, understand and apply as appropriate:

a) The current, relevant legislation for dealing with waste (e.g. The Controlled Waste Regulations; Packaging Regulations; The Waste Electrical and Electronic Equipment Regulations (WEEE); The Special Waste Regulations; The Hazardous Waste Regulations)

The person carrying out the work must know and understand:

b) Where relevant, the Building Regulations (including energy efficiency requirements for new dwellings), the Code for Sustainable Homes

c) The potential implications for the environment of the work procedures used in installing or maintaining systems or components

d) Prefabrication and installation methods that reduce material wastage

e) The legislation or recommendations governing the safe use and disposal of hazardous materials

f) The materials and products that are classed as hazardous to the environment and how to identify them

g) Organisational procedures for the handling and disposal of hazardous materials and products

h) The materials and products that are classed as recyclable, how to identify them, and organisational procedures for dealing with them

i) The importance of reporting hazards to the environment that arise from work procedures within the scope of their area of responsibility and of ensuring that appropriate actions are taken

j) All relevant environmentally friendly materials, products and procedures

k) The possible uses for and basic operating principles of environmental technologies such as solar photo voltaic, wind energy systems, micro hydro, ground source heat pumps, combined heat and power installations (CHP)

l) The possible applications of other environmental technologies such as grey water recycling, rainwater harvesting, biomass, solar hot water heating

m) Where appropriate, the planning requirements for the integration of environmental technology within systems in new build situations and as additions to existing buildings

n) The relevant information that needs to be passed to relevant people to ensure the correct and economical use of energy dependant systems

o) The general advice that can be given on methods of reducing waste of resources, and effecting savings, including environmental technologies

EL3. MAINTAIN EFFECTIVE WORKING RELATIONSHIPS

UNIT DESCRIPTOR

This unit identifies the competences needed to contribute to the development and maintenance of positive working relationships with other people, in accordance with organisational requirements. It is about being positive and constructive in dealings with others, keeping others informed about work plans and activities that affect them by using effective communication skills.

This unit covers the responsibilities required to comply with any policies of the organisation such as contributing to and maintaining positive working relationships with other people.

The person carrying out this work should know how they can develop and maintain positive working relationships with relevant people and understand the importance of appearance and behaviour, the feelings and expectations of others, including customers, and effective communications.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Establish and maintain productive working relationships with relevant people, including dealing with disagreements in an amicable and constructive way, so that good relationships are maintained

2. Identify and confirm the needs and expectations of their colleagues and, where appropriate, customers.

3. Greet others in an appropriate way that makes them feel valued and respected

4. Keep others informed about work plans or activities which affect them or their work

5. Respond effectively to requests for job information from relevant people

6. Seek assistance from others in a polite and courteous way without causing undue disruption to normal working activities

7. Respond promptly and willingly when others ask for help or information which fall within the limits of their own job responsibilities and capabilities, referring to the appropriate person when requests for assistance fall outside their area of responsibility

8. Where appropriate, contribute actively to effective team working by co-operating with colleagues, using appropriate methods of communication

9. Identify conflicts which may cause problems to productivity and promptly seek solutions from the responsible person

10. Meet their organisations standards for appearance and behaviour

KNOWLEDGE REQUIREMENTS:

The person carrying out this work must know and understand:

a) Legislation regarding health and safety, data protection, equal opportunities and regulations that affect the way that products and services are delivered to customers

b) Industrial, organisational and professional codes of practice and ethical standards that apply

c) The actions that are necessary to begin, develop and maintain good working relationships

d) The principles of good working relationships, reasons why working relationships may break down and the action to take to resolve this

e) The importance of developing positive working relationships with relevant people and maintaining productivity – the effect on morale, productivity and company image

f) How to deal with problems that could have an adverse effect on relationships

g) How to respond to those with physical disabilities, learning difficulties and language differences (including dialects and accents)

h) Their organisation's standards for appearance and behaviour

i) Their customers' rights including any contractual agreements they have with their organisation

j) The limits of their own authority, and when they need to seek agreement or permission from others, the roles and responsibilities of different individuals and the management structures within different organisations employing labour

k) Any organisational targets relevant to their job, their role in meeting them, and the consequences for their organisation if those targets are not met

l) How to communicate in a clear, polite, confident way, why this is important and the lines of communication that are available to them

m) The importance of considering and accepting the views and opinions of other people

n) The implications for their work and organisation of their own actions

o) The implications for their organisation of not being able to communicate effectively with others, including customers

p) The types of job information that may be required by others in the workplace, including, where relevant, the need to keep colleagues informed about their work when it might impact on theirs

q) How to use the key principles of good communication in work situations, including methods of confirming that the communication has been understood

EL4. PROVIDE RELEVANT PEOPLE WITH TECHNICAL AND FUNCTIONAL INFORMATION

UNIT DESCRIPTOR

This unit is for people who pass on technical or functional information relating to equipment and components on which they have been working. It is about supplying technical and functional information accurately on appropriate occasions or at handover with the right amount of detail, bearing in mind the level of awareness of the person receiving the information.

It is about identifying who should receive such information, at what level of detail.

It requires that the person carrying out the work complies with, and works within, the policies and procedures of their organisation, and reports any problems to an appropriate person, seeking guidance and instructions from others when necessary.

This unit is about understanding the equipment and/or components and their operation to a depth adequate for carrying out effective familiarisation and demonstration procedures to the required standard.

It includes understanding the needs of a customer and assessing the customer's ability to operate the product. It is important that, where relevant, any Health & Safety aspects are explained to the customer, both for their own protection and for the safe operation of the equipment or components including how to isolate the equipment in the case of emergency and the appropriate contact details should they need further advice or help.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Identify the relevant people, such as customers, that need to be supplied with technical and functional information and ensure they have any other necessary information, such as safety information, how to isolate the product in case of emergency and the person's address or contact details for further advice or help

2. Discuss, with the relevant people, the information they need in order for the systems, equipment or components to be operated safely and effectively

3. Obtain from appropriate sources current and relevant information required for the work

4. Pass on information in a timely, courteous and professional manner and in accordance with organisational procedures

5. Confirm that the supplied product or equipment is the correct one or suitable for the purpose, working to its given specifications, meets the customers expectations and meets all the required safety standards

6. Where relevant, explain and demonstrate the operation of the product to the customer

7. Where relevant, ensure that the customer is able to operate the product and is aware of the necessary health and safety information and advice

8. Clearly identify any unusual features of the condition of the system, equipment or component

9. Where necessary, confirm that relevant people involved accept that the system or equipment is in a satisfactory condition for handover to take place

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) Sources of technical and functional information such as the manufacturer, supplier or own organisation

b) Responsibilities and limitations in their job role with respect to supplying technical and functional information

c) The technical and functional information that they are providing and its implications for the operation of equipment and components

d) The organisational policy regarding the handover and demonstration of a product or equipment

e) Where appropriate, customer relations methods and procedures

f) Work site requirements (eg structural, services and ventilation)

g) Product or equipment operation, controls, settings and adjustments

h) Waste disposal procedures at the work site

i) Alternative systems or equipment that could be more appropriate to the relevant person's needs

j) Which situations warrant written technical and functional information

k) The importance of providing information clearly, courteously and professionally

l) The safety implications and functional consequences of supplying inaccurate or incomplete information to the relevant person

m) Methods of checking the relevant person's understanding of the technical and non-technical information provided, including Health & Safety information

n) Where necessary, the organisational procedures for confirming and recording handover

EL5. OVERSEE THE WORK ENVIRONMENT

UNIT DESCRIPTOR

This unit is above overseeing the work environment, which in some cases might involve overseeing the work other operatives and/or other contractors. The person carrying out this work is responsible for ensuring that the work is effectively coordinated in order to complete the work on time and to the specification.

The person carrying out this work should know the extent of their role and responsibilities, including understanding how best to motivate and communicate with others.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Produce a risk assessment and method statement for the work to be carried out

2. Ensure the risk assessment and method statement includes others working in the area including work colleagues and any other operatives

3. Where appropriate, allocate duties and responsibilities to operatives to make best use of their competence

4. Where relevant, instruct the operatives about their duties and responsibilities clearly and concisely

5. Ensure that all their communications are clear, accurate and appropriate to the situation

6. Where relevant, ensure effective co-ordination with the work of other contractors

7. Where relevant, monitor that the work of operatives is in accordance with working practices and is:
   - safe and fit for purpose
   - cost-effective
   - within the programme of work and complies with industry standards

8. Ensure that safe and appropriate action is taken promptly where a non-compliance is identified during the programme of work

9. Ensure that all documentation is in accordance with the operations and organisational requirements and is legible, accurate and timely

10. Liaise with the responsible person to resolve issues which are outside the scope of their job role

11. Ensure that the work on completion is safe, complies with both the work specification and industry standards

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) Their role and responsibilities (e.g. Health and Safety) towards other staff, employer, customers, any sub-contractors and, where appropriate, when supervising others

b) Safety requirements with regard to others and their ability to re-schedule work to co-ordinate with their requirements

c) How to interpret a risk assessment, apply a method statement, and monitor changing conditions in the workplace

d) Different styles of supervision, how to best motivate others and, where appropriate, oversee the work of operatives for whom they are responsible

e) Where relevant, how to identify the competence of the operatives for whom they are responsible

f) Where relevant, how to plan the work allocations, duties and responsibilities of operatives for whom they are responsible

g) How to communicate with others including operatives and, where appropriate, other staff, employer, customers and any sub-contractors

h) How to be effective when communicating with and responding to others

i) The scope for carrying out the work whilst maintaining safety, cost effectiveness and remaining within the programme of work

j) The relevant industry standards for work carried out in operations

k) Organisational requirements for completing the necessary documentation and how to ensure clarity, accuracy and completion within schedule

l) How to identify that the operation on completion is safe and complies with industry standards

EL6. ORGANISE THE WORKING ENVIRONMENT

UNIT DESCRIPTOR

This unit is about managing the working environment. It involves discussing with the relevant people a programme of work and estimating the amount of time the work should take to complete.

The person carrying out the work should identify and organise the appropriate resources for the work to be carried out, including identifying suitable alternatives when the most appropriate resources are not available. It also involves ensuring that equipment and components are in a condition fit for the installation or maintenance to be carried out.

This unit also covers ensuring that work is carried out safely and in accordance with the programme of work and industry standards, and making sure that all relevant documentation is completed accurately.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Identify from the work specification what resources (such as materials, plant, vehicles or equipment) are required in order to carry out the work efficiently and, where necessary, identify suitable alternatives

2. Discuss and agree a programme of work which includes, where necessary, effective co-ordination with the work of other contractors and make an accurate estimate of the time the job should take to complete

3. Ensure that all their communications are clear, accurate and appropriate to the situation

4. Confirm that the required amount and type of materials are available for work to commence and be completed cost effectively

5. Ensure that all resources are delivered on time and undamaged by transportation

6. Where appropriate, ensure that there is sufficient and appropriate provision for the safe storage of materials and equipment in the work location

7. Ensure that all documentation is completed in accordance with the operations and organisational requirements and is legible, accurate and timely

8. Liaise with the responsible person to resolve issues which are outside the scope of their job role

9. Ensure that the work on completion is safe, complies with both the work specification and industry standards

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) Their responsibilities to their employer and to their customer

b) The scope, purpose and requirements of the work operations with which they are involved and for which they are responsible

c) How to interpret a method statement, a risk assessment and monitor changing conditions in the workplace

d) How to interpret the work specification to identify the required resources (such as materials, plant, vehicles or equipment)

e) How to estimate the amount of time for completion of the work and the factors to take into account

f) How to identify and agree a programme of work from the work specification

g) How to communicate with others clearly and concisely

h) The material schedule and how to confirm they have the right type and quantity for work to commence and be completed cost-efficiently

i) Suitable alternative resources (such as tools, materials, equipment and components)

j) The transport and storage requirements for all materials and how to manage the available storage in the work location

k) Organisational requirements for completing the necessary documentation and how to ensure clarity, accuracy and completion within schedule

l) The relevant industry standards for work carried out in operations

m) The scope for carrying out the work whilst maintaining safety, cost effectiveness and remaining within the programme of work

n) The possible consequences of not carrying out the work within the estimated time and to the programme of work

o) Their job role and its scope and when to involve someone with higher responsibilities

p) How to identify that the operation on completion is safe and complies with industry standards

EL7. PREPARE TO CARRY OUT WORK

UNIT DESCRIPTOR

This unit is for people who make the preparations prior to work being conducted and is relevant to those who prepare for both installation and service and maintenance work.

The person carrying out this work must review the work location to ensure that it is safe for the work to be carried out and that all of the necessary checks and tests have been conducted. This includes checking the work location for any existing damage or defects prior to commencement of the work.

The person carrying out this work must ensure that all the necessary preparations are made so that the work can take place safely and in accordance with current industry standards and regulations.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Carry out a review of the work location and identify factors which will impact on the work
2. Ensure that job information and documentation is current and relevant and that, where relevant, their plant, instrument, equipments, tools and data are fit for purpose, and are of the correct quantity, and size
3. Identify from job information the point(s) within the work process where liaison with other persons will be necessary and identify whom these persons will be
4. Confirm that the relevant people have job information on all key aspects of the work process
5. Seek authorisation from the relevant person(s) prior to commencing work, that it is safe to undertake the work as specified
6. Ensure that safety provisions within the immediate work location, including access to it, conform to the requirements of health and safety legislation
7. Report to the job supervisor, or line manager any pre-work damage or defects to existing equipment or building features and confirm that this existed prior to the work commencing
8. Wear suitable personal protective equipment throughout preparation activities
9. Check the external condition of materials for any damage and the quantity against relevant paperwork
10. Carry out preparatory work as necessary

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The legal duties of employers and employees for health and safety as required by the Health and Safety at Work Act 1974 and other relevant legislation appropriate to the work location (e.g. EAWR, Wiring Regulations, COSHH, CDM and Building Regulations)

b) The regulations and working practices that will affect the work activity such as regulations governing design, installation, operation and routine maintenance, and their intended function

c) How to carry out an assessment of risks and plan a safe system of work with regard to the work activity

d) The importance of checking that the work location is safe with regard to access, others working in that location and that permits to work are provided where required

e) The importance of carrying out visual inspections and tests as well as reviewing the work location for planning purposes to determine the work requirements

f) The importance of wearing appropriate personal protective equipment (PPE)

g) How to ensure that the customer is fully briefed on all aspects of the work programme

h) The importance of protecting property prior to starting work and identifying pre-existing damage to property and building fabric

i) Whether tools are fit for purpose and that they have a current calibration certificate

j) How to calculate resource requirements for materials, tools and other equipment

k) Secure storage procedures for tools, equipment, materials and components – basic stores procedures to ensure security and to minimise loss or wastage

l) The implications of different working conditions on the equipment and components and/or system

EL8. IDENTIFY SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is about dealing with a customer identifying their requirements and providing commercially acceptable solutions to them. It covers making changes and alterations required by the customer throughout the work.

It is about assessing the implications, impact and feasibility of alterations and changes to the system.

This unit is also about recognising when variations to the work programme are necessary and knowing how to go about agreeing these, and the relevant people with which to liaise.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Identify and record the customer job requirements
2. Obtain and record information on site instructions and features
3. Identify any areas of the proposed system or components where compliance with industry requirements is necessary
4. Identify alternative system options, including environmental technologies, taking into consideration factors such as efficiency (e.g. energy or water)
5. Explain clearly to relevant people system options which meet identified requirements and those which offer additional benefits such as energy or water efficiency
6. Obtain customer agreement to the proposal
7. Carry out and apply relevant calculations to determine system component requirements
8. Present the system proposal in a manner which enables customer agreement
9. Confirm that the completed system meets requirements
10. Inform the relevant person(s) immediately when changes are necessary before work can commence
11. Record and agree with the relevant person, necessary changes to the work that have cost implications and act on those changes as appropriate

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) How to obtain information from site drawings and plans

b) How to carry out a review of the location

c) The range of documentation detailing industry requirements

d) How to identify possible proposals which meet the following: customer requirements, site structures and features, and industry requirements

e) The range of environmentally friendly materials, products, procedures and energy saving devices applicable to their work and the benefits of their use

f) How to obtain agreement from the customer to progress a selected system proposal

g) The range of job information that is required to develop proposals for work on new buildings and existing properties

h) Positioning requirements for components within systems and standard system layouts

i) How to calculate the requirements of system components – size and specification

j) Methods of presenting information to customers through the use of drawings, specifications and quotations

k) The authority and organisational procedures at the site relevant to work plans and changes to the work plans

l) How to negotiate variations to work programmes, under what circumstances this might be necessary and the need to obtain written acceptance to major work or material variations and the organisational requirements for reporting changes

EL9. INSTALL ELECTRICAL SYSTEMS IN BUILDINGS AND STRUCTURES

UNIT DESCRIPTOR

This unit is for people who are required to carry out the installing of wiring systems, wiring enclosures and equipment

This unit is about following the correct procedures for the installation of wiring systems, wiring enclosures and equipment as specified.

They need to show an understanding of installing wiring systems, wiring enclosures and equipment, the methods for identifying and isolating electrical supply. They also need to know the techniques for positioning and fixing of components correctly to those areas which have the potential to be hazardous.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Confirm the existing electrical supply is compatible with the planned installation in accordance with laid down procedures

2. Follow agreed procedures to ensure the co-ordination of site services and the activities of other trades

3. Identify accurately the means of electrical isolation prior to commencing installation

4. Carry out isolation procedures to ensure a safe installation in accordance with electrical regulations and approved procedures as and when required

5. Measure and mark out all locations for wiring systems, wiring enclosures and equipment in accordance with electrical regulations and to meet an agreed specification

6. Check that the planned locations are sensible, visually acceptable and are in accordance with other site services

7. Fix the wiring systems, wiring enclosures and equipment safely in accordance with relevant regulation (e.g. Building Regulations), manufacturers' instructions and design principles

8. Report to relevant people those necessary variations to the planned programme of work that may have the potential to be dangerous and/or have a cost implication

9. Seek the appropriate action from the relevant person(s)

10. Ensure all site services are disposed of in accordance with appropriate regulations, site procedures and statutory regulations

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) Regulations relevant to installation activities (e.g. Building Regulations Part P (Electrical Safety) and Part L (Conservation of Fuel and Power))

b) The most effective methods of measuring, cutting to length and installing wiring systems and wiring enclosures

c) The most effective methods of fabricating wiring enclosures

d) The authority issuing procedures for co-ordinating data on site services

e) How to interpret diagrams and drawings to find site services and the planned location of the wiring systems, wiring enclosures and equipment

f) Organisational procedures for reporting variations to work schedules

Health and Safety:

g) The correct procedures for a safe isolation with regard to an assessment of safe working practice, the correct identification of circuits to be isolated, the correct test and proving instruments selected, the use of correct testing methods, and correct selection of devises for securing isolation

h) The implications for relevant parties of carrying out an isolation

i) The importance of using personal protective equipment and safe appropriate tools for specific jobs

j) The hazards associated with using electrical equipment and plant including their lifting, handling and fixing

Principles and theory

k) IEE wiring regulations as specified in the latest British Standard for Electrical Installations relevant to types and uses of wiring systems, wiring enclosures and equipment

l) Where to find out about the principles of electrical theory which allow for the safe installation of electrical wiring systems, wiring enclosures and equipment

m) Design principles relevant to the work location, system, equipment and components

EL10. INSTALL AND CONNECT HIGHWAY ELECTRICAL SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is for people who are required to install and connect highway electrical systems, components and associated equipment.

This unit is about following the correct procedures for the installation and connection of highway electrical systems, components and associated equipment.

The person carrying out this work will be able to show that they possess the skills and knowledge to install highway electrical systems and associated equipment, apply the correct methods of isolating electricity supply on site, position and fix highway electrical systems and associated equipment correctly, connect highway electrical systems and associated equipment and check the connections using safe methods.

PERFORMANCE OBJECTIVES

The person carrying out this work must ensure that they:

1. Implement a safe system of work during the installation and connection activities
2. Follow agreed procedures to ensure the co-ordination of the activities of other trades
3. Use all tools and equipment safely following the manufacturer's instructions and their organisation's procedures
4. Carry out safe and secure isolation procedures
5. Follow the correct procedures for installing appropriate to the type of supply and cut outs
6. Fix all highway electrical components and associated equipment in an appropriate position to enable ease of access and facilitate future maintenance and to comply with relevant regulations and manufacturers' instructions
7. Comply with relevant regulations for the connections they make and that they are electrically and mechanically sound and they are identified correctly and clearly
8. Test the connections by following safe and industry approved procedures
9. When appropriate, take safe and suitable action to remedy any identified defects
10. When unable to complete specified work, report the matter to the relevant person(s) clearly and accurately
11. Complete and maintain up to date work records and that they are passed to the relevant person(s) promptly
12. Ensure all waste materials are disposed of in accordance with appropriate regulations, site procedures and statutory regulations

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) Procedures for an assessment of risk and how to implement a safe system of work

b) Procedures for ensuring the co-ordination with other trades

c) Organisational procedures and manufacturers' instructions for using tools and equipment

d) The correct procedures for a safe and secure isolation with regard to:
- an assessment of safe working practice,
- correct identification of circuits to be isolated,
- correct test and proving instruments selected,
- use of correct testing methods, and
- correct selection of devices for securing isolation

e) The implications for relevant parties for carrying out an isolation

f) The correct procedures for dealing with electricity company supplies and private supplies

g) The existence and application of relevant regulations and manufacturers' instructions for fixing equipment

h) How to interpret diagrams and drawings to enable the correct positioning and fixing of equipment

i) How lighting circuits work for various lamp types and wattages (e.g. SOX, SON etc.)

j) The function of control gear items and various equipment

k) The procedures for the connection of major components

l) The main types, advantages and limitations of different electrical connections, including temporary or permanent purposes and joints and connections which are of strength and conductance to allow for the passage of fault currents and to prevent corrosion

m) How to interpret diagrams and drawings to facilitate the connection of highway electrical systems and associated equipment

n) The procedures for ensuring a connection is electrically and mechanically sound and identified clearly and correctly

o) The appropriate tests to be carried out on completion

p) Safe action to take to remedy system, equipment or component defects

q) Organisational reporting and recording procedures which might include organisational or external Quality Assurance systems

r) The importance of using personal protective equipment and safe appropriate tools for specific jobs

s) The legal responsibilities in accordance with current health and safety regulations, legislation and codes of practice

t) The hazards associated with using electrical equipment and plant including their lifting, handling and fixing

Principles and theory

u) The latest Industry Standards for highway electrical systems and associated equipment, such as:
   - The current edition of the Electrical Association Engineering Memorandum (G39)
   - The ILE Code of Practice

v) Where to find out about the principles of electrical theory and installation techniques which allow for the safe installation and connection of highway electrical systems and associated equipment

EL11. INSTALL SECURITY AND EMERGENCY SYSTEMS IN BUILDINGS AND STRUCTURES

UNIT DESCRIPTOR

This unit defines the national standard of occupational competence for installing the equipment for security, emergency or alarm systems.

The person carrying out this work must be able to position and mount system equipment according to installation specifications, using the correct fixing devices and methods. The position of equipment should optimise the operational requirements, maintenance access and customer requirements.

They should terminate cables and wires according to operational requirements, using approved termination methods, after which they should make sure that all terminations are electrically and mechanically sound. Where required, they should make certain that details of cable terminations are recorded fully and accurately.

After installing equipment, they must make good any damage to building structures and surfaces in line with agreed specifications. They should remove all unwanted tools, equipment, waste and debris from sites and make permanent any temporary site arrangements that were necessary to install system cabling.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Carry out isolation procedures to ensure a safe installation in accordance with electrical regulations and approved procedures as and when required

2. Measure and mark out all locations for wiring systems, wiring enclosures and equipment in accordance with electrical regulations and to meet an agreed specification

3. Position and mount specified equipment in line with system installation specifications, relevant regulations and codes of practice

4. Use suitable fixing devices and methods that are appropriate to the equipment, sites and building materials

5. Make sure that the position of equipment optimises operational requirements, maintenance access and customer requirements

6. Use the correct tools and equipment safely to position and mount equipment

7. Make sure that equipment is mounted and installed correctly

8. Comply with relevant health and safety requirements while installing system equipment

9. Ensure all waste materials are disposed of in accordance with appropriate regulations, site procedures and statutory instruments

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The correct procedures for a safe isolation with regard to an assessment of safe working practice, the correct identification of circuits to be isolated, the correct test and proving instruments selected, the use of correct testing methods, and correct selection of devises for securing isolation

b) The implications for relevant parties of carrying out an isolation

c) The most effective methods of measuring, cutting to length and installing wiring systems and wiring enclosures

d) How to relate equipment and their physical locations to technical documents (installation specifications, cable and wiring diagrams, architectural and similar drawings, configuration charts)

e) Current regulations and codes of practice relevant to installing equipment

f) The different types of devices and methods for mounting equipment, how to select and use them

g) The properties of typical building materials and how to fix equipment to them safely and securely

h) How to safely handle equipment during installation

i) The capabilities and limitation of the tools and equipment that they use, and why it is important to use the correct tools and equipment

EL12. INSTALL AUDIO VISUAL SYSTEMS

UNIT DESCRIPTOR

This unit is for people who plan and install audio visual systems.

This unit is about planning and installing audio visual equipment, cabling systems and interconnections.

It is about undertaking the planning and preparation activities prior to the installation process and then carrying out the necessary procedures for the installation to take place safely and in accordance with current Standards.

The person carrying out the work must follow procedures when changes to the work need to be undertaken.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Confirm that the audio visual system design meets the specification

2. Liaise with relevant persons as appropriate to ensure that their systems are compatible and integrate effectively

3. Carry out a survey of the work location and identify factors which will impact on the system to be installed

4. Agree a programme of work with the relevant persons and confirm with them those aspects of the risk assessment and relevant method statement which will impact on those working for them and their work

5. Confirm that the equipment, cabling system and the method of installation are appropriate for the structure, the environment and the specification

6. Install the equipment and cabling system in accordance with the specification

7. Terminate the cabling using appropriate connectors in a manner that complies with organisational and industry practice

8. Report any necessary variations to the specification in accordance with organisational procedures

9. Monitor that the installation of the audio visual system is in accordance with the specification, risk assessment and current Standards

10. Waste materials are disposed of in accordance with appropriate regulations, site procedures and statutory instruments

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The principles of audio visual system design for example; voltage, current, frequency, data rates, band widths, display resolution and control protocols, etc.

b) The importance of checking that risk assessments have been carried out and are available, that the work location is safe with regard to access, others working in that location and permits to work are provided where required

c) The plans for the installation, what actual work is required and the time it must be completed within

d) How to determine the suitability of types of equipment and cabling system for the performance required and the suitability of the structure to the materials

e) How to determine the mains power requirement for the system

f) The importance of carrying out visual inspections and tests as well as surveying the work location for planning purposes or from plans and specifications

g) The importance of being aware of the possible presence of asbestos in building fabric, its potential hazards and the action to take if its presence is suspected

h) The importance of ensuring the use of safe, industry approved work practices as well as compliance with legal requirements when preparing to carry out installation work

i) The legal duties of employers and employees for health and safety as required by the Health and Safety at Work Act 1974 and other relevant legislation appropriate to site working

j) Regulations, site procedures and statutory instruments for waste materials disposal including from the Environmental Protection Agency (EPA) and equivalent bodies in Scotland, Wales and Northern Ireland

EL13. INSTALL AUDIO SYSTEMS

UNIT DESCRIPTOR

This unit is for people who plan and install audio systems.

This unit is about planning and installing audio equipment, cabling systems and interconnections.

It is about undertaking the planning and preparation activities prior to the installation process and then carrying out the necessary procedures for the installation to take place safely and in accordance with current Standards.

The person carrying out this work must follow procedures when changes to the work need to be undertaken.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Confirm that the audio system design meets the specification
2. Liaise with relevant persons as appropriate to ensure that their systems are compatible and integrate effectively
3. Carry out a survey of the work location and identify factors which will impact on the system to be installed
4. Agree a programme of work with the relevant persons and confirm with them those aspects of the risk assessment and relevant method statement which will impact on those working for themselves and their work
5. Confirm that the equipment, cabling system and the method of installation are appropriate for the structure, the environment and the specification
6. Install the equipment and cabling system in accordance with the specification
7. Terminate the cabling using appropriate connectors in a manner that complies with organisational and industry practice
8. Report any necessary variations to the specification in accordance with organisational procedures
9. Monitor that the installation of the audio system is in accordance with the specification, risk assessment and current Standards
10. Confirm all waste materials are disposed of in accordance with appropriate regulations, site procedures and statutory instruments

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The principles of audio system design for example; sound pressure level (SPL), voltage, current, impedance, power etc.

b) The importance of checking that risk assessments have been carried out and are available, that the work location is safe with regard to access, others working in that location and permits to work are provided where required

c) The plans for the installation, what actual work is required and the time it must be completed within

d) How to determine the suitability of types of equipment and cabling system for the performance required and the suitability of the structure to the materials

e) How to determine the mains power requirement for the system

f) The importance of carrying out visual inspections and tests as well as surveying the work location for planning purposes or from plans and specifications

g) The importance of being aware of the possible presence of asbestos in building fabric, its potential hazards and the action to take if its presence is suspected

h) The importance of ensuring the use of safe, industry approved work practices as well as compliance with legal requirements when preparing to carry out installation work

i) The legal duties of employers and employees for health and safety as required by the Health and Safety at Work Act 1974 and other relevant legislation appropriate to site working

j) Regulations, site procedures and statutory instruments for waste materials disposal including from the Environmental Protection Agency (EPA) and equivalent bodies in Scotland, Wales and Northern Ireland.

EL14. INSTALL INSTRUMENTATION SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is for people who install instrumentation and associated equipment.

This unit is about following the correct procedures for the installation of instrumentation and associated equipment as specified.

The person carrying out this work will need to show that they possess the skills and knowledge to install instrumentation and associated equipment, apply the correct methods for identifying and isolating electrical supply, locate and fix instrumentation and associated equipment correctly, identify those areas which have the potential to be hazardous and apply the correct methods for identifying process isolation.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Carry out an assessment of risks and follow the agreed safe system of work during their installation activities

2. Follow accurately all appropriate manufacturers' instructions and industry approved practice when carrying out the installation of instrumentation and associated equipment

3. Confirm the existing electrical supply is compatible with the instrumentation and associated equipment to be installed

4. Carry out a safe and secure electrical and process isolation prior to commencing installation in accordance with relevant industry regulations and approved procedures

5. Measure and mark out all locations for the instruments and any associated equipment in accordance with the drawings and instructions and to comply with electrical regulations

6. Install the instruments and associated equipment correctly and in accordance with manufacturers' instructions and relevant industry regulations

7. Report to relevant people those variations to the planned programme of work that may have the potential to be dangerous and/or have a cost implication

8. Confirm the appropriate action in relation to the variations with the relevant people

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) How to carry out an assessment of risks and plan a safe system of work with regard to:
- access to the immediate workplace,
- preventing unauthorised access,
- others working at the workplace,
- safe system of work and equipment integrity,
- the working environment

b) The appropriate manufacturers' instructions to follow

c) The storage, transportation and handling of instruments and equipment

d) How to confirm the existing electrical supply is compatible with the planned installation

e) The industry procedures for a safe and secure electrical and process isolation with regard to:
- an assessment of safe working practice,
- the identification of circuits to be isolated,
- the test and proving instruments selected,
- use of the testing methods, and
- the selection of devices for securing isolation.

f) The application, advantages and limitations of installation methods when installing instruments and associated equipment

g) The environmental factors which affect the location of instruments and associated equipment

h) How to interpret diagrams and drawings to find site services and the planned location for the instrumentation and associated equipment

i) The organisational procedures for reporting variations to work schedules

j) Which equipment is associated with and determined by the function of the instruments to be installed

Health and Safety:

k) The implications for relevant parties of carrying out an isolation

l) The importance of using personal protective equipment and safe appropriate tools for specific jobs

m) The hazards associated with using electrical equipment including their lifting, handling and fixing

n) The legal implications of health and safety in accordance with current health and safety legislation, regulations and codes of practice

Principles and theory

o) The latest, relevant Industry Standards relevant to instrumentation and associated equipment

p) Where to find out about the principles of electrical theory and installation techniques for the installation of instrumentation and associated equipment

EL15. INSTALL STRUCTURED CABLING SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is for people who position, assemble, fix and install cabling, closures and equipment.

The person carrying out this work will need to be capable of installing up to 230v flexible cables, plug tops and wiring from flex/fused outlets to structured cabling equipment.

This unit is about positioning, assembling, fixing and installing cables, closures and equipment for the work. It is about undertaking the installation of cabling, closures and equipment. Fundamental to this unit is the understanding and application of the relevant aspects of the risk assessment and the method statement for all the work they carry out.

The person carrying out this work must show that they possess the skills and knowledge to follow correct procedures when changes to the programme of work need to be undertaken.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Agree a programme of work with the responsible person and confirm with them those aspects of the risk assessment and relevant method statement which will impact on themselves and their work

2. Seek an agreement that damage they identify at the work location existed prior to the installation work commencing

3. Protect property against possible damage occurring during the installation process

4. Check the building structures for hazards prior to the installation of cabling, closures and equipment

5. Confirm that the fixings and cable support systems are appropriate to the cabling being used

6. Check the external condition of materials delivered to site for any damage and the quantity of deliveries against the delivery paperwork

7. Check that the cabling, pathways, closures and equipment are of the right type for the work to be carried out, appropriate for the working environment and meet the system requirements

8. Report to the responsible person in good time where the installation of the cabling, pathways, closures and equipment has to alter from the planned programme of work

9. Confirm with the responsible person and before work commences, when its applicable, that the electrical supply has been isolated by a competent person

10. Install the structured cabling systems in accordance with current Standards and to the work specification

11. Monitor that the installation of the structured cabling systems is in accordance with the work specification, risk assessment and current Standards

12. Ensure waste material are disposed of in accordance with appropriate regulations, site procedures and statutory instruments

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) Their own responsibilities with regard to others on site and the importance of ensuring a risk assessment exists

b) The plans for the installation, what actual work is required and the time it must be completed within

c) The meaning of the following: voltage, current, power factor, kilo-watts (kW) and kilovolt ampere (kVA)

d) How to determine the suitability of types of cabling, closures, materials and equipment for the work location and the suitability of the building fabric to the materials

e) How to calculate total current and kVA for equipment and the basics of start-up/in-rush current and the impact on fuse selection

f) The authority and procedures for co-ordinating information regarding their work with other trades

g) How to check for other site services and the implications of installing into building fabrics, and adjacent to existing cables

h) The importance of being aware of the possible presence of asbestos in building fabric, its potential hazards and to whom they should report if its presence is suspected

i) Industry approved practice used for measuring, marking out and cutting cabling, pathways, closures and equipment

j) The advantages and limitations of different fixings for attaching pathways, closures and equipment to the building structure

k) The importance of ensuring the use of safe, industry approved work practices as well as compliance with legal requirements when preparing to carry out installation work

l) The legal duties of employers and employees for health and safety as required by the Health and Safety at Work Act 1974 and other relevant legislation appropriate to site working, e.g. EAWR, Wiring Regulations, COSHH, CDM and Building Regulations

m) Regulations, site procedures and statutory instruments for waste materials disposal including from the Environmental Protection Agency (EPA) and equivalent bodies in Scotland, Wales and Northern Ireland

EL16. MAINTAIN ELECTRICAL SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is for people who maintain electrotechnical systems and equipment.

This unit is about following agreed procedures when carrying out maintenance activities on electrotechnical systems and equipment.

The person carrying out this work needs to show that they possess the skills and knowledge to maintain electrotechnical systems and equipment in accordance with a safe system of work, identify faults accurately and safely, carry out repair activities within the scope of their job responsibilities and record their findings in accordance with organisational requirements.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Carry out an assessment of risks and implement the agreed safe system of work during all maintenance activities

2. When necessary, use relevant sources of technical information to support maintenance activities

3. Follow agreed maintenance procedures to ensure the effective co-ordination of activities by the relevant person(s)

4. Use, safely and correctly, the tools, equipment and materials, following:
   - their workplace procedures
   - the suppliers' instructions
   - health and safety requirements

5. Locate the correct wiring systems and equipment as specified in the maintenance instructions

6. Carry out safe and secure isolation procedures to comply with electrical regulations and the agreed safe system of work

7. Identify and locate, accurately, the electrical systems and equipment to be maintained in accordance with the relevant maintenance schedule

8. Ensure the maintenance activities comply with manufacturers' instructions, industry approved practices and the maintenance schedule

9. Advise the relevant person(s) clearly and accurately about the potential consequences of carrying out effective repairs

10. Where maintenance activities vary from the schedule, promptly notify the relevant person(s)

11. Use suitable testing methods to accurately evaluate the performance of all replaced and adjusted equipment and systems during and on completion of the maintenance activity

12. Ensure maintenance records are accurate, complete and promptly given to the relevant person(s) in the required format

13. Complete all maintenance activities within the agreed timescale

14. When necessary, promptly report any expected delays in completion to the relevant persons(s)

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The procedures for carrying out an assessment of risks and implementing safe systems of work

b) Contract responsibilities with respect to :
- planned maintenance
- non-routine maintenance
- agreeing variations to the maintenance specification or schedule
- start, finish dates and timings

c) The differences between carrying out routine and non-routine maintenance activities

d) The implications of inappropriate work practices

e) Which information sources are relevant and appropriate to the location of their maintenance activities

f) The handling and usage of tools, materials and equipment

g) Industry procedures for a safe and secure isolation with regard to:
- safe working practices
- the identification of circuits to be isolated
- the selection of test and proving instruments selected
- the selection of devices for securing the means of isolation

h) How to interpret specifications, diagrams and drawings to find the planned location of the wiring systems, wiring enclosures and equipment, and facilitate the connection of the wiring systems, wiring enclosures and equipment

i) What corrective action is appropriate and when to carry it out

j) The advantages and limitations of repair versus replacement

k) Responsibilities with regard to making decisions for repair

l) Approved procedures and likely implications for relevant parties of carrying out effective repairs

m) The reasons for regular inspection, adjustment and replacement of, or to, electrical systems and equipment

n) Workplace requirements for, and the importance of, documenting information, reporting findings and variations from the maintenance schedule

o) Organisational procedures for the completion of necessary documentation which might include organisational or external Quality Assurance systems

Health and Safety

p) The legal responsibilities for health and safety in accordance with current health and safety legislation

q) The importance of using personal protective equipment and appropriate tools for specific jobs

Principles and theory

r) The latest Industry Standards and regulations relevant to electrotechnical systems and equipment, and the environments within which they operate

s) Where to find out about the principles of electrical theory and installation techniques for maintaining electrotechnical systems and equipment

EL17. PREPARE TO BUILD PANELS

UNIT DESCRIPTOR

This unit is about making the necessary preparations for building panels, and involves ensuring that the conductor systems and equipment are suitable for the panel type and its specification, and planning a safe system of work.

The person carrying out this work must ensure that they have the right materials for the type of panel, and that the working conditions are safe for work to start. It is also about ensuring that the conductor systems and equipment are safe and fit for purpose, correctly plan a safe system of work.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Confirm that their plans for the panel building work meet with the expectations of the relevant person

2. Report, promptly, any changes to the working conditions of the workplace which might impact on the panel building to the relevant person(s)

3. Prepare a schedule of equipment applicable to the panel type from customer information and specifications

4. Ensure conductor systems and equipment they have ready for use meet the requirements of the latest issue of the circuit diagrams and layout drawings

5. Confirm that the conductor systems and equipment are:
   - fit for purpose, and
   - appropriate for the panel type to be built

6. Obtain all relevant manufacturers' data, publications and the latest, relevant Industry Standards for the panel's conductor systems and equipment

7. Confirm that there are no hazards which could harm themselves or other people prior to commencing work

8. Plan a system of work for use throughout the panel building which is safe and effective

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) Contract responsibilities and legal implications with respect to
- agreeing variations to the panel building not within the contract/ specification
- start and finish dates

b) How to carry out an assessment of risks and plan a system of work with regard to:
- access to the workplace,
- preventing unauthorised access,
- others working at the workplace,
- systems and equipment integrity,
- the working environment.

c) The materials, their advantages, limitations and applications used as electrical conductors and insulators

d) The advantages and limitations of conductor systems, equipment and panel types

e) Methods of determining the quantity and current carrying capacity of conductor systems

f) How to prepare a schedule of equipment required for panel building from customer information or specifications

g) How to determine the suitability of a conductor system and panel building equipment for a particular environment

h) How to interpret circuit diagrams and layout drawings and the planned location for conductor systems and equipment within each panel type

i) How to use and interpret the relevant Industry Standards and manufacturer's data and publications

j) Responsibilities for health and safety in accordance with current health and safety legislation, regulations and codes of practice

k) The potential hazards in the panel building environment and how the risks to others can be minimised

l) The legal responsibilities for health and safety in accordance with current health and safety legislation, regulation and codes of practice

<u>Principles and theory</u>

m) The latest, relevant Industry Standards applicable to the preparation of panel building

n) Where to find out about the principles of electrical theory and installation techniques and those which are appropriate to the preparation of building panels

o) Where to find relevant manufacturers' data and publications

EL18. BUILD PANELS USING SAFE AND APPROVED METHODS

UNIT DESCRIPTOR

This unit is for people who build panels in the workplace.

This unit is about following the correct procedures for building panels.

The person carrying out this work will need to show that they possess the skills and knowledge to build panels using safe and approved methods, use drawings, diagrams and specifications to assemble the panels, check for defects during the building period, and take suitable action to remedy defects.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Carry out an assessment of risks and follow a safe system of work which is safe and effective throughout all panel building activities

2. Assemble the main body of the panel to comply with drawings, diagrams and the relevant specification

3. Measure and mark out locations for panel equipment to comply with the drawings, diagrams and the relevant specification

4. Install and connect the panel's conductor systems and equipment safely to comply with the drawings, the diagrams, the relevant specification and the latest, relevant Industry Standards

5. Label, clearly, the conductors, connections and equipment to meet with the relevant specification and legal requirements

6. When necessary, take safe and suitable remedial action to correct any identified defects during the building period in accordance with industry practices

7. Complete any necessary documentation relating to the work legibly, accurately and in a timely manner to meet with organisational requirements

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) How to carry out an assessment of risks and plan a safe system of work with regard to:
- access to the workplace
- others working at the site
- the working environment
- preventing unauthorised access
- systems and equipment integrity

b) Safe methods and techniques of assembling the main body of panels

c) Main types, the advantages and limitations of different electrical connections

d) How to interpret circuit diagrams and drawings to facilitate the building of the main body of the panel and the connection of conductor systems and equipment

e) The procedures and techniques for the connection of single and multi-phase, control circuits and for the connection of equipment within the panel

f) The requirements of joints and connections to be of strength and conductance to allow for the passage of fault currents and to prevent corrosion

g) Industry approved procedures for labelling conductors, connections and equipment for identification purposes

h) How to identify defects and the implications of carrying out remedial action

i) Organisational procedures for the completion of necessary documentation which might include organisational or external quality assurance systems

Health and safety:

j) The importance of using personal protective equipment and safe appropriate tools for specific jobs

k) The procedures for reporting any potentially dangerous situations or incidents

l) The legal responsibilities for health and safety in accordance with current health and safety legislation, regulations and codes of practice

m) Handling conductor systems and equipment in the correct manner

Principles and theory

n) The latest, relevant Industry Standards applicable to the building of panels

o) Where to find out about the principles of electrical theory and installation techniques and those appropriate to building panels

EL19. PREPARE ELECTRICAL MACHINES FOR REPAIR

UNIT DESCRIPTOR

This unit is for people who are preparing to repair electrical machines.

This unit is about dismantling the machine to be repaired in order to identify the state of its condition and the extent of the repair required.

The person carrying out this work needs to show that they possess the skills and knowledge to dismantle the electrical machine, collect and establish data on the machine, establish the extent of the repair required and prepare records about the dismantled machine.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Obtain all relevant details on the machine to be repaired including the customer's information about possible faults

2. Record all necessary data about the machine including nameplate details prior to dismantling

3. Wear suitable personal protective equipment throughout preparation activities

4. Perform the appropriate diagnostic tests to establish and identify the faults using safe and industry approved methods

5. Prepare and clean the machine ready for dismantling using safe and industry approved methods

6. Dismantle the machine in accordance with the original equipment manufacturer's instructions using safe and industry approved industry methods

7. Uniquely identify each relevant component part to ensure an effective re-assembly and tracking process in accordance with organisational procedures

8. Establish the status of each component part and identify the type and location of the fault

9. Obtain accurate and sufficient data on all of the component parts

10. Record, clearly and accurately, those component parts which are faulty or damaged to provide for an efficient evaluation of repair viability

11. Pass on the records to the relevant person(s) promptly

KNOWLEDGE REQUIREMENTS

The person carrying out the work must know and understand:

a) The principles of safe manual and mechanical handling and lifting techniques appropriate to electrical machines

b) Methods of locating and securing different types of machines in readiness for a safe repair

c) The main types and constructional characteristics of electrical machines

d) The application, advantages and limitations of electrical machines

e) Organisational procedures for establishing the required data and the importance of collecting the required data

f) The main types of diagnostic tests and the safe procedures for carrying these out on machines and their component parts

g) Industry approved methods for:
- preparing and cleaning the machine appropriate to their location and
- dismantling the machine

h) How to interpret diagrams, drawings and original equipment manufacturer's instructions to be able to dismantle electrical machines

i) The organisational procedures for uniquely identifying and reading component parts of dismantled electrical machines

j) Common types of faults and where they may be found on electrical machines

k) The type of repairs that can be undertaken within the limitations of the electrical machine

l) Organisational requirements for compiling records

Health and Safety:

m) How to carry out an assessment of risks and plan a safe system of work with regard to:
- The legal responsibilities for health and safety according to current health and safety legislation
- The safe and correct use of diagnostic test equipment
- Potential dangers arising from hazardous substances used by or near to the machine in its original location
- The health and safety legislation in relation to lifting and mechanical handling of equipment

Principles and theory:

n) The latest Industry Standards for electrical machines

o) Where to find out about the principles of electrical theory for electrical machine

EL20. REWIND ELECTRICAL MACHINES

UNIT DESCRIPTOR

This unit is for people who rewind electrical machines.

This unit is about rewinding the machines effectively and in the correct sequence.

The person carrying out this work will need to show that they possess the skills and knowledge to strip and remove the windings, select the correct materials to conform to industry practice, insert the coils, and insulate and secure the coils.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Agree a programme of work with the responsible person and confirm with them those aspects of the risk assessment and relevant method statement which will impact on those working for them and their work

2. Confirm the electrical machine is secure and in the correct location in readiness for the rewind

3. Use tools and test instruments when carrying out rewinding operations which are suitable for the task, of the right type, for purpose and where appropriate have a current calibration certificate

4. Collect and record all relevant information, accurately, on the windings, the connections and the components when they strip the component parts from the electrical machine

5. Use materials appropriate to the rewinding required on the electrical machine, and insulate the component parts safely and in accordance with industry standards

6. Use winding techniques appropriate to the type of coils and machine and in accordance with industry approved procedures

7. Install and secure, correctly, the coils in the electrical machine in accordance with industry practice and industry approved procedures

8. Make connections according to the type of winding and which comply with the original equipment manufacturer's instructions

9. Undertake the correct static tests on the windings safely in accordance with industry approved procedures

10. Where appropriate, take safe and suitable action to remedy any identified defects after connection has taken place

11. Ensure tests and checks confirm the rewind meets the specification before varnishing

12. Follow industry procedures to varnish and cure the new windings in the correct manner

13. Complete all records about the tests legibly, accurately and timely in accordance with organisational requirements

14. Report the successful completion of the rewinding operation to the relevant person(s)

15. Ensure all waste materials are disposed of in accordance with appropriate regulations, site procedures and statutory instruments

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The principles of safe manual and mechanical handling and lifting techniques appropriate to electrical machines

b) The methods of locating and securing different types of machines in readiness for a safe repair

c) The main types of windings associated with machines

d) The main types of winding connections associated with machines

e) How to collect information on the dimensions of coils

f) The advantages and limitations of materials used in windings

g) The factors affecting the number of turns in coils and the type of conductors used within coils

h) The advantages and limitations of insulation applicable to the machine and its coils

i) The selection of correct formers appropriate to the coils size and type

j) The methods of winding coils and the various winding techniques applicable to the types of electrical machines

k) The methods of installing coils into electrical machines

l) The implications of not insulating the coils or group of coils correctly and of using incorrect materials

m) The selection and safe application of tools and test instruments and the methods for checking test instruments are functioning and in calibration

n) The correct procedures for connecting different types of electrical machines

o) The advantages and limitations of different types of static tests

p) The appropriate action to take where tests reveal defects or faults

q) The procedures for carrying out pre-varnish tests and checks

r) The methods of varnish impregnation and curing

s) Organisational procedures for completing records and reporting

Health and Safety

t) The procedures for carrying out an assessment of risks and implementing safe systems of work

u) The legal responsibilities for health and safety according to current Health and Safety legislation

v) The safe and correct use of test equipment

Principles and theory

w) The latest Industry Standards for electrical machines

x) Where to find out about principles of electrical theory and constructional features for electrical machines

EL21. REPAIR ELECTRICAL MACHINES

UNIT DESCRIPTOR

This unit is for people who repair electrical machines.

This unit is about undertaking effective repairs of electrical machines.

The person carrying out this work needs to show that they possess the skills and knowledge to set the machine up for repair in a safe and approved manner, gather information about the repair required, select, prepare, install and fit the correct materials and component parts, report problems and notify the relevant person(s) that the repair is complete.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Carry out an assessment of risk and plan a safe system of work
2. Confirm the electrical machine is secure and in the correct location in readiness for the repair
3. Carry out isolation procedures to ensure a safe installation in accordance with electrical regulations and approved procedures as and when required
4. Use tools and test instruments when carrying out repairing activities which are of the right type, suitable for the task, fit for purpose and where appropriate have a current calibration certificate
5. Confirm the information available is in accordance with the required repair
6. Select the correct materials and component parts in accordance with the information on the required repair
7. Install and fit the materials and component parts in the correct sequence to comply with the required repair appropriate to the electrical machine
8. Record problems incurred during the repair activity promptly and report them to the relevant person(s)
9. Report to the relevant person(s) that the repair is complete and ready for assembly
10. Ensure all waste materials are disposed of in accordance with appropriate regulations, site procedures and statutory instruments

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The principles of safe manual and mechanical handling and lifting techniques appropriate to electrical machines

b) Methods of locating and securing different types of machines in readiness for a safe repair

c) The main types of repairs associated with electrical machines

d) The main types of component parts associated with electrical machines

e) How to collect information on the electrical machine requiring repair

f) The advantages and limitations of materials used in repairs of electrical machines

g) The advantages and limitations of materials and component parts applicable to the machine and its fault

h) The methods of installing materials and component parts into electrical machines

i) The implications of using incorrect materials

j) The correct selection and safe application of tools and test instruments and the methods for checking test instruments are functioning and in calibration

k) Organisational procedures for completing records and reporting problems

Health and Safety:

l) The legal responsibilities for health and safety according to current Health and Safety legislation

Principles and theory:

m) The latest Industry Standards for electrical machines

n) Where to find out and the principles of electrical theory for repairing electrical machines

EL22. ASSEMBLE, INSPECT AND TEST A REPAIRED ELECTRICAL MACHINE

UNIT DESCRIPTOR

This unit is for people who assemble, inspect and test repaired electrical machines.

This unit is about assembling, inspecting and testing repaired electrical machines effectively and in the correct sequence.

The person carrying out this work will need to show that they possess the skills and knowledge to assemble the component parts, inspect and test the repaired electrical machines using appropriate methods, use the test instruments correctly and complete records on the inspection and tests and about the repaired electrical machine

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Confirm the electrical machine is secure and in the correct location in readiness for assembly

2. Use tools and test instruments when carrying out assembly operations which are of the right type, are suitable for the task, fit for purpose and where possible have a current calibration certificate

3. Have the correct data and component parts to complete the assembly process

4. Carry out final connection in the terminal box, safely and accurately and in accordance with the electrical machine's specification

5. Undertake the assembly safely and in the correct sequence to comply with manufacturers' instructions

6. Conduct a pre-test inspection to confirm the machine is ready for testing

7. Record all relevant details, accurately, on the repaired machine in accordance with workplace requirements

8. Undertake an assessment of risks in relation to testing the repaired electrical machine

9. Conduct, in the correct sequence, appropriate static and functional tests in accordance with a safe system of work, the type of machine being tested, relevant industry standards and industry procedures and manufacturers' recommendations

10. Where appropriate, take safe and suitable action to remedy any identified defects after testing has taken place

11. Ensure all test results comply with the original equipment manufacturer's specification

12. Record inspections and test results in accordance with organisational procedures

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The principles of safe manual and mechanical handling and lifting techniques appropriate to electrical machines

b) Methods of locating and securing different types of machines in readiness for a safe repair

c) The correct selection and application of tools and test instruments and the methods for checking test instruments are functioning and in calibration

d) The need to have the correct information from the dismantling activity in order to carry out an effective assembly process

e) The main types of winding connections associated with machines

f) The procedures for connecting different types of electrical machines which conform to manufacturers' instructions and Industry Standards

g) The methods of assembling different types of electrical machines

h) The different methods and purpose of pre-test inspections

i) How to carry out an assessment of risks and plan a safe system of work with regard to inspection and testing

j) The types, purpose and requirements of the electrical machine to be inspected and tested

k) The advantages and limitations of static and functional tests

l) Safe and suitable action to take to remedy defects or faults

m) The importance of recording the test results and checking those against the equipment manufacturer's specifications

n) Organisational procedures with regard to completing records

Health and Safety

o) The legal responsibilities for health and safety according to current Health and Safety legislation

p) The safe and correct use of test equipment

Principles and theory

q) The latest Industry Standards for electrical machines

r) Where to find out about principles of electrical theory for assembling, inspecting and testing electrical machines

EL23. CONNECT ELECTRICAL SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is for people who are required to connect wiring systems, wiring enclosures and equipment.

This unit is about implementing the correct procedures for connecting wiring systems, wiring enclosures and equipment appropriate to the electrical system.

The person carrying out this work needs to show an understanding of connecting wiring systems, wiring enclosures and equipment, and how to check the connection afterwards using safe methods

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Work within a safe system of work and that they identify any foreseeable hazards relating to the connection of wiring systems, wiring enclosures and equipment

2. Identify the means of electrical isolation prior to connection

3. Carry out isolation procedures to ensure a safe connection in accordance with electrical regulations and approved procedures as and when required

4. Make connections in accordance with specifications and comply with IEE wiring regulations as specified in the most recent British Standard for Electrical Installations

5. Check the connections are electrically and mechanically sound, and ensure that they are identified correctly and clearly

6. Where appropriate, take safe and sensible action to remedy any identified defects after connection has taken place

7. Complete any necessary documentation about the work accurately and timely in accordance with organisational requirements

8. Ensure all waste materials are disposed of in accordance with appropriate regulations, site procedures and statutory instruments

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The main types, their advantages and limitations of different electrical connections

b) The correct procedures for a safe isolation

c) The implications for relevant parties of carrying out an isolation

d) The procedures for the connection of single and multi-phase circuits

e) How to interpret diagrams and drawings to facilitate the connection of wiring systems, wiring enclosures and equipment

f) The procedures for proving a connection is electrically and mechanically sound

g) How to establish which connections in circuits and protective conductors including connections to terminals are suitable for the purpose for which they are being used

h) The implications on the choice of connections with regard to permanent or temporary purposes

i) The requirements of joints and connections to be of strength and conductance to allow for the passage of fault currents and to prevent corrosion

j) Organisational procedures for completion of necessary documentation

Health and Safety

k) The importance of using personal protective equipment and safe appropriate tools for specific jobs

l) Procedures for carrying out an assessment of safe systems of work including permits to work

m) The procedures for reporting any potentially dangerous situations or incidents

Principles and theory

n) IEE wiring regulations as specified in the latest British Standard for Electrical Installations relevant to types and uses of wiring systems, wiring enclosures and equipment

o) Where to find out about the principles of electrical theory which allow for the safe connection of electrical wiring systems and equipment

EL24. INSPECT ELECTRICAL SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is for people who need to carry out final inspection procedures for electrotechnical systems, equipment and components.

This unit is about final inspection procedures requiring that they check the cable separations, earthing and bonding procedures and labelling. It also covers ensuring that the appropriate health and safety precautions have been taken, including a risk assessment. It requires that all necessary documentation is completed following inspection.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Agree a programme of work with the responsible person and confirm with them those aspects of the risk assessment and relevant method statement which will impact on those working for them and their work

2. Confirm that their safe system of work is appropriate to the scope of work

3. Conduct a structural inspection in accordance with the requirements of the client and the industry codes of practice

4. Confirm cables are installed and labelled to required standards

5. Carry out a check to confirm that earthing and bonding have been carried out in accordance with current Standards

6. Follow the correct procedures for identifying and carrying out a safe isolation before inspecting, testing and commissioning the electrical installation

7. Conduct an inspection in accordance with the IEE wiring regulations as specified in the British Standard for Electrical Installations

8. Ensure that documentation related to the installation, connection and testing of the system and components has been completed accurately and clearly

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) Risk assessment procedures and knowledge of method statements to ensure safe systems of work

b) The importance of ensuring correct cable separation and how to check this

c) The importance of choosing the correct instruments for the inspection

d) What documentation is required and organisational procedures for completion

e) The scope, type and requirements of the inspection electrical systems and associated equipment with regard to:
- Selection, identification and connection of conductors
- Protection against contact and fire
- Labelling and access
- Application of danger, warning notices, diagrams and instructions

f) The correct procedures for safe isolation

g) The approved recording and reporting procedures for inspection and test results

h) The legal responsibilities in accordance with current health and safety regulations and legislation and codes of practice

Health and Safety

i) The importance of using personal protective equipment and safe, appropriate tools for specific jobs

j) The procedures for reporting any potentially dangerous situations or incidents

k) The legal responsibilities for health and safety in accordance with current health and safety legislation, regulations and codes of practice

Principles and theory

l) The latest Industry Standard for electrotechnical systems, equipment and components, for example:
- The current edition of the Electrical Association Wiring Memorandum (G39)
- The ILE Code of Practice

m) Where to find out about the principles of electrical theory and installation techniques for the inspection and testing of electrical systems and associated equipment

EL25. TEST ELECTRICAL SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is for people who need to carry out final testing procedures for electrotechnical systems and components.

The person carrying out this work needs to ensure that the test instruments to be used are of the required calibration for testing. This unit is about conducting tests to ensure that the installation complies with industry standards and reporting any problems that they encounter.

They must know how to conduct a risk assessment to ensure that the work is carried out safely. They must also know the range of testing instruments and the appropriate tests to carry out.

The person carrying out this work must ensure that all records are completed accurately and all reporting requirements are met.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Agree a programme of work with the responsible person and confirm with them those aspects of the risk assessment and relevant method statement which will impact on those working for them and their work

2. Confirm that their safe system of work is appropriate to the scope of work

3. Confirm cables are installed and labelled to required standards

4. Carry out a check to confirm that earthing and bonding has been carried out in accordance with current Standards

5. Confirm that test instruments are appropriate to the job in hand, fit for purpose and have a current calibration certificate

6. Conduct, in the correct sequence, the required tests to ensure that the installation complies with the latest Industry Standards relevant to electrical systems and associated equipment, manufacturers' instructions and the client's requirements

7. Where the test results reveal problems, report the problems to the relevant person(s)

8. Carry out the correct functional tests to determine whether the system and equipment operates prior to leaving the site

9. Prepare a formal record of the inspection and testing in accordance with the client's requirements and the industry codes of practice

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) Risk assessment procedures and knowledge of method statements to ensure safe systems of work

b) Earthing and bonding and how to check the procedures have been carried out correctly

c) What documentation is required and organisational procedures for completion

d) The importance of following industry practices for labelling which ease future work and referencing

e) The scope, type and requirements of the testing of electrotechnical systems and associated equipment

f) Procedures for an assessment of risk and how to implement a safe system of work

g) The specific procedures and requirements for:
- initial and periodic inspection and testing
- pre-commissioning and commissioning

h) The correct procedures for a safe isolation

i) The importance of choosing the correct instruments for the particular test

j) The main methods for checking test instruments are functioning and in calibration

k) The best practice with regard to methods of testing and the correct sequence of testing

l) The characteristics of different types of cabling and components and how they impact on the test

m) The importance of accurate recording of the test

n) The approved recording and reporting procedures for test results

o) The legal responsibilities in accordance with current health and safety regulations and legislation and codes of practice

p) Precautions necessary for testing energised equipment

Health and Safety

q) The importance of using personal protective equipment and appropriate tools for specific jobs

r) How carrying out tests effects equipment not part of the fixed installation

s) Industry approved procedures and practices for the use of test equipment

t) The legal responsibilities for health and safety in accordance with current health and safety legislation, regulations and codes of practice

u) The implications of testing under live conditions

Principles and theory

v) The latest Industry Standard for electrotechnical systems, equipment and components, for example
   - The current edition of the Electrical Association Engineering Memorandum (G39)
   - The ILE Code of Practice

w) Where to find out about the principles of electrical theory and installation techniques for the testing of electrical systems and associated equipment

EL26. COMMISSION ELECTRICAL SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is for people required to commission an electrotechnical installation.

This unit is about carrying out the process of commissioning electrotechnical systems, components and equipment in a safe manner and in the correct sequence as prescribed by the relevant regulations.

The person carrying out this work needs to show that they have an understanding of how to commission electrotechnical systems, equipment and components bearing in mind the constraints imposed by legislation and regulations, and the importance of keeping good records of the procedures followed and results.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Plan and agree the commissioning procedures with relevant people on site

2. Undertake an assessment of safe working practices in accordance with general and industry specific health and safety regulations

3. Confirm that an inspection in accordance with all relevant regulations has been conducted

4. Confirm that the required tests in accordance with all relevant regulations and in accordance with manufacturers' instructions have been carried out

5. Commission by confirming that the electrical systems and equipment are in accordance with health and safety requirements, the latest Industry Standards, manufacturers' instructions, industry approved procedures, and the maintenance schedule

6. Confirm that the electrotechnical systems, equipment and components are safe and function correctly

7. Handover of the electrotechnical systems and equipment to the relevant person(s) includes accurate and complete information and documentation about the inspection, tests and commissioning

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The purpose and requirements of the system to be commissioned

b) Procedures for an assessment of safe systems of work including permits to work

c) The correct procedures for a safe isolation

d) The requirements of an inspection

e) The best practice with regard to methods of testing, their inter-relationship and sequence

f) The importance of accurate labelling and recording of the test

g) The characteristics of different types of cabling and components and how they impact on the test

h) The approved procedures and requirements for commissioning the system, equipment and components

i) The importance of commissioning in accordance with :
- health and safety requirements
- manufacturers' instructions
- approved industry procedures
- and the work schedule

j) The approved reporting procedures

Health and Safety

k) The importance of using personal protective equipment and appropriate tools for specific jobs

l) How carrying out tests effects equipment not part of the fixed installation

m) Industry approved procedures and practices for the use of test equipment

n) The legal responsibilities for health and safety in accordance with current health and safety legislation, regulations and codes of practice

o) The implications of testing under live conditions

Principles and theory

p) IEE wiring regulations as specified in the latest British Standard for Electrical Installations relevant to types and uses of wiring systems, wiring enclosures and equipment

q) Where to find out about the principles of electrical theory for the inspection, testing and commissioning of electrical wiring systems and equipment

EL27. IDENTIFY FAULTS IN ELECTRICAL SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is for people who diagnose common faults in electrotechnical systems and equipment, and need to take appropriate action.

This unit is about ensuring the safe identification using safe and approved methods.

The person carrying out this work needs to show that they possess the skills and knowledge to follow correct procedures in identifying the location of the fault, carrying out safe and secure isolation procedures, and diagnosing the faults in electrotechnical systems and equipment.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Obtain clear and detailed information about the reported faults and any components which need to be replaced, this includes the system specification relating to the electrotechnical systems and equipment

2. Advise the relevant people clearly and accurately about the potential disruption and consequences of carrying out a diagnosis of faults

3. Conduct an assessment of safe working practices and perform suitable tests on the installed electrotechnical systems and equipment, safely, to identify the fault

4. Follow the correct procedures for carrying out a safe and secure isolation, where required, before diagnosing the fault or removing and replacing components

5. Follow safe procedures for diagnosing using appropriate tools, equipment and materials

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The necessary information for carrying out a successful fault diagnosis

b) The implications for relevant parties of carrying out diagnosis and rectification of faults

c) How to carry out an assessment of risks and plan a safe system of work

d) The working conditions and the working environment

e) Organisational reporting and recording procedures

f) The correct sequence of tests for locating faults

g) The advantages and limitations of fault diagnosis techniques

h) The correct procedures for a safe and secure isolation

Health and Safety

i) The importance of using personal safety equipment and appropriate tools for specific jobs

j) The legal responsibilities for health and safety in accordance with current health and safety legislation, regulations and codes of practice

k) The hazards associated with using electrical equipment and plant including their lifting, handling, fixing and disposal

l) Importance of providing information clearly, courteously and professionally and the consequences of supplying inaccurate or incomplete information to the relevant person in terms of safety and system operation

Principles and theory

m) The latest, relevant Industry Standards applicable to diagnosing faults in electrotechnical systems

n) Where to find out about principles of electrical theory and installation techniques for diagnosing and correcting faults in electrical systems and equipment

EL28. RECTIFY FAULTS IN ELECTRICAL SYSTEMS, EQUIPMENT AND COMPONENTS

UNIT DESCRIPTOR

This unit is for people who correct common faults in electrotechnical systems and equipment, and need to take appropriate action.

This unit is about ensuring the safe replacement of faults and faulty components, and correcting the faults by using safe and approved methods.

The person carrying out this work needs to show that they possess the skills and knowledge to follow correct procedures for identifying the location of the fault, carrying out safe and secure isolation procedures, correcting faults using safe and approved methods and using test equipment and tools correctly. They must remove and replace components.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Obtain clear and detailed information about the reported faults and any components which need to be replaced, this includes the system specification relating to the electrotechnical systems and equipment

2. Advise the relevant people clearly and accurately about the potential disruption and consequences of carrying out a diagnosis and correction of faults

3. Agree the appropriate repairs, removals and replacements and their implications with the relevant people in accordance with organisational procedures

4. Follow the effective procedures when rectifying the fault, including using the appropriate tools, equipment and materials

5. Remove and replace electrotechnical systems, components and associated equipment components in order to enable ease of access and facilitate future maintenance and in accordance with relevant regulations, manufacturers' instructions and organisation procedures

6. Leave the electrotechnical systems, equipment and components safe, in accordance with industry regulations if the fault can not be corrected immediately

7. Inspect and test that the repaired electrotechnical systems and equipment are functioning in accordance with the relevant Industry Standards and specifications

8. Inform the relevant people about the test results and complete the documentation clearly and accurately

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The implications for relevant parties of carrying out rectification of faults

b) How to carry out an assessment of risks and plan a safe system of work

c) The working conditions and the working environment

d) Organisational reporting and recording procedures

e) The correct sequence of tests for locating faults

f) The advantages and limitations of fault diagnosis techniques

g) The main types, advantages and limitations of test instruments

h) The correct procedures for a safe and secure isolation

i) The correct methods for checking that test instruments are functional and in calibration

j) The methods and the correct procedures to follow for correcting faults

k) The main requirements and procedures for inspecting and testing rectified electrotechnical systems and equipment installed equipment

l) Organisational requirements with regard to informing relevant people about the test results and completing all relevant documentation

m) How to interpret diagrams and drawings to enable the correct positioning and fixing of electrotechnical systems, equipment and components

n) The procedures for ensuring that components are electrically and mechanically sound and identified clearly and correctly

o) The procedures for functional testing following the rectification of faults in electrotechnical systems

Health and Safety

p) The importance of using personal safety equipment and appropriate tools for specific jobs

q) The legal responsibilities for health and safety in accordance with current health and safety legislation, regulations and codes of practice

r) The hazards associated with using electrical equipment and plant including their lifting, handling, fixing and disposal

s) Importance of providing information clearly, courteously and professionally and the consequences of supplying inaccurate or incomplete information to the relevant person in terms of safety and system operation

Principles and theory

t) The latest, relevant Industry Standards applicable to diagnosing and correcting faults in electrical systems and equipment

u) Where to find out about principles of electrical theory and installation techniques for diagnosing and correcting faults in electrical systems and equipment

EL29. INSTALL HIGHWAY ELECTRICAL INFRASTRUCTURE EQUIPMENT

UNIT DESCRIPTOR

This unit is for people who are going to undertake the installation, adjustment or removal of lighting columns, traffic sign posts or feeder pillars in highway electrical systems.

This unit is about ensuring the safe and correct installation, adjustment and removal of lighting columns, traffic sign posts and feeder pillars in highway electrical systems.

The person carrying out this work needs to show that they possess the skills and knowledge to install / adjust / remove lighting columns, traffic sign posts and feeder pillars, to confirm that they have the correct materials and equipment for the work and site conditions, to carry out the correct procedures for excavation and reinstatement and the correct procedures for lifting and handling.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Confirm with the relevant person the scope of the work to be carried out
2. Review the work site and working conditions for any changes which might impact on the work due to take place
3. Identify any variances in the working conditions which might impact on the work taking place
4. Comply with the approved procedures for reporting, recording and taking corrective action
5. Determine the position of site services using suitable equipment and information
6. Confirm details of infrastructure equipment to be installed in terms of weight and lifting points
7. Confirm details of foundation depths for the infrastructure equipment to be installed
8. Confirm that the lifting equipment they are to use is suitable for the work to be undertaken
9. Have the appropriate foundation/reinstatement materials for the work to be completed
10. Use/wear suitable personal protective equipment throughout all work activities
11. Follow manufacturers' instructions or organisational procedures in the use of equipment and materials
12. Ensure correct alignment and orientation of infrastructure equipment

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The scope of the work to be carried out

b) Hazards present at the work site or from a change in working conditions which need to be controlled

c) How to confirm the suitability of materials and equipment for the work to be carried out

d) How to identify the position and avoid damage to existing site services

e) How to confirm the appropriate method of installation for the work to be carried out

f) The use of cable/pipe detection instruments

g) The correct method and choice of reinstatement methods and materials

h) The correct methods for the disposal of surplus site materials

i) The importance of wearing appropriate personal protective equipment

j) The correct signing and guarding appropriate to the site and in accordance with current legislation

k) Health and safety legislation. regulations and codes of practice relevant to lifting equipment

For the installation of pillars, columns and posts:

l) How to confirm the safe working load of the crane/lifting equipment

m) How to ensure stability of the crane/ lifting equipment for all site conditions

n) How to ensure operation of the crane/lifting equipment in compliance with manufacturers instructions

o) The correct selection of lifting slings/chains

p) The methods of sling/chain inspection prior to use

q) How to determine the weights to be lifted including column/post removal

r) The correct foundation depths for columns, posts and feeder pillars

s) The correct use of slings/chains

They should know and understand the following aspects relating to:

Principles and Theory

t) Current industry standards relevant to installing highway electrical systems such as:
- ILE Code of Practice for Public Lighting
- Electricity Association Memorandum G39
- Traffic Signs Manual Chapter 8, Department of Transport
- Specification for Excavation and Reinstatement. (H.A.U.C.)
- Code of Practice for Reinstatement (N.R.S.W.A.)
- H.S.E Guidance Notes

EL30. APPLY SURFACE PROTECTION TO HIGHWAY ELECTRICAL SYSTEMS

UNIT DESCRIPTOR

This unit is for people who are going to apply surface protection to highway electrical systems.

This unit is about following the correct procedures and instructions received from the relevant person to prepare for and apply surface protection to highway electrical systems.

The person carrying out this work needs to show that they possess the skills and knowledge to confirm what surface preparation is required, to prepare highway electrical systems prior to the application of surface protection, to apply surface protection to highway electrical systems and to take appropriate measures to protect the public and property during the work activity.

PERFORMANCE OBJECTIVES

The person carrying out the work must show that they:

1. Confirm with the relevant person the scope of the work to be carried out
2. Review the work site and working conditions for any changes which might impact on the work due to take place
3. Identify any variances in the working conditions which might impact on the work taking place
4. Comply with the approved organisation procedures for reporting, recording and taking corrective action
5. Confirm that the access equipment they are to use is suitable for the work to be undertaken
6. Confirm with the relevant person the materials and equipment to be used are correct for the work to be undertaken
7. Use/wear suitable personal protective equipment throughout all work activities
8. Follow manufacturers instructions or organisational procedures and current legislation in the use and disposal of all materials
9. Confirm the surface preparation and application of surface protection requirements
10. Take adequate precautions to prevent damage to property, persons and the environment from spillage

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The scope of the work to be carried out

b) Hazards present at the work site or from a change in working conditions which need to be controlled

c) How to confirm the suitability of access equipment for the work to be carried out

d) How to determine the surface preparation required to minimise contamination, rusting or flaking paint

e) How to confirm the system and colours of surface protection material to be used for surface protection

f) How to apply organisational procedures/requirements, the current codes of practice and regulations for the work to be carried out

g) How to determine the correct tools/equipment for the application of surface protection materials

h) The importance of using appropriate personal protective equipment

i) The correct signing and guarding appropriate to the site and in accordance with current legislation

j) The correct disposal of materials

Principles and theory

k) Current industry standards relevant to installing highway electrical systems such as:
- The ILE Code of Practice
- Electricity Association Engineering Memorandum G39
- Traffic Signs Manual (Chapter 8), Department of Transport

EL31. CARRY OUT EMERGENCY WORK ON HIGHWAY ELECTRICAL SYSTEMS

UNIT DESCRIPTOR

This unit is for people who are required to carry out emergency work on highway electrical systems and associated equipment.

This unit is about ensuring that safe and approved methods are used to carry out emergency work on highway electrical and associated electrical equipment

The person carrying out this work needs to show that they possess the skills and knowledge to assess the likely hazards and risks to themselves and others resulting from the emergency situation, assess the site for damaged equipment, ensure the site is safe and secure for site personnel and the general public, repair equipment where appropriate, report work that cannot be repaired and record the results of their work.

PERFORMANCE OBJECTIVES

The person carrying out the work must show that they:

1. Prepare for the emergency work by confirming its nature and location of the checking and that they have appropriate equipment

2. Follow agreed procedures to ensure co-ordination as appropriate with the Emergency Services and the relevant person(s)

3. Carry out an accurate assessment of the site to determine the structural damage, electrical damage and the type of electrical supply present at the site

4. Carry out safe isolation procedures

5. Make safe the highway electrical and associated equipment, where appropriate, cables to prevent immediate danger to the public, themselves and other site personnel

6. Identify equipment which can be removed from the site and equipment which can be left safely on site

7. Monitor that the site is safe and secure and protects the public, vehicular traffic and livestock from harm

8. Keep the relevant person(s) and emergency services aware of their actions regularly

9. Follow agreed organisational procedures to obtain technical back-up and additional resources where necessary

10. Maintain and complete accurate records about the work and that they are passed to the relevant person(s) promptly

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The correct procedures for preparations for attending to emergency work

b) The correct site procedures for co-ordination with emergency service work and other relevant people

c) How to carry out a safe assessment of the site and plan site working

d) The procedures for identifying structural damage and electrical damage

e) How to identify the different types of supply

f) What the correct procedures are to effect a safe isolation

g) The correct procedures for making Electricity Company and private supplies safe

h) How to identify which equipment must be removed and which can be safely left

i) How to light, sign and guard the site to protect the public, livestock and vehicular traffic

j) When to request technical backup and when it is safe to repair and is within their job responsibility to do so

k) Organisational reporting and recording procedures and those relating to involving technical advice and additional resources

l) The importance of using personal protective equipment and safe appropriate tools for specific jobs

m) The legal responsibilities in accordance with current health and safety regulations, legislation and codes of practice

n) The hazards associated with underground and overhead cables and other services

Principles and theory

o) Responsibilities under the New Roads and Streets Works Act

p) The latest Industry Standards for highway electrical systems and associated equipment

q) The ILE Code of Practice

r) Where to find out about the principles of electrical theory and installation techniques which allow for the safe emergency working on highway electrical systems and associated equipment

EL32. CARRY OUT EARTHING AND BONDING PROCEDURES FOR STRUCTURED CABLING

UNIT DESCRIPTOR

This unit is for people who carry out earthing and bonding on structured cabling systems.

This unit is about ensuring that the person carrying out the work follows appropriate earthing and bonding principles for locations with structured cabling systems and equipment.

The person carrying out this work will need to show that they are aware of the potential hazards involved with this work and that they carry out the work safely and utilise the right materials and instruments. It also requires that they inspect and test the earthing systems to ensure they have been carried out in accordance with the current Standards. It involves recording the test results accurately and noting those that need rectification and then repeating the tests.

Fundamental to this unit is the understanding and application of the relevant aspects of the risk assessment and the method statement for all the work they carry out and the understanding that a qualified electrician will need to identify the type of earthing and bonding system required.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Agree a programme of work with the responsible person and confirm with them those aspects of the risk assessment and relevant method statement which will impact on those working for them and their work

2. Identify the scope and responsibilities of earthing and bonding and the type of earthing and bonding system required in conjunction with a competent person

3. Work safely when working on earthing and bonding systems by being alert to the potential hazards that this work can incur

4. Utilise materials and instruments appropriate to the earthing and bonding system that are safe, fit for purpose and certified as appropriate for their use

5. Inspect and test the earthing system in accordance with the current Standards

6. Record the results of the tests accurately and in accordance with the appropriate regulations and organisational requirements

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) The purpose and requirements of the system to be earthed

b) Risk assessment procedures and knowledge of method statements to ensure safe systems of work

c) The basic principles relating to earthing and bonding including how to carry out continuity testing on the system on hand and inspect in accordance with the Standards

d) The hazards associated with connecting into an existing earthing system to include what happens when disconnecting an earth return conductor, touch voltage principle, the dangers in an earthing system when an earth fault occurs or when lightening strikes

e) The letter classifications for types and arrangements of earthing systems including: TN-C, TN-S, TNC-S, TT and IT systems

f) The different types and requirements of protective conductors including for lightning protection

g) The principles involved with protective multiple earthing (PME)/TNC –S

h) Factors that affect earth connections

i) The scope and responsibilities of the relevant Standards with reference to earthing and bonding of structured cabling systems and requirements on the application of equipotential bonding and earthing in buildings where structured cabling systems are to be installed

j) The scope and limitations of their work on earthing and bonding and the importance of including a qualified electrician to make the final earth connection

EL33. CARRY OUT FINAL INSPECTION PROCEDURES FOR STRUCTURED CABLING SYSTEMS

UNIT DESCRIPTOR

This unit is for people who need to carry out final inspection procedures for structured cabling systems.

This unit is about final inspection procedures requiring that the person carrying out the work checks the cable separations, earthing and bonding procedures, labelling and fire-stopping. It requires that the person carrying out this work produce “as fitted” drawings and schedules ready for handover to the client or responsible person.

PERFORMANCE OBJECTIVES

The person carrying out this work must show that they:

1. Agree a programme of work with the responsible person and confirm with them those aspects of the risk assessment and relevant method statement which will impact on those working for them and their work

2. Confirm that the separations between installed cables meet the requirements of the specification and the work location

3. Carry out a check to confirm that earthing and bonding procedures have been carried out in accordance with current Standards

4. Ensure that documentation related to the installation, connection and testing of the structured cabling systems has been completed accurately and clearly

5. Label the cables in accordance with the site documentation for ease of future reference

6. Identify what fire-stopping requirements are needed and ensure procedures for permanent fire-stopping are in place

7. Produce accurate “as fitted” drawings and schedules which can be handed over to the responsible person on completion of the work

KNOWLEDGE REQUIREMENTS

The person carrying out this work must know and understand:

a) Risk assessment procedures and knowledge of method statements to ensure safe systems of work

b) The importance of ensuring correct cable separation and how to check this

c) Earthing and bonding requirements and how to check the procedures have been carried out correctly

d) What documentation are required and organisational procedures for completion

e) The importance of following industry practices for labelling which ease future work and referencing

f) Permanent fire-stopping techniques, which to use and how to install them

g) How to produce accurate “as fitted” drawings and schedules for use by others on completion of the work