

# **Highway Electrical VRQ** **Specification**

## **for the Installation and Maintenance of Highway Electrical Works**

**Meeting the requirements of  
National Highway Sector Scheme 8 (NHSS 8);  
the Highway Electrical Registration Scheme (HERS);  
the Knowledge Requirements of the relevant units of NVQ Levels 2  
and 3 for the Highway Electrical Sector**



**VRQ Issue Status**

Issue 1	First Issue
Issue 1.1	Page 73 <b>Unit</b> 3/3 – Management and Supervision - Unit 3/3 Outcome 3: changed to 805
Issue 1.2	Page 71 <b>Unit</b> 2/2 – Safe Working Practices within the Highway Electrical sector - Unit 2/2 Outcome 8 changed to 209 Unit 2/5 Outcome 1: course ref 211 and 212 added to support underpinning knowledge criteria
Issue 1.3	Updated through-out Added additional pathways
Issue 1.4	Updated to reflect the Education and Skills Funding Agency (ESFA) requirements Clarification for Training Centre Provision
Issue 1.5	Final Review.
Issue 1.6 25 <sup>th</sup> April 2018	Removal of Specialist Training for HESA course 709, Unit 2/5 Outcome 1 – Installation Techniques – Public Lighting Removal of course 711 for Unit 2/9 Outcome 1 – Advance notification of course review and replacement. <u>Advance Notification</u> <i>Advance notification of course 403 update and course duration increase to 2 days, which will be a mandatory course for 711 replacements. Courses 712 to 716 will be updated in June 2018.</i>

**Associated Documents**

To ensure a full understanding of the Highway Electrical Sector and required levels of occupational knowledge and competence for a Learner undergoing the Apprenticeship programme, the following Documents must be read in conjunction with this document;

- **The Highway Electrical Training Specification** - <http://www.thehea.org.uk/hers/>
- **The Requirements for Approved Training Organisations and approved Trainers** - <http://www.thehea.org.uk/hers/>
- **The Highway Electrical Registration Scheme**- <http://www.thehea.org.uk/hers/>

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## **VRQ's for Highway Electrical Works**

### **Introduction**

The VRQ for Highway Electrical Works

These Qualifications have been developed with the aim of progressing learners into further learning and training / development. They each contain a range of units that may be used to create individual learning programmes tailored to the learners needs whilst enabling those learners to achieve to work towards achieving a national Qualification and improve their opportunities for success.

#### ***Level 2 Certificate in Highway Electrical Work***

Currently consists of a number of sub-sector specific pathways as set out below (note: further pathways may be added at a future date). Each pathway has a prescribed range of mandatory units that focus upon the specific skills that a learner will need to prepare them for level two activities within the highway electrical sector:

- Highway Cameras
- Highway Communications / Variable Message Signs
- Public Lighting (including Traffic Signs)
- Slot Cutting
- Traffic Signals

#### ***Level 3 Certificate in Highway Electrical Work***

Currently consists of a number of sub-sector specific pathways as set out below (note: further pathways may be added at a future date). Each pathway has a prescribed range of mandatory units that focus upon the specific skills that a learner will need to prepare them for level three activities within the highway electrical sector:

- Highway Cameras
- Highway Communications / Variable Message Signs
- Public Lighting (including Traffic Signs)
- Traffic Signals

There is no Level 3 Pathway for Slot Cutting

## Structure

The VRQ's for Highway Electrical Works consist of a Level 2 VRQ and a Level 3 VRQ. For formal Level 2 apprenticeships, the VRQ at Level 2 must be completed, followed by an NVQ at Level 2. At Level 3 (the commencement point for which would be the completion of the Level 2 criteria), the Level 3 VRQ must be completed followed by an NVQ at Level 3.

Learners will not be able to complete the advanced levels of learning required by the Level 3 VRQ without the necessary required level of underpinning knowledge being achieved.

It is recognised that there may be opportunities for prior learning to be accredited. In these circumstances, the Centre must establish that the level is current and meets the necessary standards. Where APL is to be used, it must be confirmed and recorded by the Centre that this has been reviewed, in terms of content, currency and applicability to the specific unit outcomes as set out in the Highway Electrical Training Specification

### The structure at Level 2 is as follows:

#### Level 2 Core units applicable to all sub-sectors:

Unit	Title	Sector
2/1	Health, Safety & Environmental Implementation in Highway Electrical works	All
2/2	Safe Working Practices within the Highway Electrical Sector	All
2/3	Basic Electrical Theory and Practice in the Highway Electrical Sector	All

#### Highway Cameras Pathway

Unit	Title	Sector
2/15	Installation Techniques – Cameras	Cameras
2/16	Routine Maintenance Techniques - Cameras	Cameras
2/17	Reactive Maintenance Techniques – Cameras/ Detector	Cameras

#### Highway Communications / Variable Message Signs Pathway

Unit	Title	Sector
2/19	Communications Fundamental Principles	Highway Comms
2/20	Installation of non-Infrastructure Equipment – Communications/VMS	Highway Comms
2/21	Reactive Maintenance Techniques Communications/VMS	Highway Comms

#### Public Lighting Pathway

Unit	Title	Sector
2/4	Public Lighting Awareness	Public Lighting
2/5	Installation Techniques – Public Lighting	Public Lighting
2/6	Routine Maintenance Techniques – Public Lighting	Public Lighting
2/7	Reactive Maintenance Techniques – Public Lighting	Public Lighting
2/8	Specific Techniques – Public Lighting – Surface Protection	Public Lighting
2/9	Specific Techniques – Public Lighting	Public Lighting

#### Slot Cutting Pathway

Unit	Title	Sector
2/22	Cutting to Specification	Slot Cutting
2/23	Cable laying and sealing	Slot Cutting
2/24	Testing and Repair of cables	Slot Cutting
2/25	Access to cabinets through ducts	Slot Cutting

#### Traffic Signals Pathway

Unit	Title	Sector
2/10	Traffic and Pedestrian Signal Awareness	Traffic Signals
2/11	Installation Techniques – Traffic Signals	Traffic Signals
2/12	Routine Maintenance Techniques – Traffic Signals	Traffic Signals
2/13	Reactive Maintenance Techniques – Traffic Signals	Traffic Signals
2/14	Specific Techniques – Traffic Signals	Traffic Signals

**The structure at Level 3**, in addition to that at Level 2, is as follows:

**Core Level 3 units applicable to all sub-sectors:**

Unit	Title	Sector
3/1	Advanced Electrical Theory and Practice within the Highway Electrical Sector	All
3/2	Electrical Inspection and Testing (Pathway Specific)	All
3/3	Coordinate the Work of Others	All

**Highway Cameras Pathway**

Unit	Title	Sector
3/10	Specialist Techniques - Transmission Systems and Techniques Fundamentals	Cameras
3/11	Specialist Techniques – Commissioning Procedures for Camera	Cameras
3/12	Specialist Techniques – Ancillary Equipment Skills	Cameras

**Highway Communications / Variable Message Signs Pathway**

Unit	Title	Sector
3/13	Specialist Techniques – Maintenance of specialist Communications Equipment	Highway Comms
3/14	Specialist Techniques – Maintenance of specialist VMS Equipment	Highway Comms
3/15	Specialist Techniques – Commissioning Procedures – VMS	Highway Comms

**Public Lighting Pathway**

Unit	Title	Sector
3/4	Specialist Routine Maintenance – Public Lighting	Public Lighting
3/5	Specialist Reactive Maintenance – Public Lighting	Public Lighting

**Traffic Signals Pathway**

Unit	Title	Sector
3/6	Specialist Techniques – Traffic Signals – Advance Principles	Traffic Signals
3/7	Specialist Techniques – Traffic Signals - Inspection and Commissioning	Traffic Signals
3/8	Specialist Techniques – Data Transmission and Ancillary Control	Traffic Signals
3/9	Specialist Techniques – Traffic Signals - MOVA	Traffic Signals

## Training Standards

For Apprenticeships, all Training Centres must be approved by the Education and Skills Funding Agency (ESFA), listed on the Register of Apprenticeship Training Providers (RoATP) for levy paying employers use and direct with the ESFA for non-levy paying employers' use and conform to their particular requirements and criteria.

Approved Training providers must only use approved ESFA subcontractors for Training for this qualification where their scope of delivery falls short, or as specified by the RoATP application routes.

Training Centres, including subcontractor training providers must be approved by the Highway Electrical Skills Academy and Lantra Awards and meet the required level of quality assurance to deliver these qualifications.

All approved Training Centre providers must complete training in accordance with the Highway Electrical Training Specification and meet and maintain the registration requirements for the Highway Electrical Skills Academy (HESA) and Approved Trainers during the full period of the qualification delivery. Training Centres may only deliver courses as specified within the HESA approved scope for the Centre and must meet the HESA quality assurance requirements.

Where specialist engineers or designers are used to support the learning outcomes, (named as Approved Trainer's practical assistant) the requirements as specified within the Requirements for approved Training Organisations and Approved Trainers must be applied.

Accredited Prior Learning that falls within the Training specification scope and appropriately certificated through HESA or Lantra Awards, or allowed alternative provision and certificated as specified, is deemed as meeting the minimum knowledge requirements for National Highway Sector Scheme 8 and the associated Highway Electrical Registration Scheme.

Specialist Training for powered access / mobile elevating work platforms, on-road lifting and lorry loader equipment is not covered as part of this qualification. There are agreed industry "norms" for these.

## Training Course Assessment Result Banding Accreditation

To ensure the validity of the end of course evaluations, the following bands will receive the following level of achievement:

For multi-choice, closed book assessments:

- Below 70% referred
- Equal to or Over 70% constitutes a Pass

For multi-choice, open book assessments:

- Below 75% referred
- Equal to or Over 75% constitutes a Pass

For assessments other than multi-choice, closed or open book assessments:

- Below 64% referred
- Equal to or Over 64% constitutes a Pass

Those areas in which health and safety are critical - particularly for practical assessments – should be identified and the candidate must pass each of these. This would need taking into account when compiling the final mark. It is the responsibility of the Approved Training Organisation through their centre quality assurance process to ensure that the marking of practical assessments is recorded, transparent and available at any time for audit.

## Course Durations

The course durations specified are the recommended minimum times only. Within the recommended time frame to complete the course, it is expected that the necessary level of professional training would have ensured that the required level of learning had taken place and equally, that multi-choice summary evaluations to determine the required level of understanding have also taken place.

The minimum recommended course durations also take into account expected practical sessions to enable the evaluation and assessment of the necessary cognitive skills

A course can be longer than the recommended time frame, which would also take into account special needs and the abilities of the learner group.

## Learner Numbers

The term '**Maximum Learner Number**' relates to the maximum number of learners allowed on a course, for any training period per trainer.

The NHSS 8/ HEA Standards and Training Committee has agreed a maximum number of 8 students per Approved Trainer for practical based courses and 12 per Approved Trainer for knowledge based courses.

## Training Delivery

Training will be delivered by Approved Trainers and Approved Training Organisations who meet the requirements and standards set by the Highway Electrical Skills Academy and Lantra Awards. It is their responsibility to ensure that effective training to common standards is achieved throughout the industry and that there is no abuse of the minimum recommendations.

Lantra Awards (or the Highway Electrical Skills Academy for individual courses) will certificate the VRQ against the specified syllabi shown in the contents section. A fee is due for each certificate.

Specific Courses require additional levels of approval and supporting course delivery resources. These requirements are specified within the Requirements for Approved Training Organisations and Approved Trainers document.

Training course delivery must be such that the progression of the learning builds the learner underpinning knowledge progressively and in line with the Highway Electrical Training Specification.

Training Centres are to refer to the Appendix 1 – VRQ Road Map to establish the HESA courses that supports the specific pathway and learning outcomes.

## Notification of Shortfalls or Improvements

Where shortfalls or improvements have been identified within this document the Training Centre must bring these to the attention of the HESA to investigate, review and advise.



# **Section 1 – Level 2 Common Modules**

## Unit 2/1 – Health, Safety and Environmental Implementation in Highway Electrical Works

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to apply safe working practices

### Unit Outcomes

This unit has seven learning outcomes:

1. Identify individual and organisational responsibilities and safe working practices complying with HASAWA
2. Describe safe working practices in respect of substances which may be hazardous to health
3. Describe the causes, results and prevention of electrical injuries
4. Describe the causes, results and prevention of manual handling injuries
5. Identify responsibilities and actions arising from other relevant H&S legislation (other than the EAW Regs) and guidance
6. Identify appropriate actions to be taken in emergency situations (including emergency aid)
7. Identify responsibilities and appropriate working practices to comply with environmental requirements

### Course Topics:

- The Health and Safety at Work Act.
- Internal Company Safety Policies & Procedures
- Responsibilities: individual and company
- Accidents and Reporting.
- The Personal Protective Equipment requirements.
- Identification markings of hazardous substances.
- Other potentially hazardous substances covered by legislation other than COSHH (e.g. asbestos, lead)
- COSHH Assessment Sheets.
- Reducing the Risk from hazardous substances.
- The Management role and responsibilities in relation to hazardous substances.
- The COSHH assessor role and responsibilities.
- The Users role and responsibilities.
- First Aid actions.
- Injuries from electricity.
- \* Types of electrical contact.
- \* Effects of electricity on the human body.
- \* Measures to prevent electrical injuries.
- \* Awareness of Electricity at Work Regs; G39/1
- \* Electrical inspection & testing principles.
- \* Identification of hazards in respect of manual handling.
- \* Reducing the risks in respect of manual handling.
- \* Management responsibilities in respect of manual handling.
- \* Employee responsibilities in respect of manual handling.
- \* Lifting equipment for manual handling tasks.
- \* Lifting methods for manual handling tasks
- \* Key Regulations & ACoPs – e.g. Management, CDM, LOLER, Noise at work, PUWER, RIDDOR, Work at Height
- \* H&S (Safety Signs & Signals) Regulations
- \* H&S Guidance Notes – e.g. HSG(6), HSG(47)
- \* Industry Guidance
- \* Electrical & other injuries
- \* Works vehicle accident
- \* Vehicle malfunctions - stuck at height, spills
- \* Emergency First Aid procedures & their limitations
- \* Limitations of First Aid
- \* Environmental awareness

- \* Carbon footprint
- \* Disposal of materials

**Pre-requisites:**

As specified within the HE Training Specification

**Assessment:**

Practical Assessment –Learners will be assessed by a summative holistic assessment at the end of the delivery of this Unit 1 in addition to any practical assessments identified within each outcome. In addition, those learners who will be assessed against a CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

**Unit 2/1 Outcome 1: Identify individual and organisational responsibilities and safe working practices complying with HASAWA**

**Practical Activities**

The learner will be able to:

- Complete an accident / incident form
- Locate the H&S poster

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- \* State the need for a Health and Safety Policy.
- \* State the legal obligations from the HASAWA.
- \* Identify the responsibilities of the company.
- \* Identify the responsibilities of the individual.
- \* Explain the Accident Reporting and Investigation procedure.
- \* Explain the importance of Risk Assessment.
- \* State when and why Personal Protective Equipment might be required.
- \* State the need for safety, welfare and access arrangements on site
- \* Explain the importance of housekeeping including waste disposal and environmental issues

**Unit 2/1 Outcome 2: Describe safe working practices in respect of substances which may be hazardous to health**

**Practical Activities**

The learner will be able to:

- Identify local hazard, prohibition, warning and advisory signs
- Locate the location of spill kits / eyewash warning stations

**Underpinning Knowledge**

On completion of the course attendees should be able to:

- \* Identify substances likely to cause harm.
- \* Follow COSHH assessment instructions.
- \* Identify and use the required PPE correctly.
- \* Identify actions before using chemicals.
- \* Identify the measures required to ensure the safety of employees and the general public.
- \* Explain actions required on contact with chemicals and substances.

**Unit 2/1 Outcome 3: Describe the causes, results and prevention of electrical injuries**

**Practical Activities**

The learner will be able to:

- Visually assess a portable appliance

**Underpinning Knowledge**

On completion of the course attendees should be able to:

- \* Identify injuries caused by electricity.
- \* State the difference between direct and Indirect contact.
- \* Explain the effects of electric shock to the human body
- \* Identify measures to prevent electrical injuries.
- \* Follow company procedures.
- \* State the reasons for inspection & testing of fixed and portable equipment.

**Unit 2/1 Outcome 4: Describe the causes, results and prevention of manual handling injuries**

**Practical Activities**

The learner will be able to:

- Correctly lift, carry and place a range of objects

**Underpinning Knowledge**

On completion of the course attendees should be able to:

- \* Identify associated hazards before and during the handling of materials.
- \* Identify the associated risks.
- \* Identify and use the required PPE correctly.
- \* Carry out assessment of items to be handled and associated risks.
- \* Carry out correct lifting techniques.
- \* Identify alternative handling methods.

**Unit 2/1 Outcome 5: Identify responsibilities and actions arising from other relevant H&S legislation (other than the EAW Regs) and guidance**

**Practical Activities**

The learner will be able to:

- Point out and explain signs covered under the H&S (Safety Signs & Signals) Regulations

**Underpinning Knowledge**

On completion of the course attendees should be able to:

- \* State the hierarchy of documents in relation to health and safety legislation
- \* Identify the key legislation and guidance relating to risks in highway electrical works
- \* Identify where standards to be reached in respect of risk assessments can be found
  - State what action is to be taken in response to defined signs under the H&S (Safety Signs & Signals) Regulations

**Unit 2/1 Outcome 6: Identify appropriate actions to be taken in emergency situations (including emergency aid)**

**Practical Activities**

The learner will be able to:

- Identify the location of the First Aid Box
- Identify the First Aid poster / list of First Aiders

**Underpinning Knowledge**

On completion of the course attendees should be able to:

- \* Identify activities likely to require emergency action
- \* State the constituents of the emergency first aid primary survey
- State the correct action to take in the case of a LV & HV electrical injury
- State the method of dealing with potential pollution to the environment from a spill
- Identify when and how to obtain assistance

**Unit 2/1 Outcome 7: Identify responsibilities and appropriate working practices to comply with environmental requirements**

**Practical Activities**

The learner will be able to:

- Locate and identify the organisation's Environmental Policy Statement

**Underpinning Knowledge**

On completion of the course attendees should be able to:

- Identify when their acts or omissions may have an adverse effect on the environment
- Identify how the disposal of material can be dealt with in an environmentally friendly manner

## Unit 2/2 – Safe Working Practices within the Highway Electrical sector

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to apply safe working practices on site

### Unit Outcomes

This unit has eight learning outcomes:

1. Identify the principle of hazard identification and risk assessment, identify control measures to eliminate or reduce risks
2. Identify hazards from power tools; inspect and use relevant hand and power tools
3. Materials - Load onto, transport with and remove from vehicles
4. Identify and avoid danger from services on site
5. Identify equipment for work at height and work at height with steps, ladders
6. Identify, inspect and use relevant PPE/RPE
7. Identify and use equipment for safety at street works and road works, as appropriate to the scope of their work on site
8. Identify hazards and risks on site, apply control measures to eliminate or reduce risks, complete a risk assessment appropriate to a typical highway electrical site

### Course Topics:

- Definitions of hazard and risk.
- Identifying hazards in the workplace.
- Assessing risks.
- Measures to reduce risks.
- Recording risk assessments
- Personal conduct on site
  
- Cable preparations.
- Tool identification, checks maintenance and safety
- Basic maintenance of tools.
- Power tools
- Limitations and identifying the hazards with tools.
  
- Loading of vehicles.
- Securing of loads
- Identifying hazards when loading, transporting or unloading.
- Assessing risks when loading, transporting or unloading.
- Working practices when loading, transporting or unloading.
- Transporting goods on/to site.
- Assessing loads
  
- Identification of hazards from site services.
- Safe Systems of Work.
- Introduction to CAT & Genny
- Operation of the Cable Avoidance Tool.
- Operation of the Generator.
- Using the CAT in conjunction with a Sonde
- Site drawings of services.
  
- Organisation procedures and method statements for working at height.
- Using ladders.
- Using step ladders
- Using trestles
- Work at Height Regulations
- Safety equipment for working at height.

- Hazard and Risks requiring the use of PPE.
- Tasks, risks and using PPE, including limitations.
- Organisation and legislative procedures.
- Types of Personal Protective Equipment.
  
- An outline of the legislation, Codes of Practice, Risk Assessments, Method Statements.
- Highway Terminology, Site definitions, Safety Zones
- Types of work, Equipment & Vehicles, Traffic Lane widths
- Moving and Minor Works
- Basic Layouts, Stop Works Sign, Give and Take, Priority Signing
- Stop and Go
- Dealing with pedestrians
  
- Identifying typical significant hazards.
- Assessing risks.
- Working practices
- Transporting goods on site.
- Assessing and securing loads.
- Site safety practices.
- Organisation policies.

### **Prerequisites:**

As specified within the HE Training Specification

### **Assessment:**

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against a CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## **Unit 2/2 Outcome 1: Identify the principle of hazard identification and risk assessment, identify control measures to eliminate or reduce risks**

### **Practical Activities**

The learner will be able to:

- Complete a Hazard Identification list
- Complete a Risk Assessment

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Follow associated company risk assessment procedures
- Identify hazards and risks.
- Carry out a risk assessment.
- Identify measures needed to reduce risk.
- Correctly record risk assessments
- Identify when and how to report hazards and risks considered to be excessive or requiring further control measures
- Ensuring site is safe for work to proceed or finish.
- Conduct themselves in a safe and professional manner on site



**Unit 2/2 Outcome 2: Identify hazards from power tools; inspect and use relevant hand and power tools**

**Practical Activities**

The learner will be able to:

- Visually assess a power tool

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify the Hazards and Risks when using Hand and Power Tools.
- Correctly use Cutting and Stripping tools correctly.
- Correctly use and identify Insulated Tools.
- Take appropriate care and maintenance of hand and power tools.
- Correctly use drivers and wrenches.
- Correctly use excavation tools.
- Correctly use power tools.
- Identify precautions with fuel driven tools.

**Unit 2/2 Outcome 3: Materials - Load onto, transport with and remove from vehicles**

**Practical Activities**

The learner will be able to:

- Correctly handle, load and secure appropriate items

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify hazards and risks.
- Load vehicles with equipment in a safe manner.
- Secure & store equipment in a safe manner.
- Identify and use safe working practices to load and unload equipment.
- Use correct methods for transporting goods on site
- Assess Loads to be handled/transported.
- Identify when and how to seek assistance.

**Unit 2/2 Outcome 4: Identify and avoid danger from services on site**

**Practical Activities**

The learner will be able to:

- Visually assess the site and identify the broad location of possible services

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify associated Hazards.
- Explain the Safe System of work.
- State the need for using Cable Avoidance Tool and generator.
- Demonstrate the correct use of the Cable Avoidance Tool.
- Demonstrate the correct use of the Generator and Ancillary equipment.
- Demonstrate the correct use of underground services drawings.

## **Unit 2/2 Outcome 5: Identify equipment for work at height and work at height with steps, ladders**

### **Practical Activities**

The learner will be able to:

- Unload, carry and set up steps or ladders
- Climb steps or ladders under controlled conditions
- Remove, carry and load steps or ladders

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Follow associated company procedures and method statements.
- Complete hazard and risk assessment documentation.
- Identify the correct method for planning and gaining access.
- Identify and use correct PPE.
- Demonstrate correct use of safety equipment.
- Correctly use the appropriate work belts and support.

## **Unit 2/2 Outcome 6: Identify, inspect and use relevant PPE/RPE**

### **Practical Activities**

The learner will be able to:

- Identify appropriate and relevant PPE/RPE
- Wear appropriate and relevant PPE/RPE

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify the need for Personal Protective Equipment / Respiratory Protective Equipment.
- Use appropriate Personal Protective Equipment / Respiratory Protective Equipment. for tasks and the environment.
- Follow company and legislative procedures for use & maintenance

## **Unit 2/2 Outcome 7: Identify and use equipment for safety at street works and road works, as appropriate to the scope of their work on site**

### **Practical Activities**

The learner will be able to:

- Complete the traffic management elements of a risk assessment
- Set out appropriate traffic management or signing and guarding for short duration work

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify risk assessments and method statements
- Identify the relevant codes of practice and other associated documentation involved in traffic management
- State the main requirements for signing and guarding road works to national standards.
- Identify the equipment required in temporary traffic management
- State the requirements for signing and guarding of road works for short duration, moving and minor works
- Identify the different methods of positive traffic control
- State how to deal with pedestrians

- Identify the correct sequence of actions for installing, maintaining and removing positive traffic control systems.

**Unit 2/2 Outcome 8: Identify hazards and risks on site, apply control measures to eliminate or reduce risks, and complete a risk assessment appropriate to a typical highway electrical site**

**Practical Activities**

The learner will be able to:

- Complete a hazard identification list from a site case study
- Complete a risk assessment from a site case study

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify hazards and risks on site.
- Define the site working area.
- Check and confirm site details.
- Assess ground works.
- Correctly prepare and store equipment on site safely.
- Identify and use associated company policies & procedures.
- Ensuring the site is safe for work to proceed or finish
- Conduct themselves in a safe and professional manner on site

## Unit 2/3 – Basic electrical theory and practice within the Highway Electrical sector

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to apply electrical knowledge and work on or near electrical equipment

### Unit Outcomes

This unit has four learning outcomes:

1. Explain electrical terms, identify electrical and electronic items used in highway electrical works
2. Identify responsibilities and actions to comply with the Electricity at Work Regulations and guidance
3. Identify hazards, precautions and safe working procedures associated with work on or near DNO or iDNO equipment
4. Identify how to carry out a safe isolation

### Course Topics:

- Electrical Theory.
- Electrical Components and functions e.g. Relays, Transformers, Resistors, Capacitors, Inductors.
- Earthing and Bonding.
- Power Distribution Circuits.
- Electrical Safety.
- The Electricity at Work Regulations & Guidance
- Electric shock, fire, explosions and burns.
- Maintenance, inspection, isolation, normal dead and live working procedures.
- Applying the EAW regulations to equipment located on the Highway.
- Suitability, protection, placing, integrity and security of conductors.
- Overview of Engineering Recommendation G39/1
- Overview of ILE Supplement to the ILE CoP for Electrical Safety in Highway Electrical Operations
- Explanation of definitions.
- Statutory requirements.
- Means of providing electricity supplies.
- Commissioning, Maintenance, Repair and Emergency Attention.
- Electrical Injuries.
- Cut-out fuse carrier removal and replacement procedures.
- Safe isolation.
- Testing to determine availability of supply and the use of appropriate equipment.
- Protective devices used in Highway Electrical works.
- Identification of private networks
- Reporting procedures

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against a CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

### **Unit 2/3 Outcome 1: Explain electrical terms; identify electrical and electronic items used in highway electrical works**

#### **Practical Activities**

The learner will be able to:

- Identify a circuit diagram drawing and label the component parts

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- State the associated Hazards and Risks.
- Define current, voltage, resistance and power.
- State and use Ohms Law.
- State & use Power calculations
- Identify different electrical components and their functions.
- State typical earthing arrangements and bonding.
- Read electrical circuit diagrams

### **Unit 2/3 Outcome 2: Identify responsibilities and actions to comply with the Electricity at Work Regulations and guidance**

#### **Practical Activities**

The learner will be able to:

- Locate organisational procedures which identify how and when H&S issues are to be reported

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- State the scope of the regulations
- State the requirements of the Regulations in respect to live working and competency
- State the regulations associated with the safety, design and location of electrical equipment.
- Identify the procedures necessary for the installation, maintenance, inspection and working practices used in electrical installations.

### **Unit 2/3 Outcome 3: Identify hazards, precautions and safe working procedures associated with work on or near DNO or iDNO equipment**

#### **Practical Activities**

The learner will be able to:

- Carry out a polarity check
- Demonstrate the ability to correctly remove and replace a cutout fuse carrier for isolation purposes and fuse replacement.

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- State the associated Hazards and Risks.
- State the acceptable clearances between lighting columns and overhead lines.
- State the different methods of providing a mains supply.
- Describe their responsibilities regarding commissioning, maintenance, repair and emergency attention.
- State the method of work to be adopted when working in the vicinity of live conductors.
- List the PPE requirements.

**Unit 2/3 Outcome 4: Identify how to carry out a safe isolation**

**Practical Activities**

The learner will be able to:

- Carry out isolation on a single-phase circuit

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- State the various methods for the isolation of electrical circuits in differing highway electrical equipment.
- Test to determine if a supply is present.
- How to replace or reinstate protective devices in order to restore supply.
- State the limits of the work that can be done by the operative.
- What action to take in the event that the supply cannot be restored.

# **Section 2 – Level 2 Specialist Modules**

## Unit 2/4 – Public Lighting Awareness

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to identify a range of public lighting equipment on site

### Unit Outcomes

This unit has two learning outcomes:

- Identify safe methods of installing lighting columns, pillars and bollards, public lighting and traffic sign equipment and highway boundaries
- Identify safe methods of installing and connecting luminaires, control gear and underground cables, public lighting circuits

### Course Topics:

- The need for public lighting
- Different types of public lighting equipment
- Different types of Highways
- Use of equipment on different Highways
  
- Traffic Sign Products and fixings
- Route classifications and sign colours.
- Sizes and siting of signs.
- Signing requirements for traffic orders
- Current requirements for illumination.
- Current requirements for passively safe posts/protection.
- Overview of EN12899
- Traffic sign types, handling and installation.
- Lantern types and configuration, handling and installation.
  
- Wiring systems: remote/gear 'in head' lanterns. 1/2 part PEC control, single/double arm column, bollards, beacons, remote switching.
- Private loop supplies: feeder pillar/lighting column points of supply, terminations, loop in/out cable joints.

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment



## **Unit 2/4 Outcome 1: Identify public lighting equipment, traffic signs and highway boundaries**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Confirm site details and define boundaries
- Identify different types of equipment under, on and over the highway
- Explain the scope of work likely to be carried out on different types of equipment
- State the application of common types of public lighting systems.
- Identify different power supply equipment
- Confirm the suitability of fixing methods for public lighting systems in the environment of the installation including the threat from vandalism and unauthorised access.
- Explain how to dispose of public lighting equipment and components
- Identify correct size/type of sign / post for road environment.
- Correctly site sign assemblies in accordance with status/speed of road, traffic orders
- Identify appropriate offsets and mounting heights in accordance with status of road and the presence of other furniture eg safety fences.

## **Unit 2/4 Outcome 2: Identify public lighting circuits**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify electrical components used in street lighting & traffic signs
- Identify the difference between wiring in head and remote gear units.
- Recognise wiring systems for illuminated signs, bollards and beacons.
- Compare various circuits for photocells.
- Identify cable layouts for private loop supplies.
- Identify options for connecting circuits into supply cut outs.
- Show correct fusing arrangements.

## Unit 2/5 – Installation Techniques – Public Lighting

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to carry out the installation of a range of public lighting equipment on site

### Unit Outcomes

This unit has two learning outcomes:

- Identify safe methods of installing lighting columns, pillars and bollards
- Identify safe methods of installing and connecting luminaires, control gear and underground cables

### Course Topics:

- Reversing vehicles in confined spaces.
- Working on a live carriageway
- HSE and Road Transport Industry Training Board recommended code of signals
- HSE Guidance Note GS9
- Handling Lighting columns 3m to 15m
  
- Footways and carriageways: construction layers.
- Flexible and modular pavement.
- Exposed apparatus.
- Field identification of excavated materials.
  
- Lifting and handling of columns
- Evaluation of size of column holes for different circumstances.
- Pole and bracket types, handling storage and installation
- Foundations, rooted columns, baseplate units, special bases.
- Concrete mixes
  
- Pole and bracket types, handling storage and disposal.
  
- Cabinet types, handling storage and installation
- Foundations for cabinets.
- Concrete mixes
  
- Bollard types, handling storage and installation
- Foundations for bollards
  
- Lantern and bracket types and installation
- Circuit diagrams: various types of lamps, different photo cells, lighting column/bollard/beacon circuits.
- Correct installation: neat, operates correctly, secure terminations, secure control gear
  
- Cable types and installation.
- Identification of REC, loop supply, private cable networks
- Regulations and Codes of Practice
- Cable preparation and termination.
- Cut out types.
- Terminations: middle fuse/single units, RCD's, gland

**Prerequisites:**

Unit 2/; 2/2; 2/3

**Assessment:**

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

**Unit 2/5 Outcome 1: Identify safe methods of installing lighting columns, pillars, bollards and small traffic signs**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Assess different types of loads and centres of gravity.
- Assist a vehicle driver in manoeuvring on site by recognised signalling methods.
- Identify the range of lifting gear including methods of slinging.
- Assist in controlling loads.
  
- Identify different types of footway and carriageway materials.
- Identify hazards, risks and control measures
- Carry out minor excavation in the highway.
- Correctly choose excavating materials for re-use as backfill
  
- Take necessary precautions before during and after completion of works
- Locate position of column.
- Verify instructions for the size of hole to be dug.
- Refer difficulties in excavating hole in marked position.
- Decide on appropriate method of lifting column.
- Install rooted columns correctly in hole.
- Correctly align and backfill.
- Compare various alternative bases.
- Prepare/obtain concrete used in accordance with specification.
- Prepare and fill concrete bases for equipment.
- Bolt equipment to prepared bases in accordance with specification.
  
- Locate column to be removed.
- Verify that electricity service has been removed.
- Refer difficulties in removal of column.
- Select appropriate material for backfill
- Temporarily reinstate after completion of excavation works.
- Correctly dispose of redundant equipment
  
- Locate column to be re-aligned.
- Refer difficulties in re-aligning column.
- Correctly re-align and reinstate surfaces.
- Prepare/obtain concrete used in accordance with specification.
  
- Locate position of cabinet.
- Identify manufacturer's instructions for the size of excavation to be dug.
- Refer difficulties in excavating hole in marked position.

- Install cabinet in accordance with manufacturer's instructions correctly in hole.
  - Correctly align and backfill.
  - Prepare/obtain concrete used in accordance with specification.
  - Prepare and fill concrete cast bases for equipment.
  - Bolt equipment to prepared bases in accordance with specification.
- 
- Identify manufacturer's instructions for the size of excavation to be dug.
  - Refer difficulties in excavating hole in marked position.
  - Install bollard in accordance with manufacturer's instructions correctly in hole.
  - Correctly align and backfill.
  - Prepare/obtain concrete used in accordance with specification.
  - Prepare and fill concrete bases for equipment.
  - Bolt equipment to prepared bases in accordance with specification.
  - Install bollard on to base in accordance with manufacturer's instructions.
  - Correctly orientate and secure.
  - Explain why a person who is fully trained and authorised should only connect the bollard to the cut-out
- 
- Load, transport sign plates to site and offload.
  - Correctly align and secure sign plates, stub arms and lanterns to posts.
  - Take down sign plates from posts, load and transport off site.

## **Unit 2/5 Outcome 2: Identify safe methods of installing and connecting luminaires, control gear and underground cables**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify hazards and reduce risks.
- Take necessary precautions before during and after completion of works
- Wire lanterns and fit onto brackets and columns.
- Install brackets/lantern assembly on to columns.
- Demonstrate avoidance of damage to cables.
- Correctly line up and secure equipment as placed.
- Secure sign plates to posts.
- Install control gear and wiring but not connect into cut out
  
- Select circuit diagram.
- Select appropriate cables.
- Install control gear securely.
- Ensure cables are correctly stripped back and terminated in gear.
- Ensure wiring was in accordance with circuit diagram.
- Ensure wiring avoids obstructing access to gear and is neatly laid out.
- Use heat resistance sleeving as specified.
- Ensure unit operates correctly
- Test operation of photoelectric cell
  
- Evaluate the purpose and need for different underground cable systems.
- Evaluate the purpose and need for cable marker tape and ducts.
- Identify different types of cables.
- Identify appropriate excavation procedures.
- Carry out excavation of trench in accordance with recognised safe working practices to the correct depth.
- Prepare base of trench for cable laying or ducting as appropriate.
- Install underground cables
- Backfill and reinstate trench in accordance with specification
  
- Identify different types of cables and their individual termination requirements.
- Trim and prepare cables and fit cable glands or other termination fittings.
- Take appropriate precautions to ensure safe connection into cut out.

## Unit 2/6 – Routine Maintenance Techniques – Public Lighting

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to carry out routine maintenance on a range of public lighting equipment on site

### Unit Outcomes

This unit has two learning outcomes:

- Identify the different types of routine maintenance
- Explain how to carry out routine maintenance

### Course Topics:

- Lantern, column, sign and bollard types
- Assessing the structural integrity of columns by visual inspection
- Assessing the optical integrity of lanterns by visual inspection.
- Assessing the electrical integrity of public lighting installations by visual inspection
- Recording and reporting inspections.
- Types of raising and lowering columns and their uses
- The need for regular maintenance
- Lamp replacement strategies
- Mechanical and electrical components used in public lighting
- Correct handling and disposal of components
- Fault recording and reporting.
- Types of fault on components and how to recognise them.
- Systematic method of fault identification – circuit dead.
- Assessment of site conditions under emergency situations

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## **Unit 2/6 Outcome 1: Identify the different types of routine maintenance**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify items to be inspected.
- Identify the differences between inspections and tests.
- Identify the types of raising and lowering columns.
- Explain why the column should be lowered before commencement of any work.
- Identify different types of columns and lanterns and methods of entry
- Recognise mechanical components that require lubrication
- Identify the requirements for replacing like for like components
- Identify items that may need reporting
- State how to dispose of redundant equipment and components in a safe and approved manner.
- Identify how to use tools and equipment in a safe and correct manner

## **Unit 2/6 Outcome 2: Explain how to carry out the different types of routine maintenance**

### **Practical Activities**

The learner will be able to:

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify items to be inspected.
- Carry out optical mechanical and electrical inspections.
- Identify the differences between inspections and tests.
- Record results of inspection and record variations
- Identify the types of raising and lowering columns.
- Lower and raise column.
- Explain why the column should be lowered before commencement of any work.
- Identify different types of columns and lanterns and methods of entry
- Carry out cleaning of luminaires and column base compartments
- Recognise mechanical components that require lubrication
- Isolate the supply before carrying out work
- Identify the requirements for replacing like for like components
- Replace components
- Test for correct operation
- Identify items that may need reporting
- State how to dispose of redundant equipment and components in a safe and approved manner.
- Identify how to use tools and equipment in a safe and correct manner

## Unit 2/7 – Reactive Maintenance Techniques – Public Lighting

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to carry out reactive maintenance on a range of public lighting equipment on site

### Unit Outcomes

This unit has two learning outcomes:

- Define reactive maintenance and explain how to carry out planned reactive maintenance
- Explain how to deal with unplanned reactive maintenance safely

### Course Topics:

- Lantern, column, sign and bollard types
- Re-cap on visual assessment
- Recording and reporting inspections.
  
- Fault recording and reporting.
- Types of fault on components and how to recognise them.
- Systematic method of fault identification – circuit dead.
  
- Single phase cable types.
- Joint types for single phase cables.
  
- Assessment of site conditions under emergency situations
- Making the site safe
- Communication

### Prerequisites:

As specified within the HE training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment



## **Unit 2/7 Outcome 1: Identify and explain how to carry out planned reactive maintenance**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify faulty components.
- Check switching devices for correct operation.
- Check operation of equipment.
- Replace equipment identified as probably being faulty or at end of life.
- Adhere to all safety precautions when isolating/handling DNO/IDNO cut-outs.
- Leave equipment in normal operating mode.
- Record details of work carried out and report variations.
- Dispose of redundant equipment and components in a safe and approved manner.
- Identify different types of cables and their individual jointing requirements.
- Prepare single phase cables to accommodate cable joint.
- Identify cores to be jointed and prepare.
- Use appropriate tools for jointing.
- Ensure continuity of earth.
- Ensure correct colour coding of cores and sleeve as appropriate.
- Enclose joint and fill with compound.

## **Unit 2/7 Outcome 2: Identify and explain how to carry out unplanned reactive maintenance**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Take necessary precautions before, during and after completion of emergency works
- Understand the need for attendance as soon as possible
- Assess the emergency and carry out any work to make the site safe except for any work on the regional electricity company equipment.
- Decide on the need or otherwise to report to supervisor for advice and instructions.
- Decide on the need or otherwise to call out the DNO/IDNO
- Make the site safe to prevent access by the general public.
- Report actions and additional work required.

## **Unit 2/8 – Specialist Techniques – Public Lighting - Surface Protection of Structures**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to carry out the preparation and painting of a range of public lighting equipment on site

### **Unit Outcomes**

This unit has two learning outcomes:

- Identify and explain how to prepare surfaces ready for protective coats to be applied
- Identify different surface protection systems and how these can be applied

### **Course Topics:**

- Hazards and risks
- On site precautions
- Types of existing protection systems
- Types of preparation to be carried out
- Types of protection systems to be applied
- Environmental precautions and the safe disposal of redundant materials

### **Prerequisites:**

As specified within the HE Training Specification

### **Assessment:**

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## **Unit 2/8 Outcome 1: Identify and explain how to prepare surfaces ready for protective coats to be applied**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify hazards and risks
- Take necessary precautions before, during and after completion of works
- Identify the condition of the highway electrical equipment's existing surface protection system
- Identify the preparation required
- Identify manufacturer's instructions and data sheets
- Identify environmental issues
- State how to dispose of redundant material and equipment properly
- Identify items that may need reporting

## **Unit 2/8 Outcome 2: Identify different surface protection systems and how these can be applied**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify manufacturer's instructions and data sheets
- Identify environmental issues
- Identify different forms of surface protection
- Apply surface protection to highway electrical equipment
- State how to dispose of redundant material and equipment properly
- Identify items that may need reporting

## **Unit 2/9 – Specialist Techniques – Public Lighting**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to carry out electrical inspection and testing data collection and limited fault finding on underground cables

### **Unit Outcomes**

This unit has two learning outcomes:

- Explain how to carry out the recording of results from electrical inspection and testing.
- Identify ways of identifying and locating faults on underground cables

### **Course Topics:**

- Hazards and risks
- Electrical inspection and testing of new and existing public lighting installations.
- Inspection and test methods and working practices
- Electrical Test Equipment
- Reporting procedures
  
- Types of underground cable test equipment.
- Types of underground cable faults
- Systematic method of fault identification

### **Prerequisites:**

As specified within the HE Training Specification

### **Assessment:**

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## **Unit 2/9 Outcome 1: Explain how to carry out the recording of results from electrical inspection and testing**

### **Practical Activities**

The learner will be able to:

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- State the limits of the work they are undertaking
- Identify the organisational procedures required
- Identify appropriate Test Equipment correctly and safely.
- State the key items to be recorded
- Identify appropriate action for results not in accordance with organisation's written procedures.
- Record and report variations

## **Unit 2/9 Outcome 2: Identify ways of identifying and locating simple faults on underground cables**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify and use different types of test equipment available.
- Explain the different types of circuits used in underground cable systems.
- Carry out safe and systematic method for locating faults.
- Replace faulty section of cable using approved methods.
- Leave equipment in normal operating mode.
- Record details of work carried out and report variations

## Unit 2/10 – Traffic and Pedestrian Signal Awareness

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to identify a range of traffic and pedestrian signalling equipment on site

### Unit Outcomes

This unit has two learning outcomes:

- Identify the equipment and common methods of traffic control
- Identify the drawing symbols, equipment and concepts of traffic and pedestrian controls

### Course Topics:

- The need to control Traffic.
- Controller Modes.
- Using Traffic Sector terminology.
- Detection methods overview.
- The Junction and Pedestrian control methods.
- Remote methods of junction control.
- A general introduction to traffic signals
- The traffic STS symbols/plans.
- Basic Concepts:-Phases, Stages, Streams
- Basic timing periods:- Min, Max, Extensions, Intergreen, Detection
- Detection – an overview
- Junction and Pedestrian Controller Types and Modes:-, Traffic, Toucan, Pedestrian, Puffin, VA, FT, Manual
- The Basic Specification data sheets interpretation with connections, stages, phases streams and general information.
- Use of the handset/terminals for checking controller operation and facilities.

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## **Unit 2/10 Outcome 1: Identify the equipment and common methods of traffic control**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- State the need for Traffic Control Measures.
- Identify 3 modes of traffic control.
- State 10 basic traffic related terms.
- Identify basic detection methods.
- State the two common Traffic Control Types.
- State other methods of remote junction control.

## **Unit 2/10 Outcome 2: Identify the drawing symbols, equipment and concepts of traffic and pedestrian controls**

### **Practical Activities**

The learner will be able to:

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- State and relate to basic traffic terminology.
- Explain traffic and pedestrian controller applications and modes.
- Explain the basic principles and facilities associated with controller specification sheets.
- Explain basic controller communications using a range of equipment
- Identify and read site plans.

## Unit 2/11 – Installation Techniques – Traffic Signals

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to carry out the installation of a range of traffic and pedestrian signalling equipment on site

### Unit Outcomes

This unit has three learning outcomes:

- Explain how to install Poles, brackets, Heads and cabinets in accordance with manufacturing and/or company and legislative policies
- Explain how to install a combination of Detection equipment, including Loop, Optical, Infrared, Microwave and Pedestrian detection equipment
- Explain how to install and connect underground cables, supply tails and earth bonding

### Course Topics:

- Hazards and Risks.
- Onsite precautions.
- Pole and Lantern Types and installation.
- LED systems
- Concrete bases and mixes.
- Pole and Aspect alignment.
- Other Pole furniture.
- Bracket types.
  
- Cabinet installation.
- Concrete bases and mixes and sealants.
- Cabinet alignment.
  
- Detection types and installation.
- Detector alignment.
- Detector cable connections.
  
- Cable types and installation methods
- Cable preparation and termination.
- Control and monitoring terminology.
- Ancillary equipment types
  
- Cable types and installation.
- Cable preparation and termination.
- Controller connections
- Pole top connections
  
- Types of bonding
- Methods of Testing

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment



**Unit 2/11 Outcome 1: Explain how to install Poles, brackets, Heads and cabinets in accordance with manufacturing and/or company and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Take necessary precautions before, during and after planting equipment
- Install different types of poles associated with traffic installations.
- Identify precautions when preparing concrete bases
- Install different types of heads associated with traffic installations.
- Align aspect heads in accordance with manufacturing instructions.
- Install and assemble Brackets and extension arms.
  
- Install Cabinet Stools and housings.
- Identify precautions and correctly prepare concrete.
- Backfill and base seal to manufacturing instructions.
- Check alignment and positioning
- Report variations to site build to relevant personnel

**Unit 2/11 Outcome 2: Explain how to install Detection and ancillary equipment, including loop, optical, infrared, microwave and pedestrian detection equipment**

**Practical Activities**

The learner will be able to:

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Install different types of detection equipment.
- Cable and connect detection equipment types correctly.
- Identify various detection types.
- Work to manufacturer's instructions.
- Take necessary precautions before, during and after installing cables.
- Correctly install Urban Traffic Control Units.
- Correctly install Monitoring and Control equipment.
- Identify cable types
- Identify correct polarity connections

**Unit 2/11 Outcome 3: Explain how to install and connect underground cables, supply tails and earth bonding**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Install different types of underground cables.
- Correctly strip, and prepare cable for final terminations.
- Terminate cable cores to meet required specifications and customer requirements.
- Identify cable types.
  
- Recognise types and methods of earth bonding.
- Test earth bonding.
- Identify cable types and designations.
- Identify correct polarity connections.
- Work to manufacturer's instructions.
- Report variations to site build.

## Unit 2/12 – Routine Maintenance Techniques – Traffic Signals

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to carry out the routine maintenance of a range of traffic and pedestrian signalling equipment on site

### Unit Outcomes

This unit has two learning outcomes:

- Explain how to carry out routine maintenance including lamp changing and cleaning
- Identify how to maintain Poles, brackets and Lantern types in accordance with manufacturing and/or company and legislative policies

### Course Topics:

- Review of installation practices
- Pole and Lantern Types and maintenance.
- LED systems
- Other Pole furniture maintenance.
- Bracket types and maintenance.

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

### Unit 2/12 Outcome 1: Explain how to carry out routine maintenance including lamp changing and cleaning

#### Practical Activities

The learner will be able to:

#### Underpinning Knowledge

On completion of the course the learner will be able to:

- Take necessary precautions before, accessing poles, heads and PBU's
- Carry out cleaning of equipment
- Carry out lamp changing
- Carry out functional testing.
- Identify and work with LV & ELV circuits safely.
- Report actions and unsafe site conditions to correct personnel.

**Unit 2/12 Outcome 2: Identify how to maintain poles, brackets and heads in accordance with manufacturing and/or company and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Take necessary precautions before accessing poles and heads
- Be familiar with fault reports and be able to confirm faults.
- Carry out correct electrical/mechanical fault assessment using a range of test equipment.
- Maintain different types of heads associated with traffic installations.
- Carryout manufacturer testing.
- Identify and work with LV circuits safely
- Report actions and unsafe site conditions to correct personnel

## Unit 2/13 – Reactive Maintenance Techniques – Traffic Signals

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to carry out the maintenance of a range of traffic and pedestrian signalling equipment on site

### Unit Outcomes

This unit has seven learning outcomes:

- Identify the common concepts associated with Traffic Controller operations so as to maintain a combination of Cabinet types
- State the principles of vehicle and pedestrian detection necessary to facilitate installation, commissioning and 1<sup>st</sup> line maintenance key skills
- Identify the principles and common concepts associated with the understanding of Underground Cable Maintenance
- Maintain supply tails and earthing to accepted commissioned standards
- Identify what is required to commission and carry out first line maintenance key skills on specified Pedestrian Crossing Controller equipment
- Identify what is required to commission and carry out first line maintenance key skills on specified Junction Controller equipment
- Identify what is required to commission and carry out first line maintenance key skills on specified Detector equipment

### Course Topics:

- Cabinet Maintenance/Assessments
- The Traffic Controller, concepts and build
- Cabinet power supplies
- Common basic handset commands
  
- Detector Principles
- Detector Maintenance/Assessments
- Detector Types, Pedestrian, Above Ground, Below Ground
- Detector Power supplies
  
- Cable types and maintenance.
- Data, Signal, Supply Power, Neutrals, and Active Cables.
- Testing Methods.
  
- Common cable faults.
- Types of bonding
- Testing methods
  
- Controller facilities, modes and related traffic concepts.
- Understanding of the site specification sheets.
- Full Hardware descriptions to block diagram level.
- Commands and handset/PC operations.
- Timetables, Seasonal Clocks and Cableless Linking Facilities
- Routine Servicing and Periodic Inspections and Commissioning
  
- Detector facilities, modes and related traffic concepts.
- Understanding of the site specification sheets.
- Full Hardware descriptions to block diagram level.
- Routine Servicing and Periodic Inspections and Commissioning

**Prerequisites:**

As specified within the HE Training Specification

**Assessment:**

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

**Unit 2/13 Outcome 1: Identify the common concepts associated with Traffic Controller operations so as to maintain a combination of Cabinet types**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Take necessary precautions before accessing cabinets.
- Be familiar with fault reports and be able to confirm faults.
- Carry out electrical/mechanical fault assessment and rectification.
- Describe the Traffic controller hardware concepts.
- Use common handset command functions during investigations.
- Report actions and unsafe site conditions to correct personnel.

**Unit 2/13 Outcome 2: State the principles of vehicle and pedestrian detection necessary to facilitate installation, commissioning and 1st line maintenance key skills**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Take necessary precautions before, accessing cabinets.
- Be familiar with fault reports and be able to confirm faults.
- Carry out electrical/mechanical fault assessment and rectification using a range of test equipment.
- State the principles associated with detection and loop configurations.
- State the requirements for detector configurations and common operational features.
- Report actions and unsafe site conditions to relevant personnel.

### **Unit 2/13 Outcome 3: Identify the principles and common concepts associated with the understanding of Underground Cable Maintenance**

#### **Practical Activities**

The learner will be able to:

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Maintain different types of underground cables.
- Identify cable types.
- Test cable to required specifications
- Work to manufacturer's instructions.

### **Unit 2/13 Outcome 4: Maintain supply tails and earthing to accepted commissioned standards**

#### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Take necessary precautions before and during maintenance of cables.
- Recognise types and methods of earth bonding.
- Test Earth Bonding using correct test equipment.
- Identify cable types and designations
- Identify correct polarity connections

### **Unit 2/13 Outcome 5: Identify what is required to commission and carry out first line maintenance key skills on specified Pedestrian Crossing Controller equipment**

#### **Practical Activities**

The learner will be able to:

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Be familiar with fault reports and be able to confirm faults.
- List and describe the associated component parts of the controller.
- Explain site data sheets.
- Demonstrate use of the handset commands.
- Test and commission controllers.
- Test and prove RLMU and LMU configurations
- Successfully download site data and test

## **Unit 2/13 Outcome 6: Identify what is required to commission and carry out first line maintenance key skills on specified Junction Controller equipment**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Be familiar with fault reports and be able to confirm faults.
- List and describe the associated component parts of the controller.
- Explain site data sheets.
- Diagnose and rectify faults by block replacement.
- Demonstrate use of the handset commands.
- Test and commission controllers.
- Test and prove RLMU and LMU configurations
- Successfully download site data and test

## **Unit 2/13 Outcome 7: Identify what is required to commission and carry out first line maintenance key skills on specified Detector equipment**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Be familiar with fault reports and be able to confirm faults.
- List and describe the associated component parts of the Detector.
- Explain site data sheet requirements.
- Explain the operation of the Detector and associated modes.
- Describe the hardware operational and configuration features.
- State the maintenance requirements for the Detector.
- Diagnose and rectify faults by block replacement.
- Test and commission detector on site.



## Unit 2/14 – Specific Techniques – Traffic Signals

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to collect data from electrical inspection and testing of a range of traffic and pedestrian signalling equipment on site in accordance with organisational procedures

### Unit Outcomes

This unit has two learning outcomes:

- Describe how to inspect non-energised installations to ensure installations are in accordance with manufacturing/customer requirements and/or organisation and legislative policies
- Identify the tests and test equipment to be used on highway electrical equipment when carrying out non-energised testing.

### Course Topics:

- Non-energised completion certificate records.
- Site installation completion checks.
- Installation compliancy.
- Site ground works completion checks.
- Variation reporting.
  
- Electrical testing for new installations.
- Test methods and working practices.
- Using the relevant test equipment.
- Measuring resistance and associated calculations.
- Traffic Installation completion certificates.

### Prerequisites:

Unit 2/; 2/2; 2/3

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

**Unit 2/14 Outcome 1: Describe how to inspect non-energised installations to ensure installations are in accordance with manufacturing/customer requirements and/or organisation and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Take necessary precautions before, during and after installing cables.
- Check installations are compliant with manufacturer/customer specifications.
- Check installations are compliant with current legislative requirements.
- Check site requirements.
- Produce a defect rectification list.
- Report variations to site build.

**Unit 2/14 Outcome 2: Identify the tests and test equipment to be used on highway electrical equipment when carrying out non-energised testing**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Gain authority to carry out testing after site isolation confirmation.
- Explain the concepts of earthing, bonding and insulation
- Use appropriate Test Equipment .
- State the need for non-energised Electrical Testing.
- List the tests, test equipment and test methods.
- Complete and interpret the appropriate parts of a traffic installation completion certificate.

## Unit 2/15 – Installation Techniques – Cameras

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to install a range of non-infrastructure equipment and cable in accordance with organisational procedures.

### Unit Outcomes

This unit has three learning outcomes:

- Describe and demonstrate how to ensure cable installations are installed to specification in accordance with manufacturing/customer requirements and/or organisation and legislative policies
- Terminate a range of cable types in accordance with manufacturing/customer requirements and/or organisation and legislative policies.
- Describe and demonstrate how to install a range of non-infrastructure equipment to specification in accordance with manufacturing/customer requirements and/or organisation and legislative policies

### Course Topics:

- Hazards and Risks.
- Onsite precautions.
- Cable types and installation.
- Variation reporting.
  
- Hazards and Risks.
- Onsite precautions.
- Cable types and installation.
- Cable preparation and termination.
- Variation reporting.
  
- Hazards and Risks
- Onsite precautions
- Cable types and installation methods
- Cable preparation and termination.
- Camera equipment terminology.
- Equipment types
- Variation reporting

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

**Unit 2/15 Outcome 1: Describe and demonstrate how to ensure cable installations are installed to specification in accordance with**

**manufacturing/customer requirements and/or organisation and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Identify cable types.
- State necessary precautions before, during and after installing cables
- Install different types of cables to client specification / manufacturer's instructions
- Report variations to site build

**Unit 2/15 Outcome 2: Terminate a range of cable types in accordance with manufacturing/customer requirements and/or organisation and legislative policies.**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- State necessary precautions before, during and after work
- Identify cable types
- Prepare cable for terminations.
- Terminate cable cores to meet required specifications and customer requirements.
- Work to client specification / manufacturer's instructions.
- Report variations to site build.

**Unit 2/15 Outcome 3: Describe and demonstrate how to install a range of non-infrastructure equipment to specification in accordance with manufacturing/customer requirements and/or organisation and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Identify cable types
- State necessary precautions before, during and after work
- Install Camera equipment in accordance with client specification / manufacturer's instructions
- Identify correct polarity and connections.
- Report variations to site build.

## Unit 2/16 –Routine Optical Maintenance of Cameras

### Unit Aims

This course aims to provide employees working in the highway electrical sector with the knowledge and practical key skills required to carry out routine optical maintenance of cameras

### Unit Outcomes

This unit has one learning outcome:

- Describe and demonstrate how to ensure routine maintenance optical maintenance in accordance with manufacturing/customer requirements and/or organisation and legislative policies

### Course Topics:

- Hazards and Risks
- Environmental considerations
- Onsite precautions.
- Camera Types and routine optical maintenance.
- Action reporting and tests.

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## Unit 2/16 Outcome 1: Describe and demonstrate how to ensure routine maintenance optical maintenance in accordance with manufacturing/customer requirements and/or organisation and legislative policies

### Practical Activities

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### Underpinning Knowledge

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- State necessary precautions before, during and after accessing Cameras
- Carry out cleaning of equipment in accordance with client specification / manufacturer's instructions
- Carry out functional testing in accordance with client specification / manufacturer's instructions
- Report actions and unsafe site conditions to relevant personnel.

## Unit 2/17 – Reactive Maintenance Techniques – Cameras/Detectors

### Unit Aims

This course aims to provide employees working in the highway electrical sector with the knowledge and practical key skills required to carry non-routine optical maintenance of cameras, cables and detector equipment

### Unit Outcomes

This unit has three learning outcomes:

- Describe and demonstrate how to ensure carry out non-routine maintenance on camera head assemblies in accordance with manufacturing/customer requirements and/or organisation and legislative policies
- State the principles necessary to facilitate the fundamental common concepts associated with the understanding of Cable Maintenance in accordance with manufacturing and/or organisation and legislative policies
- Describe and demonstrate how to Commission and carry out First Line Maintenance key skills on Detector equipment in accordance with manufacturing and/or organisation and legislative policies (specific to equipment types)

### Course Topics:

- Hazards and Risks.
  - Onsite precautions.
  - Review of installation practices
  - Camera Types / head assembly maintenance.
  - Action reporting and tests.
- 
- Hazards and Risks.
  - Onsite precautions.
  - Cable types and maintenance.
  - Testing Methods.
  - Action reporting
- 
- Hazards and Risks.
  - Detector facilities, modes and related traffic concepts.
  - Site specification sheets.
  - Hardware descriptions to block diagram level.
  - Routine Servicing and Periodic Inspections and Commissioning.
  - Action reporting

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

**Unit 2/17 – Outcome 1: Describe and demonstrate how to ensure carry out non-routine maintenance on camera head assemblies in accordance with manufacturing/customer requirements and/or organisation and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- State necessary precautions before accessing Camera / head assembly
- Carry out maintenance of equipment in accordance with client specification / manufacturer's instructions
- Carry out alignment and functional testing in accordance with client specification / manufacturer's instructions
- Report actions and unsafe site conditions to relevant personnel.

**Unit 2/17 – Outcome 2: State the principles necessary to facilitate the fundamental common concepts associated with the understanding of Cable Maintenance in accordance with manufacturing and/or organisation and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- State necessary precautions before and during maintenance activities.
- Maintain different types of cables in accordance with client specification / manufacturer's instructions.
- Identify cable types.
- Test cable to required client specification / manufacturer's instructions.
- Report actions and unsafe sites to relevant personnel.

**Unit 2/17 – Outcome 3: Describe and demonstrate how to Commission and carry out First Line Maintenance key skills on Detector equipment in accordance with manufacturing and/or organisation and legislative policies (specific to equipment types)**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Identify typical faults
- List and describe the associated component parts of the Detector.
- Explain site data sheet information.
- Explain the operation of the Detector and associated modes.
- Describe the hardware operational and configuration features.
- State the maintenance requirements for the Detector.
- Diagnose and rectify faults by module replacement.
- Test and commission detector on site.
- Report actions and unsafe sites to relevant personnel.



## Unit 2/19 – Communications / Variable Message Signs Fundamental Principles

### Unit Aims

This unit aims to provide learners with the underpinning knowledge required to understand the common concepts associated with Communications / Variable Message Signs operations and. communications detection necessary to facilitate the fundamental common concepts associated with the understanding of installation, commissioning and 1<sup>st</sup> line maintenance key skills in accordance with manufacturing and/or organisation and legislative criteria

### Unit Outcomes

This unit has two learning outcomes:

- Describe the common concepts associated with Communications / Variable Message Signs operations and to maintain a combination of Cabinet types in accordance with manufacturing and/or organisation and legislative policies
- Describe the principles of communications detection necessary to facilitate the fundamental common concepts associated with the understanding of installation, commissioning and 1<sup>st</sup> line maintenance key skills in accordance with manufacturing and/or organisation and legislative policies

### Course Topics:

- Hazards and Risks.
  - Onsite precautions.
  - Cabinet Maintenance/Assessments
  - Communications concepts and build
  - System build
  - Diagnostic equipment
  - Action reporting.
- 
- Hazards and Risks.
  - Onsite precautions.
  - Principles of detectors incl. loop configurations and setting up
  - Detector Maintenance/Assessments
  - Detector Types - Above Ground, Below Ground
  - System Build
  - Action reporting.

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

**Unit 2/19 – Outcome 1: Describe the common concepts associated with Communications / Variable Message Signs operations and to maintain a combination of Cabinet types in accordance with manufacturing and/or organisation and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- State necessary precautions before, accessing cabinets.
- State fault reporting mechanisms
- State the principles of electrical/mechanical fault assessment and rectification.
- Describe the Communications hardware concepts.
- Identify diagnostic equipment and methods of interrogation
- Describe how to report actions and unsafe site conditions to relevant personnel

**Unit 2/19 – Outcome 2: Describe the principles of communications detection necessary to facilitate the fundamental common concepts associated with the understanding of installation, commissioning and 1st line maintenance key skills in accordance with manufacturing and/or organisation and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- State necessary precautions before, accessing cabinets.
- State fault reporting mechanisms
- State the principles associated with detection and loop configurations.
- State the common operational features.
- State the principles of electrical/mechanical fault assessment and rectification.
- Describe how to report actions and unsafe site conditions to relevant personnel.

## **Unit 2/20 – Installation of non-Infrastructure Equipment – Communications/VMS**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge required to install a generic set of typical non-infrastructure equipment used for communications in accordance with manufacturing and/or organisation and legislative policies

### **Unit Outcomes**

This unit has two learning outcomes:

- Describe the required steps to install a generic set of typical non-infrastructure equipment used for communications in accordance with manufacturing and/or organisation and legislative policies
- Describe the required steps to install a generic set of typical non-infrastructure equipment used for variable message signs in accordance with manufacturing and/or organisation and legislative policies

### **Course Topics:**

- Hazards and Risks
  - Onsite precautions
  - Cable types and installation methods
  - Cable preparation and termination.
  - Communications equipment terminology.
  - Equipment types
  - Variation reporting.
- 
- Hazards and Risks
  - Onsite precautions
  - Cable types and installation methods
  - Cable preparation and termination.
  - Variable Message Sign equipment terminology.
  - Equipment types
  - Variation reporting.

### **Prerequisites:**

As specified within the HE Training Specification

### **Assessment:**

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

**Unit 2/20 – Outcome 1: Describe the required steps to install a generic set of typical non-infrastructure equipment used for communications in accordance with manufacturing and/or organisation and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify appropriate Health and Safety measures to safe guard workers and public.
- Identify Hazards and Risks.
- State necessary precautions before, during and after installing cables.
- Install Communications equipment
- Identify cable types.
- Identify correct polarity and connections.
- Work to manufacturers and specification instructions.
- Describe how to report variations to site build

**Unit 2/20 – Outcome 2: Describe the required steps to install a generic set of typical non-infrastructure equipment used for variable message signs in accordance with manufacturing and/or organisation and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- State appropriate Health and Safety measures to safe guard workers and public.
- Identify Hazards and Risks.
- Take necessary precautions before, during and after installing cables.
- Install Variable Message Sign equipment
- Identify cable types.
- Identify correct polarity and connections.
- Work to manufacturers and specification instructions.
- Describe how to report variations to site build

## Unit 2/21 – Reactive Maintenance Techniques Communications/VMS

### Unit Aims

This unit aims to provide learners with the underpinning knowledge required to install a generic set of typical non-infrastructure equipment used for communications in accordance with manufacturing and/or organisation and legislative policies

### Unit Outcomes

This unit has three learning outcomes:

- Describe the required steps to commission and carry out first line maintenance key skills on variable message signs equipment as stated, in accordance with manufacturing and/or organisation and legislative policies.
- Describe the required steps and principles to facilitate the fundamental common concepts associated with the understanding of Cable Maintenance in accordance with manufacturing and/or organisation and legislative policies.
- Describe the required steps to commission and carry out first line maintenance key skills on Communications equipment as stated above, in accordance with manufacturing and/or organisation and legislative policies

### Course Topics:

- Hazards and Risks.
- Variable Message Sign types, facilities, modes and related concepts (including associated detection modes).
- Test results
- Full Hardware descriptions to block diagram level.
- Commands and diagnostic equipment operations.
- Routine Servicing and Periodic Inspections and Commissioning.
- Results and action reporting.
  
- Hazards and Risks.
- Onsite precautions.
- Cable types and maintenance.
- Data, Signal, Supply Power, Neutrals, and Active Cables.
- Testing Methods including cable attenuation and frequency response; sheath testing.
- Action reporting
  
- Hazards and Risks.
- Communications facilities, modes and related concepts.
- Test results
- Full Hardware descriptions to block diagram level.
- Commands and diagnostic equipment operations.
- Routine Servicing and Periodic Inspections and Commissioning.
- Results and action reporting

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

**Unit 2/21 – Outcome 1: Describe the required steps to commission and carry out first line maintenance key skills on variable message signs equipment as stated above, in accordance with manufacturing and/or organisation and legislative policies.**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Explain fault reports and be able to confirm faults.
- List and describe the associated component parts of the equipment
- Diagnose and rectify faults by module replacement.
- Demonstrate use of the diagnostic equipment commands.
- Test and commission equipment to specification
- Describe how to report actions and unsafe sites to relevant personnel.

**Unit 2/21 – Outcome 2: Describe the required steps and principles to facilitate the fundamental common concepts associated with the understanding of Cable Maintenance in accordance with manufacturing and/or organisation and legislative policies.**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- List Onsite precautions.
- Identify different cable types and maintenance Including Data, Signal, Supply Power, Neutrals, and Active Cables.
- Describe testing Methods including cable attenuation and frequency response; sheath testing.
- Action reporting

**Unit 2/21 – Outcome 3: Describe the required steps to commission and carry out first line maintenance key skills on Communications equipment as stated above, in accordance with manufacturing and/or organisation and legislative policies**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Explain fault reports and be able to confirm faults.
- List and describe the associated component parts of the equipment
- Diagnose and rectify faults by module replacement.
- Demonstrate use of the diagnostic equipment commands.
- Test and commission equipment to specification
- Describe how to report actions and unsafe sites to relevant personnel.

## Unit 2/22 –Cutting to Specification

### Unit Aims

This unit aims to provide learners with the underpinning knowledge and practical key skills required to cut slots to specification

### Unit Outcomes

This unit has one learning outcome:

- Describe and demonstrate the required steps to cut appropriate road slots to the required specification for mode of operation, in accordance with manufacturing and/or organisation and legislative policies.

### Course Topics:

- Hazards and Risks, including abrasive wheels, traffic, blowers, water
- Environmental considerations
- Onsite precautions.
- Cable / Loop types
- Variation reporting.

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## Unit 2/22 – Outcome 1: Describe and demonstrate the required steps to cut appropriate road slots to the required specification for mode of operation, in accordance with manufacturing and/or organisation and legislative policies.

### Practical Activities

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### Underpinning Knowledge

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Take necessary precautions before, during and after cutting the slot(s)
- State different slot configurations
- Work to customer specification / manufacturer's instructions.
- Report variations to site build.



## Unit 2/23 –Cable laying and sealing

### Unit Aims

This unit aims to provide learners with the underpinning knowledge and practical key skills required to install a combination of cable types

### Unit Outcomes

This unit has one learning outcome:

- Describe and demonstrate the required steps to install and seal to the required specification for mode of operation, in accordance with manufacturing and/or organisation and legislative policies.

### Course Topics:

- Hazards and Risks, including traffic, blower, boiler, hot working, resin, pitch.
  - Environmental considerations
  - Onsite precautions.
  - Cable types and installation.
  - Cable preparation
  - Sealing of slot
  - Variation reporting.
- **Prerequisites:**
    - As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## Unit 2/23 – Outcome 1: Describe and demonstrate the required steps to install and seal to the required specification for mode of operation, in accordance with manufacturing and/or organisation and legislative policies

### Practical Activities

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### Underpinning Knowledge

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Take necessary precautions before, during and after installing equipment.
- Identify cable types.
- Install different types of cables.
- Identify mechanism(s) for sealing slots
- Work to customer specification / manufacturer's instructions.
- Report variations to site build

## Unit 2/24 – Testing and Repair of cables

### Unit Aims

This unit aims to provide learners with the underpinning knowledge, fundamental common concepts and practical key skills required for Cable Maintenance in accordance with manufacturing and/or organisation and legislative policies

### Unit Outcomes

This unit has one learning outcome:

- Describe and demonstrate the required steps to test and repair detection cables I to the required specification for mode of operation, in accordance with manufacturing and/or organisation and legislative policies.

### Course Topics:

- Hazards and Risks.
- Onsite precautions.
- Cable types and maintenance.
- Signal, Supply Power.
- Testing Methods.
- Action reporting

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## Unit 2/24 – Outcome 1: Describe and demonstrate the required steps to test and repair detection cables I to the required specification for mode of operation, in accordance with manufacturing and/or organisation and legislative policies

### Practical Activities

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### Underpinning Knowledge

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Take necessary precautions before and during maintenance activities.
- Maintain different types of cables.
- Identify cable types.
- Work to required specifications
- Test cable to required specifications
- Report actions and unsafe sites to relevant personnel.

## Unit 2/25 – Access to cabinets through ducts

### Unit Aims

This unit aims to provide learners with the underpinning knowledge, fundamental common concepts and practical key skills required for required to access cabinets safely and to identify the particular hazards associated with this operation

### Unit Outcomes

This unit has one learning outcome:

- Describe and demonstrate the required steps to access cabinets for the connection of road loop cables, whilst identifying the electrical hazards and reducing the associated risk to ensure the safety of the individual and to the integrity of the equipment.

### Course Topics:

- Hazards and Risks – including site specific risk assessments and separate written justification where appropriate, base seal
- Onsite precautions.
- Cable types and installation.
- Cabinet types and means of access
- Variation reporting.

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## Unit 2/25 – Outcome 1: Describe and demonstrate the required steps to access cabinets for the connection of road loop cables, whilst identifying the electrical hazards and reducing the associated risk to ensure the safety of the individual and to the integrity of the equipment.

### Practical Activities

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### Underpinning Knowledge

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Take necessary precautions before, during and after installing equipment.
- Identify cable types.
- Identify cabinet types and means of access
- Install different types of cables, excluding connections.
- Work to client specifications / manufacturer's instructions including reinstatement of base seal.
- Report variations to site build

# **Section 3 – Level 3 Common Modules**

## Unit 3/1 – Advanced electrical theory and practice within the Highway Electrical sector

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to apply electrical knowledge and work on or near electrical equipment

### Unit Outcomes

This unit has three learning outcomes:

1. Explain electrical terms, identify electrical and electronic items used in highway electrical works; use of advanced calculations
2. Identify responsibilities and actions to comply with the Electricity at Work Regulations and guidance
3. Identify responsibilities and actions to comply with BS7671 and guidance

### Course Topics:

- Advanced Electrical Theory.
- Electrical Components and functions e.g. Relays, Transformers, Resistors, Capacitors, Inductors.
- Earthing and Bonding.
- Power Distribution Circuits.
- Electrical Safety.
- The Electricity at Work Regulations & Guidance
- Electric shock, fire, explosions and burns.
- Maintenance, inspection, isolation, normal dead and live working procedures.
- Applying the EAW regulations to equipment located on the Highway.
- Suitability, protection, placing, integrity and security of conductors.
- Introduction to BS 7671.
- Requirements for standards, regulation, testing and certification.
- “Fundamental Requirements for Safety” as defined in BS 7671.
- Terminology, definitions and abbreviations.
- Theory and applications of Earthing and Bonding.
- Safety and Protection of equipment and people.
- BS 7671 Street furniture
- Choice of protective devices used in Highway Electrical works.

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – Learners will be assessed by a summative holistic assessment identified within each outcome. In addition, those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the underpinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

**Unit 3/1 Outcome 1: Explain electrical terms, identify electrical and electronic items used in highway electrical works; use of advanced calculations**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Define current, voltage, resistance, inductance, impedance and power.
- State and use Ohms Law.
- State & use Power calculations, including power factor correction
- Identify different electrical components and their functions.
- State typical earthing arrangements and bonding.
- Interpret electrical circuit diagrams

**Unit 3/1 Outcome 2: Identify responsibilities and actions to comply with the Electricity at Work Regulations and guidance**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- State the associated Hazards and Risks.
- State the scope of the regulations
- State the requirements of the Regulations in respect to live working and competency
- State the regulations associated with the safety, design and location of electrical equipment.
- Identify the procedures necessary for the installation, maintenance, inspection and working practices used in electrical installations.

**Unit 3/1 Outcome 3: Identify how to comply with BS7671 and guidance**

**Practical Activities**

The learner will be able to:

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- State the need for standards, regulations, testing and certification.
- Demonstrate knowledge of the scope and plan of BS7671, how it applies to Highway Electrical installations and the terminology employed.
- Describe methods of protection available in highway electrical installations

## **Unit 3/2 – Electrical Inspection and Testing (Pathway Specific)**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to carry out electrical inspection and testing on highway electrical equipment

### **Unit Outcomes**

This unit has two learning outcomes:

1. Identify what is required for the electrical inspection and testing of new highway electrical installations
2. Identify what is required for the periodic electrical inspection and testing of highway electrical installations

### **Course Topics:**

- Electrical inspection and testing of new and replacement highway electrical installations.
- Periodic electrical inspection and testing of existing highway electrical installations
- Electrical test methods and working practices
- Using Electrical Test Equipment.
- Calculation of Earth Loop Impedance.
- Types of certificates used in highway electrical works

### **Prerequisites:**

As specified within the HE Training Specification

### **Assessment:**

Practical Assessment – There is no practical assessment within this unit. Those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

## **Unit 3/2 Outcome 1: Identify what is required for the electrical inspection and testing of new highway electrical installations**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Explain earthing, bonding and insulation as described in the regulations.
- Define the purpose of and difference between initial verification and periodic condition reporting
- Use appropriate Test Equipment
- List the tests, test equipment and test methods.
- Complete the appropriate and recognised Certificate.
- Explain the reasons for an appropriate record system.
- Describe how to carry out initial inspection and testing of highway electrical equipment.
- Check the results against the Regulations and guidance and identify appropriate action for unsatisfactory results
- Complete appropriate, recognised certification
- Record and report variations

## **Unit 3/2 Outcome 2: Identify what is required for the periodic electrical inspection and testing (condition reporting) of highway electrical installations**

### **Practical Activities**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Explain the concepts of earthing, bonding and insulation as described in the regulations.
- Define the purpose of and difference between initial and periodic inspection and testing
- Use appropriate Test Equipment List the tests, test equipment and test methods.
- Complete an appropriate and recognised Certificate.
- Carry out periodic inspection and testing of highway electrical equipment
- Check the results against the Regulations and guidance and identify appropriate action for unsatisfactory results



## Unit 3/3 –Coordinate the Work of Others

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to apply supervisory management principles

### Unit Outcomes

This unit has three learning outcomes:

1. Identify how to coordinate on site works
2. Identify key principles associated with the coordination of quality, safety and productivity on site
3. Identify the main duty holders and their responsibilities under CDM Regulations

### Course Topics:

- Defining the role & responsibilities of work coordinators
- Assertiveness
- Communication
- Inter-personal relationships
- Motivation
  
- Time management
- Delegation
- Managing the manager
- Team Building
- Health & Safety and Employment law aspects of supervision
  
- An Introduction to the CDM regulations.
- Application of the CDM regulations.
- The stages of a construction project.
- The main duty holders and their responsibilities.
- Competency assessment
- Pre-construction H&S information
- The construction phase H&S plan.
- The H&S file.

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – There is no practical assessment within this unit. Those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

Written Assessment - Underpinning knowledge will be assessed by a summative written multiple choice or short form answer assessment

### **Unit 3/3 Outcome 1: Identify how to coordinate on site works**

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- \* State the main areas of responsibility of a works coordinator
- \* State the key characteristics of an effective works coordinator
- \* Define assertive behaviour
- \* Identify the steps in effective communication
- \* State the main parts of one of the main motivational models
- \* State the importance of leading by example

### **Unit 3/3 Outcome 2: Identify key principles associated with the coordination of quality, safety and productivity on site**

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- \* Identify how to delegate effectively
- \* Explain a technique to manage personal time effectively
- \* Explain how to ensure teams work well together
- \* Explain how to address under-performance
- \* Explain the steps to take to ensure continuing satisfactory performance
- \* Explain a mechanism for individual and team development
- \* Identify significant legal aspects on site including employment law and H&S law

### **Unit 3/3 Outcome 3: Identify the main duty holders and their responsibilities under CDM Regulations**

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- \* State the purpose and benefits of the CDM regulations.
- \* State under what circumstances the CDM regulations apply.
- \* State the main stages of a project.
- \* State the main duty holders and their responsibilities at each stage
- \* Describe how capability and competency may be assessed
- \* Describe the contents of pre-construction H&S information
- \* Describe the contents of the construction phase H&S plan.
- \* Describe the contents of the H&S file.
- \* Explain how the H&S file should be used after the project has been completed.

# **Section 4 – Level 3 Specialist Modules**

## Unit 3/4 – Specialist Routine Maintenance – Public Lighting

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to identify and explain specialist routine maintenance covering night time monitoring, periodic structural testing and photometric testing

### Unit Outcomes

This unit has three learning outcomes:

1. Identify the structural tests that can be applied and how these is carried out
2. Identify the purpose and methods of carrying out photometric testing of highway lighting installations on site

### Course Topics:

- .
- Types of structural tests
- Types of structural test equipment
- Methods for carrying out structural tests and factors affecting the results
- Management of Highway Infrastructure with reference to ILP Report on Lighting Columns and Sign Posts Planned Inspection Routine
- Types of photometric tests
- Types of photometric test equipment
- Uncertainties
- Methods for carrying out photometric tests

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – There is no practical assessment within this unit. Those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

### **Unit 3/4 Outcome 1: Identify the structural tests that can be applied and how these are carried out**

#### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify the need for and types of structural testing
- Identify the types and use of structural test equipment.
- Identify the factors which could affect the results
- Carry out safe and systematic method for carrying out structural testing
- Record details of work carried out and report variations

### **Unit 3/4 Outcome 2: Identify the purpose and methods of carrying out photometric testing of highway lighting installations on site**

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- \* Identify the need for and types of photometric testing
- \* Identify the types and use of photometric test equipment.
- \* Identify the factors which could affect the results
- \* Carry out safe and systematic method for carrying out photometric testing
- \* Record details of work carried out and report variations

## Unit 3/5 – Specialist Reactive Maintenance – Public Lighting

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to identify and explain specialist reactive maintenance covering the diagnosis and rectification of faults and the maintenance of high mast lighting

### Unit Outcomes

This unit has two learning outcomes:

1. Identify and diagnose common faults on highway electrical systems and identify the subsequent repair to the electrical system.
2. Identify and replace faulty components used in high mast equipment

### Course Topics:

- Fault recording and reporting
- Types of faults and how to recognise them.
- Systematic method of fault identification
  
- High mast purpose & construction
- High mast maintenance operating procedures
- Fault recording and reporting.

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – There is no practical assessment within this unit. Those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

### Unit 3/5 Outcome 1: Identify and diagnose common faults on highway electrical systems and identify the subsequent repair to the electrical system.

### Underpinning Knowledge

On completion of the course the learner will be able to:

- Make appropriate checks to identify the nature and location of faults.
- Check electrical supply for polarity and possible faults on the supply company equipment.
- Measure voltages and currents on the electrical supply and at the lamp terminals.
- Identify faulty lamp, control gear, switching devices and similar components.
- Isolate installation before replacing components.
- Replace faulty equipment correctly, securely and safely.
- Adhere to all safety precautions when isolating/handling DNO cut-outs.
- Record details of work carried out and report variations.
- Dispose of redundant equipment and components in a safe and approved manner.

## **Unit 3/5 Outcome 2: Identify and replace faulty components used in high mast equipment**

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify the specialist tools and equipment required
- Describe how to lower and raise the head-frame
- Identify correct luminaire alignment; faulty components.
- Check operation and alignment of equipment.
- Replace equipment identified as probably being faulty or at end of life.
- Leave equipment in normal operating mode.
- Record details of work carried out and report variations.
- Dispose of redundant equipment and components in a safe and approved manner.

## Unit 3/6 – Specialist Techniques – Traffic Control Foundation and Advanced Principles

### Unit Aims

This unit aims to provide learners with the underpinning knowledge to identify and explain the operation of Urban Traffic Control and Monitoring and Control principles

### Unit Outcomes

This unit has four learning outcomes:

1. Explain the common concepts associated with UTC operations
2. Explain the common concepts associated with a combination of Ancillary Equipment operations
3. Use advanced tools and thought processes to logically identify, evaluate and resolve issues, associated with on street equipment configurations.
4. Identify how to monitor, test, commission and repair Detection Equipment using a range of standard and specialist test equipment

### Course Topics:

- Ancillary equipment maintenance/assessments for O.T.U and U.T.M.C
- The Traffic Controller, concepts and common builds for O.T.U and U.T.M.C equipment
- Power supplies
- Common basic handset commands
  
- Ancillary equipment maintenance/assessments for OMCU, OMU.
- The Traffic Controller, concepts and common builds for OMCU, OMU equipment
- Power supplies
- Common basic handset commands
  
- A description at block diagram level of the controller hardware.
- Detection controller configuration concepts
- Facilities: Timetables and Clocks, Early Cut-off and Late Release, Gap changes, Dummy Phases, Conditions of Appearance
- The Controller Specification Sheets.
- Uses of the handset for enhanced checking of controller operation, facilities.
- Advance modes UTC, CLF, Part time, Bus/LRT/Emergency, Hurry Call.
  
- Advanced Detection equipment type technology.
- Advanced Detection equipment type servicing
- Advanced Detection equipment faults and rectification

### Prerequisites:

As specified within the HE Training Specification

### Assessment:

Practical Assessment – There is no practical assessment within this unit. Those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).



### **Unit 3/6 Outcome 1: Explain the common concepts associated with UTC operations**

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Take necessary precautions before accessing cabinets.
- Be familiar with fault reports and be able to confirm faults.
- Describe the Ancillary Control principles and hardware concepts.
- Use common handset command functions during investigations.

### **Unit 3/6 Outcome 2: Explain the common concepts associated with a combination of Ancillary Equipment operations**

#### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Take necessary precautions before accessing cabinets.
- Be familiar with fault reports and be able to confirm faults.
- Describe Ancillary Monitoring principles and hardware concepts.
- Use common handset command functions during investigations.

### **Unit 3/6 Outcome 3: Use advanced tools and thought processes to logically identify, evaluate and resolve issues, associated with on street equipment configurations.**

#### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- State in-depth advance traffic control modes of operation.
- Explain the principles and facilities associated with controller specification sheets.
- Demonstrate user configuration commands associated with traffic controllers.
- Identify command structure for control interrogation

**Unit 3/6 Outcome 4: Identify how to monitor, test, commission and repair Detection Equipment using a range of standard and specialist test equipment**

**Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify equipment hardware and set to work
- Test and Commission on site detection equipment.
- Identify and apply associated technology requirements
- Successfully complete routine servicing and inspections.
- Successfully carry out fault recognition and rectification.
- Accurately report finding and actions taken

## **Unit 3/7 – Specialist Techniques – Inspection and Commissioning Procedures - Traffic and Pedestrian Control Equipment**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to identify the requirements of inspection and commissioning procedures

### **Unit Outcomes**

This unit has two learning outcomes:

1. Explain how to carry out Period Inspections on Junction Controller and other associated equipment,
2. Explain how to correctly commission Traffic Control, Ancillary Control/Monitoring and associated Street Furniture equipment

### **Course Topics:**

- Periodic Inspection Concepts.
- Inspection Types.
- Access, tests and reporting on associated equipment.
- PC operations.
- Completing site visit reports.
  
- Commissioning concepts for Traffic Control Equipment.
- Commissioning concepts for Ancillary Control/Monitoring Equipment
- Commissioning concepts for associated Street Furniture

### **Prerequisites:**

As specified within the HE Training Specification

### **Assessment:**

Practical Assessment – There is no practical assessment within this unit. Those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

### **Unit 3/7 Outcome 1: Explain how to carry out Period Inspections on Junction Controller and other associated equipment,**

#### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Carry out Mechanical and Structural inspections
- Carry out Electrical/Electronic Inspections.
- Use required level of handset control.
- Test associated equipment as required.
- Make appropriate reports on findings and actions.
- Successfully upload site data as required.

**Unit 3/7 Outcome 2: Explain how to correctly commission Traffic Control, Ancillary Control/Monitoring and associated Street Furniture equipment**

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Verify installations are compliant with manufacturer/customer specifications.
- Verify installations are compliant with current legislative requirements.
- Report variations and unsafe conditions to site build.
- Produce a defect rectification list.

## **Unit 3/8 – Specialist Techniques – Data Transmission and Ancillary Control**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to identify and explain transmission systems and techniques and to monitor, test and commission specified ancillary control and monitoring equipment

### **Unit Outcomes**

This unit has three learning outcomes:

1. Apply Transmission System Fundamentals and Techniques to a range of common products, and demonstrate an in-depth understanding of principles
2. Explain how to monitor, test and commission specific Ancillary Control Equipment, and carry out First Line Maintenance using a range of standard and specialist test equipment
3. Explain how to monitor, test and commission specific Monitoring Equipment, and carry out First Line Maintenance using a range of standard and specialist test equipment

### **Course Topics:**

- Hardware Identification
- The Transmission, concepts and build
- Transmission system common basic handset commands
  
- Advance command sets for ancillary and monitoring equipment.
- Commissioning and configuration.
- Testing and fault recognition
- Specialist test equipment and tools

### **Prerequisites:**

As specified within the HE Training Specification

### **Assessment:**

Practical Assessment – There is no practical assessment within this unit. Those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s).

### **Unit 3/8 Outcome 1: Apply Transmission System Fundamentals and Techniques to a range of common products, and demonstrate an in-depth understanding of principles**

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Take necessary precautions before, accessing cabinets.
- Be familiar with fault reports and be able to confirm faults.
- Describe Transmission System hardware concepts.
- Use common handset command functions.
- Describe Transmission Concepts

**Unit 3/8 Outcome 2: Explain how to monitor, test and commission specific Ancillary Control Equipment, and carry out First Line Maintenance using a range of standard and specialist test equipment**

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify equipment hardware and set to work
- Correctly configure and commission the associated equipment.
- Identify and monitor the associated facilities
- Use advance handset and software applications.
- Carry out correct electrical and mechanical fault assessment.
- Use a range of test equipment and specialist to type equipment

**Unit 3/8 Outcome 3: Explain how to monitor, test and commission specific Monitoring Equipment, and carry out First Line Maintenance using a range of standard and specialist test equipment**

**Underpinning Knowledge**

On completion of the course the learner will be able to:

- Advance command sets.
- Commissioning and configuration.
- Testing and fault recognition
- Specialist test equipment and tools

## **Unit 3/9 – Specialist Techniques – Microprocessor Optimised Vehicle Actuated Equipment**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to monitor, test and commission the Microprocessor Optimised Vehicle Actuated Equipment, and using a range of standard and specialist test equipment to carry out First Line Maintenance key skills

### **Unit Outcomes**

This unit has two learning outcomes:

1. Identify MOVA principles, hardware and software
2. Install, inspect, test, commission and repair associated equipment

### **Course Topics:**

- MOVA Principles.
- Communication Tools.
- Installation, Commissioning and Testing.
- Site Dataset information
- Fault messages and meaning

### **Prerequisites:**

As specified within the HE Training Specification

### **Unit 3/9 Outcome 1: Identify MOVA principles, hardware and software**

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- State basic MOVA principles.
- Identify equipment hardware and set to work
- Correctly use communication tools and applications.
- Correctly interpret dataset information

### **Unit 3/9 Outcome 2: Install, inspect, test, commission and repair associated equipment**

#### **Practical Activities**

The learner will be able to:

#### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Install and commission associated equipment.
- Correctly test and carry out inspections.
- Interpret fault messages and correctly rectify.
- Leave on controlled junction in full working order

## **Unit 3/10 – Specialist Techniques – Transmission Systems and Techniques Fundamentals**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to apply Transmission System Fundamentals and Techniques to a range of common products, and to enable an in-depth understanding of principles when attending associate product training courses

### **Unit Outcomes**

This unit has one learning outcome:

1. The Learner will be able to explain and apply the necessary underpinning knowledge of Transmission System Fundamentals and Techniques to a range of common products to enable 1<sup>st</sup> line maintenance and commissioning activities.

### **Course Topics:**

- Hazards and Risks.
- Onsite precautions.
- Transmission system concepts and build

### **Prerequisites:**

As specified within the HE Training Specification

### **Assessment:**

Practical Assessment – There is no practical assessment within this unit. Those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s)

## **Unit 3/10 Outcome 1: Transmission Systems and Techniques Fundamentals**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will a number of exercises. These may be both interactive and demonstrative to enhance the learning experience

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- State necessary precautions before accessing cabinets.
- State the principles of Transmission Systems concepts and protocols



## **Unit 3/11 – Specialist Techniques – Commissioning Procedures for Camera**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to monitor, test and commission the Camera Equipment / head assemblies, and using a range of standard and specialist test equipment to carry out First Line Maintenance key skills

### **Unit Outcomes**

This unit has one learning outcome:

1. Describe and establish the appropriate tests and commissioning processes to ensure camera equipment is appropriately commissioned and set to work

### **Course Topics:**

- Hazards and risks.
- Safe Practices.
- Commissioning concepts for Camera / head assembly

### **Prerequisites:**

As specified within the HE Training Specification

### **Assessment:**

Practical Assessment – There is no practical assessment within this unit. Those learners who will be assessed against an CBQ/NVQ will be expected to demonstrate the application of the under-pinning knowledge through the relevant CBQ/NVQ unit(s)

## **Unit 3/11 Outcome 1: Commissioning Procedures for Camera**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will a number of exercises. These may be both interactive and demonstrative to enhance the learning experience.

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Verify installations are compliant with customer specifications / manufacturer's instructions.
- Report variations and unsafe conditions to site build.
- Produce a defect rectification list

## **Unit 3/12 – Specialist Techniques – Ancillary Equipment Skills**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to monitor, test and commission the Ancillary Equipment as stated above, and using a range of standard and specialist test equipment to carry out First Line Maintenance key skills, in accordance with manufacturing and/or organisation and legislative policies,

### **Unit Outcomes**

This unit has one learning outcome:

1. Describe and apply the appropriate 1<sup>st</sup> line maintenance criteria to a range of associated ancillary equipment to ensure appropriate rectification of reported faults and set to work to the required specification.

### **Course Topics:**

- Hazards and risks
- Transmission principles
- Diagnostic equipment
- Commissioning and configuration.
- Testing and fault recognition
- Specialist test equipment

### **Prerequisites:**

As specified within the HE Training Specification

## **Unit 3/12 Outcome 1: Ancillary Equipment Skills**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will be a number of exercises. These may be both interactive and demonstrative to enhance the learning experience.

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks
- Identify equipment hardware
- Identify the ancillary facilities
- Configure and commission the ancillary equipment.
- Use diagnostic equipment, software applications and specialist test equipment
- Carry out electrical and mechanical fault assessment.
- Use appropriate test equipment

## **Unit 3/13 – Specialist Techniques – Maintenance of specialist Communications Equipment**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to monitor, test and commission a range of Communications equipment, and using a range of standard and specialist test equipment to carry out First Line Maintenance key skills in accordance with manufacturing and/or organisation and legislative policies

### **Unit Outcomes**

This unit has one learning outcome:

1. To identify and describe the necessary equipment repair criteria to ensure correct operation and outputs as specified by the design specification

### **Course Topics:**

- Hazards and Risks.
- Communications facilities, modes and related concepts.
- Test results
- Full Hardware descriptions to block diagram level.
- Commands and diagnostic equipment operations.
- Routine Servicing and Periodic Inspections and Commissioning.
- Results and action reporting

### **Prerequisites:**

As specified within the HE Training Specification

## **Unit 3/13 Outcome 1: Maintenance of specialist Communications Equipment**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will a number of exercises. These may be both interactive and demonstrative to enhance the learning experience.

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and reduce Risks.
- Explain fault reports and be able to confirm faults.
- List and describe the associated component parts of the equipment
- Diagnose and rectify faults by module replacement.
- Demonstrate use of the diagnostic equipment commands.
- Test and commission equipment to specification
- Describe how to report actions and unsafe sites to relevant personnel.

## **Unit 3/14 – Specialist Techniques – Maintenance of specialist VMS Equipment**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to monitor, test and commission a range of VMS equipment, and using a range of standard and specialist test equipment to carry out First Line Maintenance key skills in accordance with manufacturing and/or organisation and legislative policies

### **Unit Outcomes**

This unit has one learning outcome:

1. To identify and describe the necessary equipment repair criteria to ensure correct operation and outputs as specified by the design specification

### **Course Topics:**

- Hazards and Risks.
- Variable Message Sign types, facilities, modes and related concepts (including associated detection modes).
- Test results
- Full Hardware descriptions to block diagram level.
- Commands and diagnostic equipment operations.
- Routine Servicing and Periodic Inspections and Commissioning.
- Results and action reporting

### **Prerequisites:**

Level 2 Units As specified within the HE Training Specification

## **Unit 3/14 Outcome 1: Maintenance of Specialist VMS Equipment**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will a number of exercises. These may be both interactive and demonstrative to enhance the learning experience.

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Explain fault reports and be able to confirm faults.
- List and describe the associated component parts of the equipment
- Diagnose and rectify faults by module replacement.
- Demonstrate use of the diagnostic equipment commands.
- Test and commission equipment to specification
- Describe how to report actions and unsafe sites to relevant personnel.

## **Unit 3/15 – Specialist Techniques – Commissioning Procedures – VMS**

### **Unit Aims**

This unit aims to provide learners with the underpinning knowledge to commission and test a range of VMS equipment using a range of standard and specialist test equipment to manufactures and client specification

### **Unit Outcomes**

This unit has one learning outcome:

1. To identify and describe the necessary steps and processes to ensure correct specification commissioning of VMS equipment to meet the necessary operating criteria and outputs.

### **Course Topics:**

- Hazards and risks.
- Safe Practices.
- Commissioning concepts for Variable Message Signs.
- Commissioning concepts for Ancillary Control/Monitoring Equipment

### **Prerequisites:**

As specified within the HE Training Specification

## **Unit 3/15 Outcome 1: Commissioning Procedures – VMS**

### **Practical Activities**

To enable maximum learning and benefit from this course, there will a number of exercises. These may be both interactive and demonstrative to enhance the learning experience.

### **Underpinning Knowledge**

On completion of the course the learner will be able to:

- Identify Hazards and Risks.
- Verify installations are compliant with manufacturer/customer specifications.
- Verify installations are compliant with current legislative requirements.
- Reporting including variations and unsafe conditions to site build.
- Produce a defect rectification list.

# Appendix 1

## VRQ - Training Specification

### Road Map

## VRQ and Training Specification Road Map

VRQ Unit Level 2 - Common Learning		Training Specification Course Reference
<b>Unit 2/1 – Health, Safety and Environmental Implementation in Highway Electrical Works</b>		
Unit 2/1 Outcome 1		101
Unit 2/1 Outcome 2		102
Unit 2/1 Outcome 3:		103
Unit 2/1 Outcome 4:		104
Unit 2/1 Outcome 5:		105
Unit 2/1 Outcome 6:		106
Unit 2/1 Outcome 7:		101
<b>Unit 2/2 – Safe Working Practices within the Highway Electrical sector</b>		
Unit 2/2 Outcome 1		201
Unit 2/2 Outcome 2:		204 and 204.1
Unit 2/2 Outcome 3:		208 or M208
Unit 2/2 Outcome 4:		202
Unit 2/2 Outcome 5:		205.1
Unit 2/2 Outcome 6:		207
Unit 2/2 Outcome 7:		302.1 and 302.2
Unit 2/2 Outcome 8:		209
<b>Unit 2/3 – Basic electrical theory and practice within the Highway Electrical sector</b>		
Unit 2/3 Outcome 1		401.1
Unit 2/3 Outcome 2:		402
Unit 2/3 Outcome 3:		210
Unit 2/3 Outcome 4:		214

VRQ Unit Level 2 - Sector Specific Learning		Training Specification Course Reference
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<b>Public Lighting</b>		
<b>Unit 2/4 – Public Lighting Awareness</b>		
Unit 2/4 Outcome 1:		203
Unit 2/4 Outcome 2:		404
<b>Unit 2/5 – Installation Techniques – Public Lighting</b>		
Unit 2/5 Outcome 1:		211, 212, 301.2, 501, 502, 504,505,506,507,508
Unit 2/5 Outcome 2:		507, 509, 510
<b>Unit 2/6 – Routine Maintenance Techniques – Public Lighting</b>		
Unit 2/6 Outcome 1:		603, 604, 608, 702
Unit 2/6 Outcome 2 :		214, 605,
<b>Unit 2/7 Reactive Maintenance Techniques – Public Lighting</b>		
Unit 2/7 Outcome 1:		214, 404, 604, 606
Unit 2/7 Outcome 2:		606

<b>Unit 2/8 – Specialist Techniques – Public Lighting - Surface Protection of Structures</b>	
Unit 2/8 Outcome 1:	602
Unit 2/8 Outcome 1:	602

<b>Unit 2/9 – Specialist Techniques – Public Lighting</b>	
Unit 2/9 Outcome 1:	744 (to be updated in June 2018)
Unit 2/9 Outcome 2:	705

<b>Traffic and Pedestrian Signals</b>	
<b>Unit 2/10 – Traffic and Pedestrian Signal Awareness</b>	

Unit 2/10 Outcome 1:	M203
Unit 2/10 Outcome 2:	M301

<b>Unit 2/11 – Installation Techniques – Traffic Signals</b>	
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Unit 2/11 Outcome 1:	M501, M502
Unit 2/11 Outcome 2:	M503, M506
Unit 2/11 Outcome 3:	M504, M505

<b>Unit 2/12 Routine Maintenance Techniques – Traffic Signals</b>	
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Unit 2/12 Outcome 1:	M601a
Unit 2/12 Outcome 2:	M601b

<b>Unit 2/13 Reactive Maintenance Techniques – Traffic Signals</b>	
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Unit 2/13 Outcome 1:	M602
Unit 2/13 Outcome 2:	M603
Unit 2/13 Outcome 3:	M604
Unit 2/13 Outcome 4:	M605
Unit 2/13 Outcome 5:	M608
Unit 2/13 Outcome 6:	M609
Unit 2/13 Outcome 7:	M611

<b>Unit 2/14 – Specific Techniques – Traffic Signals</b>	
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Unit 2/14 Outcome 1:	M507
Unit 2/14 Outcome 2:	M507

<b>Highway Cameras</b>	
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<b>Unit 2/15 – Installation Techniques – Cameras</b>	
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Unit 2/15 Outcome 1:	TCAM001
Unit 2/15 Outcome 2:	TCAM002
Unit 2/15 Outcome 3:	TCAM003

<b>Unit 2/16 – Routine Maintenance Techniques - Cameras</b>	
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Unit 2/11 Outcome 1:	TCAM004

<b>Unit 2/17 Reactive Maintenance Techniques – Cameras/ Detector</b>	
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Unit 2/17 Outcome 1:	TCAM005
Unit 2/17 Outcome 2:	TCAM006
Unit 2/17 Outcome 3:	TCAM007



<b>Signals Highway Communications / Variable Message Signs</b>	
<b>Unit 2/19 –Communications Fundamental Principles</b>	
Unit 2/19 Outcome 1:	TCOM001
Unit 2/19 Outcome 2:	TCOM002
<b>Unit 2/20 Installation of non-Infrastructure Equipment – Communications/VMS</b>	
Unit 2/20 Outcome 1:	TCOM003
Unit 2/20 Outcome 2:	TVMS001
<b>Unit 2/21 Reactive Maintenance Techniques Communications/VMS</b>	
Unit 2/21 Outcome 1:	TVMS002 TVMS003
Unit 2/21 Outcome 2:	TCOM004
Unit 2/21 Outcome 3:	TCOM005
<b>Slot Cutting</b>	
<b>Unit 2/22 Cutting to Specification</b>	
Unit 2/22 Outcome 1:	TSC001
<b>Unit 2/23 Cable laying and sealing</b>	
Unit 2/11 Outcome 1:	TSC002
<b>Unit 2/24 Testing and Repair of cables</b>	
Unit 2/24 Outcome 1:	TSC003
<b>Unit 2/25 Access to cabinets through ducts</b>	
Unit 2/25 Outcome 1:	TSC004

VRQ Unit Level 3 – Common Learning	Training Specification Course Reference
<b>Unit 3/1 – Advanced electrical theory and practice within the Highway Electrical sector</b>	
Unit 3/1 Outcome 1:	401.1, 401.2
Unit 3/1 Outcome 2:	402
Unit 3/1 Outcome 3:	403
<b>Unit 3/2 – Electrical Inspection and Testing</b>	
Unit 3/2 Outcome 1:	713 – Traffic or 714 Public Lighting or 715/716 for comms
Unit 3/2 Outcome 2:	713 – Traffic or 714 Public Lighting or 715/716 for comms
<b>Unit 3/3 – Management and Supervision Coordinate the Work of Others</b>	
Unit 3/3 Outcome 1:	801
Unit 3/3 Outcome 2:	802
Unit 3/3 Outcome 3:	805

VRQ Unit Level 3 - Sector Specific Learning	Training Specification Course Reference
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<b>Public Lighting</b>	
<b>Unit 3/4 – Specialist Routine Maintenance – Public Lighting</b>	
Unit 3/4 Outcome 1:	706
Unit 3/4 Outcome 2:	707
<b>Unit 3/5 – Specialist Reactive Maintenance – Public Lighting</b>	
Unit 3/5 Outcome 1:	701
Unit 3/5 Outcome 2:	708

<b>Traffic and Pedestrian Signals</b>	
<b>Unit 3/6 – Specialist Techniques – Traffic Signals – Advance Principles</b>	
Unit 3/6 Outcome 1:	M606
Unit 3/6 Outcome 2:	M607
Unit 3/6 Outcome 3:	M704
Unit 3/6 Outcome 4:	M705
<b>Unit 3/7 – Specialist Techniques – Inspection and Commissioning Procedures - Traffic and Pedestrian Control Equipment</b>	
Unit 3/7 Outcome 1:	713
Unit 3/7 Outcome 2:	M701
<b>Unit 3/8 Specialist Techniques – Data Transmission and Ancillary Control</b>	
Unit 3/8 Outcome 1:	M702
Unit 3/8 Outcome 2:	M706
Unit 3/8 Outcome 3:	M707

<b>Unit 3/9 – Specialist Techniques – Microprocessor Optimised Vehicle Actuated Equipment</b>	
Unit 3/9 Outcome 1:	M708
Unit 3/9 Outcome 2:	M708

<b>Highway Cameras</b>	
<b>Unit 3/10 Specialist Techniques – Transmission Systems and Techniques Fundamentals</b>	
Unit 3/10 Outcome 1:	TCAM009
<b>Unit 3/11 Specialist Techniques – Commissioning Procedures for Camera</b>	
Unit 3/11 Outcome 1:	TCAM008
<b>Unit 3/12 – Specialist Techniques Ancillary Equipment Skills</b>	
Unit 3/11 Outcome 1:	TCAM010

<b>Signals Highway Communications / Variable Message Signs</b>	
<b>Unit 3/13 Specialist Techniques – Maintenance of specialist Communications Equipment</b>	
Unit 3/13 Outcome 1:	TCOM005
<b>Unit 3/14 Specialist Techniques – Maintenance of specialist VMS Equipment</b>	
Unit 3/14 Outcome 1:	TVMS002
<b>Unit 3/15 Specialist Techniques – Commissioning Procedures – VMS</b>	
Unit 3/15 Outcome 1:	TVMS003

<b>Slot Cutting</b>	
There are no specialist areas	

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