



Mapping Exercise

Electrical Technician (Underground)

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Introductions

This document has been produced to examine how statements within the National Occupational Standards (NOS) can be used to develop the content that could form a common training standard for electrical technicians across the UK mining sector. The following standards have been considered as part of developing this approach.

Module Title	Original NOS Reference	UK Standards Reference
Confirm work Activities and Resources for the Work.	MT8	PROMT8
Using Engineering Drawings and Documents in Maintenance Activities.	MT9	PROMT9
Working Safely on Electrical Equipment in Mines.	MT10	PROMT10
Maintaining Electrical Equipment.	MT11	PROMT11
Modifying or Rewiring Electrical Circuits.	MT12	PROMT12
Testing Electrical Equipment and Circuits.	MT13	PROMT13
Carrying Out Planned Maintenance on Electrical Equipment.	MT14	PROMT14
Carrying Out Fault Diagnosis on Electrical Equipment and Circuits.	MT15	PROMT15
Identify and Address Mine Engineering Health and Safety Hazards and Risks.	MT16	PROMT16
Operate Safely in the Mine Environment.	MT17	MPQVG01
Confirm to Efficient Work Practices.	MT18	MPQVG02
Handing Over and Confirming Completion of Maintenance Activities.	MT19	PROMT19

The tables contained within this document have aimed to:

1. Use the knowledge statements from the NOS to inform a wider content for any training programme.
2. Use the performance statements to start to inform a structured approach to assessment.

There are some elements following the initial review that are not considered within the existing NOS. Suggestions have been included for additional content that would improve the technical capabilities of the candidate.

Once the content of this document has been agreed by the sector it is suggested that:

1. A structured portfolio is developed that covers the knowledge elements.
2. The portfolio is structured around a reference document that would allow the apprentice/ electrical technician to easily reference completed elements.
3. A structured skills development programme is developed that covers the key performance statements.
4. A structured assessment is constructed for each of the elements to allow the assessment of the performance elements.

Disclaimer

The **Mining Qualification Committee** (MQC) has developed and reviewed the training and assessment material.

MPQC have provided the accreditation for the training and assessment material.

MAUK have published the training and assessment material and provided access for the underground mining sector.

It remains the responsibility of the **mine operator** to verify the training and assessment material is suitable for their circumstances and application.

Knowledge Element

MPQVG01 (MT17) – Operate Safely in the Mine Environment

This module can be satisfied by the common induction module (working safely and efficiently in the underground environment).

MPQVG02 (MT18) – Conform to Efficient Work Practices

This module can be satisfied by the common induction module (working safely and efficiently in the underground environment).

PROMT8 (MT8) – Confirm Work Activities and Resources for the Work

PROMT8 (MT8) – Confirm Work Activities and Resources for the Work		
Knowledge Statement		Elements
K1	How to identify the work activities.	Understand how potential work activities are identified.
		Understand how the work activity is recorded.
		Can outline the planning process to ensure that work activities are suitably co-ordinated.
		Can define how work is allocated as part of the deployment process.
K2	How to assess the resources needed from the information available.	The process for identifying the number of people required to complete a task.
		The process for identifying if there are any components/ parts that are required to complete a task.
		The process for identifying if there are specialised tools required to complete the task.
		The process for identifying the need to have access to specific plant/ equipment/ skills to complete the task.
K3	How to prepare a work programme.	How to use the information in K2 to generate a method of work for completing the tasks.
		How to extend the work being allocated to cover a shift or meet specific organisational objectives.
K4	How to obtain clarification and advice where the resources required are not available.	The organisational process to escalate where the element identified in K2 above are not available.
K5	Valuation of the work activities against project requirements and the requirements of significant external factors.	How progress is against the plan for the day
		How progress is measured against any overarching project plan.
		How to understand if there are other elements/ functions that may impact delivery of the tasks or plan.
		How to use the process to agree priorities (based on safety/ expediting delivery/ minimising operational impact).
K6	How to identify which work activities influence each other.	How dependencies are identified within the planning process.

		How the dependencies are used to influence the planning of resources and activities.
K7	How to determine how long each work activity will take and the sequence of activities. Alterations to the work programme.	Understanding of any plant or equipment not being available including pumps, and environmental monitoring equipment which could affect the safety of the mine.
		Ability to modify/ amend the work to prevent an unsafe condition.
K8	How to identify alterations to the work programme to meet changed circumstances.	Identified in K7 above.
K9	How to assess the contractual/ work effects resulting from alterations to the work programme.	This is not included in the technician level.
K10	How to justify to decision makers the effects resulting from alterations to the work programme.	Identified in K7 above.

PROMT09 (MT9) – Using Engineering Drawings and Documents in Maintenance Activities

PROMT09 (MT9) – Using Engineering Drawings and Documents in Maintenance Activities		
Knowledge Statement		Elements
K1	The information sources used for the drawings and specifications that you use in your work activities.	Knows where to find the information on site.
		Understands how to engage with manufacturers and suppliers to get relevant up to date information.
		Knows how to book out (and replace the information) including any referencing systems.
		Knows what a wiring diagram is and how it is used.
		Knows what a cabling drawing is and how it relates to the machine/ equipment.
		Knows how manufactures provide updates, and how these are utilised as part of modifying and updating machinery and equipment.
		Knows what a schematic diagram is and how it is used.
		Knows how to use other, none paper based sources of information.
K2	How drawings and documents are obtained, and how to check that they are current and valid.	Can outline what the process is at their site for the control of documents and the document management system that is used.
		Knows what to do if the document available within the document management system is not to the current standard or specification.
		Understands the organisational arrangements for document and version control.
K3	How to use other sources of information to support the drawings (such as electronic component pin configuration specifications, standard reference charts for limits and fits, tapping drill reference charts, cable current carrying capacities, thread reference tables).	See K1 above.
K4	The procedures for reporting discrepancies in the drawings or documents and for reporting lost or damaged drawings/ documents	See K2 above.

K5	Care and control procedures for the drawings and documents, and the importance of returning them to the designated location on completion of the work activities.	See K1 above.
K6	The basic drawing conventions that are used, and why there needs to be different types of drawings.	See K1 above.
		Knows the various symbols that may be used to indicate elements or components within the electrical system.
		Knows how cable types and sizes are identified on drawings.
K7	The types of drawings used, and how they interrelate (such as isometric and orthographic, first and third angle, assembly drawings, circuit and wiring diagrams, block and schematic diagrams).	See K1 above.
		Other content within this section is self-explanatory.
K8	Imperial and metric systems of measurement, tolerancing and fixed reference points.	Can use suitable scales to interpret dimensions from an engineering drawing.
		Can convert the measurement from imperial to metric and vice versa.
		Understands the principles of engineering tolerances when it comes to measurement and construction and why observing these tolerances are important to the safety, quality, and reliability of the finished product.
K9	The meaning of the different symbols and abbreviations found on the drawings that you use (such as surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure, and flow characteristics).	See K6 above.
		Understands markings relating to protection levels (for example flameproof).
		Understands the principle of CE marking.
		Understands the principle of UK Certifications marking.
K10	How damage or graffiti on drawings can lead to scrapped work.	Understands the principle of controlled copies of drawings, and any modifications written on drawings may fall outside the required safety/ quality requirements.
		Understands how working to uncontrolled drawings could potentially lead to aborted work and lost dates.
K11	The extent of your own responsibility, when to act on your own initiative to find, clarify and evaluate information, and to whom you	Understands the limit of their authority when it comes to varying from the standards.
		Understands the reporting procedures to make sure that any work that varies from the standards are adequately captured

	should report if you have problems that you cannot resolve.	within the document control and asset maintenance systems.
		Understands the escalation procedure when it comes to seeking guidance.
		Understands the hierarchical structure within the engineering function and how issues or concerns are escalated.

PROMT10 (MT10) – Work Safely on Electrical Equipment in Mines

PROMT10 (MT10) – Working Safely on Electrical Equipment in Mines		
Knowledge Statement		Elements
K1	Isolation procedure(s) to be followed to comply with organisational procedures.	Can define the isolation procedure that is used within their organisation for electrical systems, and the principle of lock out/ tag out / try out
		Can define the isolation procedures for dealing with other sources of energy.
		Understands the principles of energy dissipation as part of an isolation procedure for electrical and other energy sources.
		Understands the principle of isolating for self.
		Understands the principle of isolating for self and others.
		Understands the principle of remote isolation, and how that is carried out, controlled, and verified.
		Understands the process, indicators, and safety equipment that must be used to verify electrical isolation prior to exposing or touching conductors.
		Understands how the methods statements and switching schedules (or planned job instruction sheets) may be used to control isolation sequences, and why observing defined sequence of isolation may be important to the safety of themselves and others within the mine.
		Understands how the methods statements and switching schedules (or planned job instruction sheets) may be used not only to control isolations, but to provide information on other aspects of the procedures to be followed to ensure that a job is completed safely.
		Understands how the method statements and switching schedules (or planned job instruction sheets) may be used to identify the effect on safety critical equipment (pumps, monitoring systems etc).
		Understands the process for reinstatement of electrical (and other energy sources) at the end of the task (see K4 below).
		Identify where any notices should be posted indicating that work is taking place on plant/ equipment, and it must remain isolated.
		Any other information that needs to be posted or present.

		The organisational requirement for applying multiple locks where more than one person/ discipline is working on the plant and equipment.
K2	The meaning of the terms: • Approved lock. • Personal lock. • Safety Lock. • Operational Lock. • Lock box. • Authorised. • Scheduled work. • Hierarchy of isolation. • Isolated. • Electrical equipment. • Dead. • Danger notice. • Earthed. • Safe system of work. • Permit to work.	Can define the terms outlined within K2 of these requirements.
K3	• The legal status of a permit to work. • When a "permit to work is required. • The circumstances when a permit may not be required. • Why a permit to work system is used when isolating electricity.	Can define the terms outlined within K3 of these requirements.
K4	Organisational procedures for the issue and signing off "permits to work".	Understands how permits to work are produced at the site. Understands the procedure for signing on to a permit to work. Understands the process for reinstatement of electrical (and other energy sources) at the end of the task. Define how isolations may be removed for the purpose of testing. Understands the process to get sanctions for testing within their organisation. Understands the procedure for clearing a permit to work when the task has been completed. Understands what to do if the work has not been completed and the permit needs to remain in place to allow the system to remain safe. Understands what to do if the work planned cannot be completed, and the permit needs to be suspended, cancelled or remain in place. The arrangement used within the organisation when more than one person or more than one discipline is carrying out

		simultaneous tasks on any plant/ equipment.
		Understands the requirements for electrical permits in line with guidance Electricity at Work safe working practices HSG85.
K5	Organisational method statements (Standard Operating Procedures)	See K1 above.
		Understands the content requirement for method statements and switching schedules (or planned job instruction sheets).
		Understands how the method statements and switching schedules (or planned job instruction sheets) are issued.
		Understands how the method statements and switching schedules (or planned job instruction sheets) are returned, and any information that needs to be appended is returned with the document on the completion of the task.
K6	Methods used to identify cables.	Understands the organisational procedure that is used to identify cables at each end.
		Understands how an organisation identifies a cable that forms a long run and may have multiple joints.
		Understands the organisational process for tracing a cable and verifying the origin and terminations.
K7	Tests to be carried out on electrical circuits.	Can define what is meant by an insulation test.
		Can define how earth connections are removed and applied as part of completing insulation and conductivity testing.
		Can define the procedure for carrying out an insulation test for earth fault and short circuit.
		Understands the organisational procedure relating to the minimum (and where applicable the maximum) voltage and minimum test values when carrying out and interpreting the results of an insulation test.
		Define the process for carrying out a conductance test on a cable.
		Understands what a conductance test is used to show.
		Can use the formula to calculate the percentage conductance of the conductor and earth path.

		Understands the organisational/ legislative requirements when it comes to interpreting the results of a conductance test.
		Can define how to use an ohmmeter on an electrical circuit for the purpose of measuring resistance.
		Can define how a voltmeter should be connected into an electrical circuit.
		Can define how an ammeter should be connected into an electrical circuit.
		Mine earth conductivity tests.
		Capacitance test for open circuit in a conductor.
		Lightning conductor tests.
K8	Circumstances when "live work" is permitted and the procedures to be followed when carrying out "live work".	Understands the principles required under the EWR1989 for live working: • Unreasonable to be dead. • Reasonable to work live. • Applications of suitable precautions.
		Can define the limits/ voltages where it is classified as live working within their organisation.
		Define where live work may be used within an organisation.
		Understands why in certain circumstances it may be beneficial to consider live working.
		Understands the organisational procedures/ controls that are required to allow live working to take place, including the use of an appropriate permit to work.
		Understands any personal authorisations that are required in order to be allowed to work live.
		The uses of notices to signify the risk of live working taking place to others that may enter the work area.
K9	Causes of electric shock in mines.	Can define the main source of potential electric shock in a mine.
		Can define other potential circumstances that may increase the potential difference, leading to an unplanned discharge of electrical energy.
K10	Potential injuries associated with electric shock.	<i>The statement is self-explanatory (expand within the portfolio questions).</i>
K11	Purpose and use of equipment and facilities provided for dealing with electric shock.	Identify the procedure for making yourself and others safe when approaching a potential victim of electric shock.

		Identify the equipment that may be required when dealing with an electric shock.
		Identify the type of injuries that may require treatment if an individual has received an electric shock.
		Identify how the equipment may be used to treat the potential injuries associated with an electric shock.
K12	Treatment of casualty who has received an electric shock.	See K11 above.
		The statement is self-explanatory (expand within the portfolio questions).
K13	Organisational and legislative reporting requirements should an electric shock emergency occur.	Outline the requirements under the Reporting of Injuries, Disease and Dangerous Occurrence Regulations 2013.
		Outline the requirements under the Electricity at Work Regulations 1989.
		Outline the internal requirements of your organisation to report electric shock (or any other electrical incident).
K14	Procedures to be followed to communicate details of the electric shock emergency.	Outline how details are shared within the organisation.
		Outline how details might be shared with the wider organisation (if applicable).
		Outline how details may be shared across the wider sector.
K15	The main principles of health and safety and environmental legislation and regulations relevant to using electricity in mines.	Understands how the Mines Regulations 2014 require an organisation to think about the use of electricity in an underground mine.
		Understands the requirements of the Electricity at Work Regulations 1989 and any requirements that these regulations impose on using electricity in a mine.
		Understands the principles of the Dangerous Substances and Explosive Atmosphere Regulations and how these may apply.
K16	Industrial Standards relevant to using electricity in mines.	Understands where and how to access BS EN standards.
		Understands and can apply any appropriate BS EN standard applicable.
		If applicable for potentially explosive atmospheres outline what the requirements are for BS EN 60079.

K17	Approved codes of practice and guidance for working safely with electricity in mines.	Understands how to comply with regulations, specifically The Electricity at Work Regulations 1989, If applicable regarding the mine environment, the Dangerous Substances and Explosive Atmospheres Regulations 2002. Understands how to comply with guidance specifically Electrical Safety in Mines HSG278, Electricity at Work Safe Working Practices HSG85 and Keeping Electrical Switchgear Safe HSG230. If applicable for potentially explosive atmospheres, outline the requirements of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - the 1996 Regulations. Understands any company specific policy or guidance for working with electricity safely in the mine.
K18	The different types and categories of hazards and hazardous situations in mines in general, and in your area of responsibility in particular.	Can identify the major hazards as defined by the Mines Regulations 2014 that might be present generally within a mine. Can identify other specific dangerous occurrences as listed within the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations that might be relevant to a mine. Can identify other hazards which might be found with a mine. Can identify the hazards that might normally be present in your normal area of responsibility. Can define some of the key controls that are put in place to manage those hazards.
K19	Organisational and legislative requirements for inspections, examinations, and testing.	Outline what the Mines Regulations 2014 say in relation to inspection, examination, and testing of equipment, specifically regulation 15, installed in a mine. Understands what the organisations requirements are for the systematic inspection, examination and testing of equipment installed below ground. Define what your organisation means by the terms: • Commissioning. • Inspection. • Examination. • Test.

K20	Methods of communication in hazardous or emergency situations.	Outline how you would communicate in the event of an emergency, and the systems that are in place within the operation to support that communication. Define some of the detail that you may be asked when initially reporting an emergency.
K21	Types, use and maintenance requirements of personal protective equipment provided to protect from electric shock.	Identify some of the personal protective equipment that you may be issued with to help protect you from creating a situation where you receive an electric shock. Outline the daily tests that should be completed on this type of equipment to ensure that it is operational before entering the mine. Outline the procedures on site to exchange faulty protective equipment prior to entering the mine. Define the tests that should be completed on any personal protective equipment, immediately prior to it being used. Outline the actions that should be taken if the personal protective equipment fails the test outlined above. Understands Electrical Test Equipment for Use by Electricians GS 38.
K22	Legislation, approved codes of practice and guidelines for safe use of equipment.	Outline what the Health and Safety at Work Act says about the safe use of equipment. Outline what the Provision and Use of Work Equipment Regulations 1989 say in relation the safe use of equipment. Outline what the Mines Regulation 2014 say in relation to the maintenance of equipment to remain safe to use. Understands how the Control of Substances Hazardous to Health Regulations 2002 apply to operations in underground mines
K23	The use of equipment/ tools provided in accordance with manufacturers' instructions.	Outline what the Provision and Use of Work Equipment Regulations 1998 say in relation to the provision of instructions. Outline what the Health and Safety at Work Act says in relation to the requirement of an employee to follow instructions. Outline what The Supply of Machinery (Safety) Regulations 2008 require for the use of machinery.

K24	Organisational procedures for the isolation of plant and machinery	Can define how fixed plant is isolated, and how the fact that it is isolated is brought to the attention of others.
		Can define the organisations procedures to prevent electricity (or other sources of energy) from being inadvertently re-applied to any plant or equipment that has been isolated.
		Outline how the information relating to the need to isolate is made obvious (for example, routine maintenance or defective apparatus).
K25	Your own responsibilities and limitations.	Define the various levels of authorisation that exist within your organisation.
		Outline what is required to move between these various levels of authorisation within your organisation.
		Define your own limitation and responsibilities, in relation to the organisations scheme.
K26	Methods of effective communication.	Identify the means of communication that may be utilised within your mine and function to effectively communicate deployment, work activity, actions completed and any outstanding issues.
		The various communication mediums used within your department and why.
K27	The allocation of tasks and duties.	Identify how your organisation or department determines the tasks to be completed within the shift.
		Outline how these tasks are allocated to you.
		Define how the tasks are co-ordinated between departments to make sure that safety and production are maintained.
		How changes to the plan, or task are communicated with you during the shift.
		How you and others prioritise the tasks that you are given and those that are reactionary by nature and occur during the course of a normal shift.
K28	The benefits of teamwork, and how to achieve it.	<i>The statement is self-explanatory (expand within the portfolio questions).</i>

PROMT11 (MT11) – Maintaining Electrical Equipment

PROMT11 (MT11) – Maintaining Electrical Equipment		
Knowledge Statement		Elements
K1	The health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility these requirements place on you.	See K1 of PROMT10 in relation to isolation procedures.
		See K3 of PROMT10 in relation to Permit to Work.
		Identify how you make sure that the maintenance activity will not negatively impact on the safety of others in the mine (for example the unplanned stoppage of a ventilation fan).
		Identify how you make sure that the equipment to be worked on is isolated effectively.
		Identify any specific organisational requirements for fencing or creating exclusion zones when certain maintenance activities are taking place.
K2	The isolation and lock-off procedure or permit-to-work procedure that applies to maintenance activities (such as electrical isolation, locking off switchgear, removal of fuses, placing of maintenance warning notices, proving the isolation has been achieved and secured).	See K1 of PROMT10 in relation to isolation procedures.
		See K3 of PROMT10 in relation to Permit to Work.
K3	How to recognise and deal with victims of electric shock (to include methods of safely removing victim from power source, isolating the power source, and methods of first aid resuscitation).	See K11 of PROMT10 in relation to arrangements for dealing with electric shock.
K4	Hazards associated with carrying out electrical maintenance activities (such as contact with live electrical components, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risk.	The statement is self-explanatory (expand within the portfolio questions).
K5	The importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities.	The statement is self-explanatory (expand within the portfolio questions).
K6	How to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/	See K1 of PROMT09 (Sources of drawings/information).
		See K2 of PROMT09 (How drawings/documents are obtained).

	maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations, and other documents needed for the maintenance activities.	
K7	The purpose of the components which have been replaced/ maintained.	Not sure that this statement adds any value (probably better under the performance elements).
K8	The different types of cabling and their application (such as multicore cables, single core cables, steel wire armoured (SWA), screened cables). Consideration that this is more a design element. There is overlap between this in maintenance etc.	Understands where PVC multicore cable might be used in a mining application. Understands where PVC, SWA cables might be used as part of a distribution systems, and how these cables are sized and rated. Understands where flexible trailing cables might be used, how these are sized and rated. Understands where flexible trailing cables with galvanised steel wire armouring are used. Understands the types of cabling that might be used as part of a control system underground. Understands the types of cables that might be used as part of a lighting system underground. Understands the types of cable that might be used as part of a conveyor (or other such installation) or as part of the signal system. Understands the importance of cable handling systems on mobile plant. Understands the importance of adequately suspending cables. Understands how the different types of cables are terminated.
K9	The different types of electric motors and motor starters. Consideration that this is more a design element. There is overlap between this in maintenance etc.	Can describe how a simple three phase AC motor operates, and the component parts. Understands how the rotary direction of a simple three phase motor can be changed. Understands the principle of direct online starting of motors. Understands the principles of varying the speed of a simple three phase induction motor by using an inverter. Understands the principle of a three-phase slip ring induction motor.

		Understands how the speed of the motor can be varied by altering the resistance of the cage rotor.
		Understands the principle of start/ delta starting of motor, and how this may limit starting torque and starting current.
		Understands the principle of operation of a synchronous induction motor.
		Understands how synchronous induction motor can be started.
		Understands how the motor speed can be varied using the controller.
		Understands how slip rings and brushes are used to make connection to the rotor.
		Understands how operating above and below synchronous speed can influence the overall power factor of the motor/ distribution system.
		Understands the principles associated with variable speed drive motors and how the principle of how speed and torque can be altered.
		Understands the main components of a DC motor (armature/ commutator/ field/ yoke/ brush gear).
		Understands how the direction and speed control of a DC motor is achieved.
		Understands the main types of DC motor and the differences between a shunt wound motor, a series-wound motor and a compound wound motor and the advantages and disadvantages of each type.
K10	The different types of control system, and their various components.	Understands the main components of a direct online starter (isolator/ contactor).
		Can describe how a pilot circuit operates and how the components of the pilot circuit limit the potential for inadvertent starting.
		Understands the principles of Supervisory Control and Data Acquisition Systems (SCADA).
		Understands how the hardware and software links the control system to a range of products and systems, which could include (but is not limited to) Human Machine Interfaces (HMI), Variable Speed Drives, Soft Start Units, Instrumentation and Safety Systems.
		The effective commissioning of controls to ensure that the control parameter, inputs and outputs and actions are in line with the anticipated and programmed outcomes.

		The setting of alarm/ trip parameters to prevent operation out of design specification.
		How a control system for starting and stopping equipment (locally) might be configured.
		How a control system for starting and stopping equipment remotely (including surface control) might be configured.
K11	The application and use of a range of electrical components (such as plugs, switches, sockets, lighting and fittings, junction boxes, consumer units).	Understands the purpose of an isolator.
		Understands the purpose of a contactor.
		Understands the purpose of a circuit breaker.
		Understands the purpose of a fuse.
		Understands the purpose of a live line indication.
		Understands the purpose of a voltmeter.
		Understands the purpose of an ammeter.
		Describe the types of plugs and the features of those plugs that are used to make up the distribution network.
		Describe the types of plugs and sockets and the features of those plugs and sockets that are used to provide power to mobile plant and equipment used underground in your organisation.
K12	The various lighting systems used (including tungsten, sodium, mercury vapour and fluorescent, LED).	Can define the various lighting systems that are used underground in a mine.
		Can define why different lighting systems are used in different applications.
K13	The different types of wiring enclosures that are used.	Understands the principles of IP rating and how to select an appropriate enclosure.
		Can define why enclosures need to be robust within a mining environment.
		Understands other protection concepts such as increased safety (type 'e'), flameproof (type 'd') and other concepts such as powder filled (type 'q') and encapsulation (type 'm').
K14	The care, handling and application of ohmmeters, multi-meters and other electrical measuring instruments.	See K7 on PROMT10 (tests to be carried out on electrical circuits).
		The statement is self-explanatory (expand within the portfolio questions).

		Understands Electrical Test Equipment for Use by Electricians GS 38.
K15	Company policy on the repair/ replacement of components, and the procedure for obtaining replacement parts, materials, and other consumables necessary for the maintenance activities.	Understands the policy on the replacement of components (like for like etc).
		Understands what needs to happen with the components that have been replaced (sent for refurbishment, or scrap using an approved scheme).
		Procedure for obtaining component for any planned maintenance activities.
		Understands the requirement for maintaining adequate stocks of key components.
		Understands the principle of approved suppliers, lead times, service exchange.
K16	How to check that the replacement components meet the required specification/ operating conditions (such as values, tolerance, current carrying capacity, voltage rating, power rating, working temperature range).	The statement is self-explanatory (expand within the portfolio questions).
K17	The techniques used to dismantle/ assemble electrical equipment (such as unplugging, de-soldering, removal of screwed, clamped and crimped connections).	The statement is self-explanatory (expand within the portfolio questions).
K18	Methods of removing and replacing cables and wires in wiring enclosures without causing damage to existing cables.	Understands the method of identifying the appropriate wire through testing or tracing.
		Understands the means of removing any retaining.
		Understands how to lay in the replacement wires/ cables to avoid damage to cables.
		Understands how to re-loom the wiring to avoid damage as the machine/ equipment operates.
		Understands the standards required for the wiring of enclosures.
K19	The use of regulations when selecting wires and cables and when carrying out tests on systems.	Understands how to comply with The Electricity at Work Regulations 1989 in line with system design to be safe for use and testing of systems.
		The use of BS7671/IEE in relation to electrical systems.
K20	Methods of attaching identification markers/ labels to removed	Outline why various components should be marked when removed.

	components or cables to assist with re-assembly.	Outline why it is important to markup faulty components after they have been removed.
		Understands why it is important to check the labelling to ensure the correct component has been selected and a suitable replacement is being used.
K21	The tools and equipment used in the maintenance activities (including the use of cable stripping tools, crimping tools, soldering irons and torches, gland connecting tools.	The statement is self-explanatory (expand within the portfolio questions).
K22	Methods of checking that components are fit for purpose, and the need to replace items (such as motor brushes, seals and gaskets overload protection devices).	See K20 of PROMT11 (methods of marking and identifying components).
K23	How to make adjustments to components/ assemblies to ensure they function correctly.	The statement is self-explanatory (expand within the portfolio questions).
K24	How to check tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose.	Understands the general principles of checks that should be made on hand tools.
		Understands the procedure for swapping defective tools.
		Understands the organisational policy on modifying tools.
		Understands the organisational policy on purchasing and using tools supplied by yourself.
K25	The importance of making 'off-load' checks before proving the equipment with the electrical supply on.	Understands the organisational arrangements for checking equipment prior to applying power, and the information that should be recorded.
		Can describe why these checks are completed, and the implications of applying power to apparatus that fails the test.
K26	The generation of maintenance documentation and/ or reports following the maintenance activity.	Can outline the scheme of maintenance for the mine.
		Understands how the frequency of maintenance for key items is set.
		Understands that equipment may have different maintenance requirements at different times.

		Understands how the organisation schedules maintenance activities.
		Understands the system for issuing the maintenance activities to the craftsmen.
		Can outline the various reports that need to be completed as part of a range of maintenance activities.
		Can identify how any defects located are entered into the maintenance scheme, and how work requests are generated to deal with any defects.
		Understands the requirements of regulation 15 of The Mines Regulations 2014.
K27	The equipment operating and control procedures to be applied during the maintenance activity.	See K1 of PROMT09 (information sources).
		See K1 of PROMT10 (isolation procedures).
		See K3 of PROMT10 (circumstances where permits may not be required).
		See K4 of PROMT10 (permit arrangements).
		See K5 of PROMT10 (organisational method statements).
		Understands how the maintenance activities are controlled to limit interaction or avoid introducing safety risks for others operating within the mine.
		Understands how different maintenance activities will be completed with and without energy sources, and how these activities are controlled to minimise the risks.
K28	How to use appropriate lifting and handling equipment in the maintenance activity.	
		Understands how to identify the weight of a piece of equipment from information available.
		Understands how to identify appropriate lifting points to avoid damaging equipment.
		Can describe the principles of safe working load, and how this may be used to select the appropriate equipment.
		Can describe the factors that may reduce the safe working load, and how to compensate for those factors when selecting equipment.
		Understands the organisations requirements relating to factors of safety, and how those requirements impact the selection of equipment.
K29	The problems that can occur during the electrical maintenance activity, and how they can be overcome.	The statement is self-explanatory (expand within the portfolio questions).

K30	The organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials.	<i>The statement is self-explanatory (expand within the portfolio questions).</i>
K31	The extent of your own authority and to whom you should report if you have a problem that you cannot resolve.	See K25 of PROMT10 (your own responsibilities and limitations).

PROMT12 (MT12) – Modifying or Rewiring Electrical Circuits

PROMT12 (MT12) – Modifying or Rewiring Electrical Circuits		
Knowledge Statement		Elements
K1	The specific safety precautions and procedures to be observed whilst carrying out the modifications or rewiring of the electrical systems (including any specific legislation, regulations or codes of practice relating to the activities, equipment, or materials).	Understands how to comply with The Electricity at Work Regulations 1989 in line with system remaining safe for use including current capacity and electrical protection concepts.
		The use of BS7671/IEE in relation to design and modification of electrical systems.
K2	The health and safety requirements of the work area in which you are carrying out the modification or rewiring activities, and the responsibility these requirements place on you.	The requirements under the Management Regulations to complete a suitable and sufficient risk assessment.
		Understands how modifications to systems are planned and designed.
		Understands how modifications are tested following installation to ensure that they conform to the design criteria and parameters.
		Understands the organisational procedure for commissioning/ recommissioning following any changes.
		Understands that any information, instruction and training is updated to reflect the modification and that persons required to operate the plant/ equipment are provided with any necessary information or skills.
K3	The hazards associated with carrying out modifications or rewiring of electrical systems, and how to minimise these and reduce any risks.	See K2 of PROMT12 .
		The importance of producing a scope of work and a design/ modification specification.
		The importance of involving manufactures/ suppliers in modifications to ensure that the safe operation of the plant or equipment is not impacted.
		Defines how the changes are documented and signed off prior to any changes taking place (management of change).
K4	How to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation).	See K9 of PROMT10 (causes of electric shock).
		See K10 of PROMT10 (potential injuries from electric shock).
		See K11 of PROMT10 (equipment to deal with electric shock).

		See K12 of PROMT10 (treatment of electric shock).
K5	The personal protective equipment and clothing to be worn during the modification or rewiring activities.	The statement is self-explanatory (expand within the portfolio questions).
K6	How to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, graphical electrical symbols, BS7671/IEE wiring regulations, and other documentation used during the modification or rewiring activities.	See K1 of PROMT09 (sources of drawings/ information). See K2 of PROMT09 (how drawings/ documents are obtained). See K7 of PROMT9 (types of drawing and how the interrelate).
K7	The basic principles of how the system functions, the operating sequence, the working purpose of individual units/ components, and how they interact.	Understands the importance of understanding how a system should operate and how the elements work together.
K8	The different types of cabling (such as multicore cables, single core cables, SWA cables, screened cables), their fittings and their application.	See K8 of PROMT11 (types of cables and their applications).
K9	The different types of electrical component (such as plugs, switches, lighting and fittings, junction boxes, consumer units).	See K13 of PROMT11 (types of wiring enclosure). The statement is self-explanatory (expand within the portfolio questions).
K10	Preparations to be undertaken prior to the modification or rewiring of the system.	Not considered within the document.
K11	How to extract and insert new cables in wiring enclosures (such as conduit, trunking, and tray work) without causing damage to other cables or components.	See K18 of PROMT11 (methods of removing and replacing wires and cables).
K12	The methods and techniques to be used for soldering and de-soldering, and the importance of adhering to these procedures.	Understands any organisational limitations on hot work in the mine, and the procedures that need to be in place when conducting hot work. Understands the requirements for soldering/ desoldering, including the type of solder, the requirement for fume control/ extraction.
K13	The methods and techniques to be used for crimping and heat shrinking, and the importance of	See K12 above in relation to hot works. Understands the process for selecting the correct crimp, suitable for the cross-

	adhering to these procedures, assessment and of communicating this effectively to those involved.	sectional area of the conductor, and the implications of selecting an incorrectly sized crimp.
		Understand the implications of over crimping or under crimping, and the potential implication on the safe reliable operation of the plant/ equipment.
K14	The various mechanical fasteners that can be used, and their methods of installation or removal.	Understands the markings on mechanical fasteners and can identify the characteristics of a fastener from the markings.
		Understands the implication of using incorrectly rated fasteners within electrical enclosures.
		Can define the different tools that would be needed to remove various types of fasteners.
		Can outline what is important to select the tool of the correct size.
K15	The purpose of work assessment, why work assessment plays a role in an organisation and how we apply to your own situation.	Understands the principles of the Management Regulations and the need to assess and control work activities.
		Understands the organisational requirements to assess work activities at the point of delivery and your part in completing your task.
K16	The procedure for obtaining replacement parts, materials, and other consumables necessary for the modification or rewiring activities.	See K15 of PROMT11 (policy on the repair and replacement of components).
K17	How to conduct any necessary checks to ensure that the completed work is to the required standard.	Outline the organisational procedure for signing off any modifications to plant and equipment.
		Define the organisational procedure for returning plant and equipment back to service following any planned modifications.
K18	The methods and equipment used to transport, handle and lift components/ cabling into position, and how to check that the equipment is within its current certification dates.	See K28 of PROMT11 (use of lifting and handling equipment).
		Define how distribution cable is transported in, around and out of the mine.
		Define how distribution cable is extended within the mine.

		Can define the standard of installation of distributions scales in a mine, including the specification for hanger spacing.
		Can outline the minimum separation distances between cables and mobile plant and machinery to ensure that they are not inadvertently damaged.
K19	How to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for their intended purpose.	See K24 of PROMT11 (how to check tools).
K20	The problems that can occur with the modification or rewiring operations, and how these can be overcome.	Can identify the issues of incorrectly fitting components.
		Can identify the issues with incorrectly wiring replacement components.
		Can define techniques that are used when dismantling a piece of plant/ equipment to ensure that components are identified and kept safe.
		Identify the importance of identifying the correct diagrams and drawings to ensure that finished work can be checked against the standards.
		Understands the principles and process associated with recommissioning items following any process of modification.
K21	The recording documentation to be completed for the activities undertaken.	Outline any documents that the organisation needs to complete following maintenance, repair or the modification of any plant or equipment including defect recording.
		Describe how the documentation should be filed.
		Describe how the organisation recognises that a modification has been completed, and why this is important when you have significant quantities of certain equipment.
K22	The extent of your own authority and to whom you should report if you have problems that you cannot resolve.	See K25 of PROMT10 (own responsibilities and limitations).

PROMT13 (MT13) – Testing Electrical Equipment and Circuits

PROMT13 (MT13) – Testing Electrical Equipment and Circuits		
Knowledge Statement		Elements
K1	The health and safety requirements of the work area where you are carrying out the testing activities, and the responsibility these requirements place on you.	See K1 of PROMT10 (isolation procedures).
		See K3 of PROMT10 (permit systems).
		See K1 of PROMT11 (health and safety requirements).
K2	The equipment isolation and lock-off procedure or permit-to-work procedure that applies to the testing activities (such as electrical isolation, locking off switchgear, removal of fuses, placing of maintenance warning notices, proving the isolation has been achieved and secured).	See K1 of PROMT10 in relation to isolation procedures.
		See K3 of PROMT10 in relation to Permit to Work.
K3	The hazards associated with carrying out tests on electrical systems, and how to minimise these and reduce any risks.	Understands the limitations on live working under organisational policy.
		Understands the risks associated with exposing potentially live conductors.
		Understands that even conductors or systems which have been isolated may have residual energy, and therefore this residual energy needs to be dispatched.
		Understands the potential impact that the stopping of critical plant/ equipment may have on the safety of the mine.
		Understands that some test equipment used may introduce hazards into a mine, and there may be organisational limits placed on the use to minimise those risks.
		Understands Electrical Test Equipment for Use by Electricians GS 38.
K4	The specific safety precautions to be taken when carrying out formal inspection and testing of electrical equipment.	See K1 above.
		See K2 above.
		See K3 above.
K5	How to recognise and deal with victims of electrical shock (to include methods of safely removing victim from the power source, isolating the power source, and methods of first aid resuscitation).	See K9 of PROMT10 (causes of electric shock).
		See K10 of PROMT10 (potential injuries from electric shock).
		See K11 of PROMT10 (equipment to deal with electric shock).
		See K12 of PROMT10 (treatment of electric shock).
K6	The importance of wearing protective clothing and other	The statement is self-explanatory (expand within the portfolio questions).

	appropriate safety equipment during the electrical testing activities.	Understands Electrical Test Equipment for Use by Electricians GS 38.
K7	Protection techniques for electrical systems (to prevent burn or fire risk).	Understands the principle of overcurrent protection, and how this is set up to protect the plant/ equipment/ cable.
		Understands the principles of instantaneous overcurrent protection, and how this is set up to protect the electrical distribution system.
		Understands the principle of earth fault protection, and the various limits on current that is allowed to flow under fault conditions.
		Understands how fault currents are limited with the systems being used at the mine.
		Understands how fuses may be used to protect a circuit, and how to select a correctly rated fuse.
K8	How to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/ maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations, and other documents needed in the testing activities.	See K2 of PROMT09 (How drawings/ documents are obtained).
		See K7 of PROMT9 (Types of drawing and how they interrelate)
		Understands the distribution plans that are maintained by the mine, and where they are kept.
		Understands the process for updating and reviewing the distribution plans to ensure that they continue to reflect the electrical network.
		Can define the type of information that may be included on a distribution drawing (for example, plant identification numbers, protection settings).
		Understands how the asset maintenance system at the mine operates and how information relating to the installation, testing, examination of equipment is recorded.
K9	Types of test equipment to be used, and their selection for particular types of tests.	See K7 of PROMT10 (tests to be carried out on electrical circuits).
		Any other specialised test equipment that may be used for identifying the position of faults within a distribution network.
		Understands Electrical Test Equipment for Use by Electricians GS 38.

K10	How to ensure that the test equipment is maintained and correctly calibrated, in accordance with the appropriate organisational procedures.	See K14 of PROMT11 (care in the application and handling of test instruments).
		Understands why it is important that test instruments should be periodically checked to maintain calibration.
		Understands the organisational procedure for periodically checking test instruments.
		Where there are more sensitive test instruments used, understands how to check the calibration/ service dates.
		Understands the organisational requirements covering the frequency of calibration.
		Understands Electrical Test Equipment for Use by Electricians GS 38.
K11	How to connect the appropriate test equipment for the measurement of resistance, current, and voltage.	See K7 of PROMT10 (tests to be carried out on electrical circuits).
K12	The various testing methods and procedures, as recommended in approved electrical codes of practice, and how to apply them to different operating conditions.	The statement is self-explanatory (expand within the portfolio questions).
K13	Displaying/ recording test results, and the documentation to be used.	Can identify the forms/ records that need to be completed following the completion of an electrical test.
		Can describe the tests that must be conducted before a piece of plant/ equipment is used.
		Can describe the tests that should be completed if a piece of plant/ equipment is stopped by the activation of an electrical safety device (for example, instantaneous overcurrent or earth fault).
K14	How to interpret the value and significance of the test readings.	Can define the minimum and maximum values relating to insulation, conductivity and other tests prescribed within organisational procedures.
K15	How to analyse test results using tables in approved electrical codes of practice, and how to use comparison and sequential techniques.	Understands the commissioning system and collection of test results required to certify plant and equipment safe for use. Can use these initial tests as a benchmark for any subsequent test carried out, providing any required actions.
		Can demonstrate how to interpret test results to the required standards applicable in line with BS7671.

		Understands any company policy governing electrical test parameters such as minimum ohmic resistance values.
K16	The importance of ensuring that test equipment is used only for its intended purpose and within its specified range and limits.	See K3 above.
		Understands that the operating range of some test equipment, may damage components.
		Understands how to determine the upper limits when it comes to using test equipment.
K17	Problems or errors that may occur and which could affect the test results, and how they can be avoided.	Understands how a damp environment may lead to lower insulation readings, and the actions that may be taken to ensure that this effect is minimised.
		Understands the factors that may impact the indicated resistance of a conductor.
		Understands the factors that may impact the indicated resistance of an earthing system.
		Can define the implications of inaccurate resistance tests of conductors and earth systems.
		Can define the steps taken to ensure that the connections made when completing a conductivity test are as good as possible.
K18	The environmental control and company operating procedures relating to the testing activities.	See K3 above.
		Any limitations that the organisation places on the use of certain test equipment under certain environmental conditions.
		Where applicable to the organisation, the implications of exceeding the environmental limitations which have been set.
K19	The documentation required and the procedures to be observed following the test.	See K21 of PROMT12 (recording documentation for completed activities).
K20	The extent of your own authority and to whom you should report if you have problems that you cannot resolve.	See K25 of PROMT10 (own responsibilities and limitations).

PROMT14 (MT14) – Carrying Out Planned Maintenance on Electrical Equipment

PROMT14 (MT14) – Carrying Out Planned Maintenance on Electrical Equipment		
Knowledge Statement		Elements
K1	The health and safety requirements of the area in which the planned maintenance activity is to take place, and the responsibility these requirements place on you.	See K1 of PROMT10 (isolation procedures).
		See K3 of PROMT10 (permit systems).
		See K1 of PROMT11 (health and safety requirements).
K2	The isolation and lock-off procedure or permit-to-work procedure that applies to maintenance activities (such as electrical isolation, locking off switch gear, removal of fuses, placing of maintenance warning notices, proving the isolation has been achieved and secured).	See K1 of PROMT10 in relation to isolation procedures.
		See K3 of PROMT10 in relation to Permit to Work.
K3	The specific health and safety precautions to be applied during the planned maintenance activities, and their effects on others.	Understands the needs to schedule maintenance to limit impact on the operations.
		Understands that certain aspects of maintenance may impact the mine ventilation system, and that access to certain areas will be restricted to those required.
		Understands that maintenance may need to be rescheduled dependent on environmental conditions.
		Maintenance activities may reduce or stop the automatic monitoring of the mine environment, and the actions that should be taken in those circumstances.
K4	The importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities.	<i>The statement is self-explanatory (expand within the portfolio questions).</i>
K5	How to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation).	See K9 of PROMT10 (causes of electric shock).
		See K10 of PROMT10 (potential injuries from electric shock).
		See K11 of PROMT10 (equipment to deal with electric shock).
		See K12 of PROMT10 (treatment of electric shock).
K6	Hazards associated with carrying out planned maintenance activities on electrical equipment (such as	See K3 of PROMT13 (displaying and recording test results and the documentation to be used).

	exposure to live conductors, misuse of tools), and how to minimise these and reduce any risks.	
K7	How to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/ maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations, and other documents needed in the maintenance activities.	See K2 of PROMT09 (How drawings/ documents are obtained). See K7 of PROMT9 (Types of drawing and how they interrelate).
K8	The maintenance schedules and methods to be followed in order to comply with company procedures for planned maintenance on electrical equipment.	See K27 of PROMT10 (allocation of tasks). See K1 of PROMT11 (health and safety requirements for maintenance). See K27 of PROMT11 (operating procedures during maintenance activity). Outline how maintenance is scheduled in line with the policy and procedures in your organisation. Outline how circuit isolations are planned, reviewed, and verified as part of any planned maintenance of electrical equipment in your organisation. Understands how maintenance requirements are agreed within the organisation to avoid safety and production conflicts.
K9	The basic principle of operation of the equipment/ circuits being maintained, and the function/ purpose of individual components within the circuit.	See K11 of PROMT11 (various components in electrical circuits). Outline the principle of how a breaker is opened on a typical distribution switchgear used underground in your organisation. Outline the various positions on the isolator on typical distribution switchgear used underground in your organisation. Explain how the various isolator positions and circuit breaker can be used to earth the outgoing circuits of that switch (putting the system in to circuit earth). Explain how isolation may be verified using various indications on the distribution switchgear used underground within your organisation. Outline how the underground distribution system within your organisation is laid out, and the advantages and disadvantages of using that type of arrangement compared to other systems.

K10	The different types of cabling, and their application (such as multicore cables, single core cables, steel wire armoured (SWA), screened cables).	See K8 of PROMT11 (Types of cable and their application).
K11	The different types of electric motors and motor starters, and their maintenance requirements.	Outline the typical maintenance requirement for a single phase or three phase AC induction motor, and define the importance of those maintenance elements in ensuring safe and efficient operation.
		Outline the typical maintenance requirement for a synchronous induction motor, and define the importance of those maintenance elements in ensuring safe and efficient operation.
		Outline the typical maintenance requirement for a DC motor (any type), and define the importance of those maintenance elements in ensuring safe and efficient operation.
		Outline the typical maintenance requirement for a direct online starter (typically a gate end box or load centre), and define the importance of those maintenance elements in ensuring safe and efficient operation.
		Outline the typical maintenance requirement for a liquid controller starter, and define the importance of those maintenance elements in ensuring safe and efficient operation.
		Outline the typical maintenance requirement for a variable speed drive (inverter), and define the importance of those maintenance elements in ensuring safe and efficient operation.
K12	The different types of control system, their various components and maintenance requirements.	Outline the operation of a simple pilot circuit that may be used to control plant/equipment underground locally or remotely, and define the importance of those maintenance elements in ensuring safe and efficient operation.
		Outline the typical components that may make up a SCADA system that is used to control plant and equipment, define the typical checks that may be required to ensure that it continues to operate safely and efficiently.
		Outline the typical makeup of a PLC used underground to control plant and equipment underground in your place of

		work. Define the typical maintenance tasks to be completed .
		Where plant/ equipment is operated remotely it is usual to install digital and analogue probes and sensors to give an indication of status. Outline typical probes and sensors that may be used and define the maintenance checks that are completed to ensure safe and reliable operation.
K13	The application and use of a range of electrical components (such as plugs, switches, sockets, lighting and fittings, junction boxes, consumer units), and the types of checks required for each of them.	The statement is self-explanatory (expand within the portfolio questions).
K14	The various lighting systems used (including tungsten, sodium, mercury vapour, fluorescent and LED), and their maintenance requirements.	The statement is self-explanatory (expand within the portfolio questions).
K15	The different types of wiring enclosure that are used (to include conduit, trunking and tray work systems), and what to check during the maintenance activities.	The statement is self-explanatory (expand within the portfolio questions).
K16	Methods of checking that components are fit for purpose.	Understands how components are marked and can be identified.
		Understands CE marking.
		Understand UK Certification marking.
K17	How to make sensory checks (by sight, sound, smell, touch).	Describe how when approaching a piece of plant/ equipment you might use your senses to indicate the condition of that equipment.
		Outline the types of things that you might be looking/ listening for when approaching a piece of plant/ equipment.
K18	How to check that the replacement components meet the required specification/ operating conditions (such as values, tolerance, current carrying capacity, voltage rating, power rating, working temperature range)	Define the process that you would use to verify that the components are like for like.
		Define the type of information that may be on a component or manufactures data sheet that would be useful in ensuring that the component is fit for purpose.
		After fitting a new/ replacement component, outline the typical steps that should be taken to ensure that the equipment is operating within the design parameters.

K19	The various planned maintenance categories that are generally used (such as condition-based maintenance, scheduled maintenance and total preventative maintenance (TPM)).	The statement is self-explanatory (expand within the portfolio questions).
K20	The procedure for obtaining the consumables to be used during the planned maintenance activity.	See K15 of PROMT11 (procedure for obtaining replacement parts).
K21	The appropriate testing procedures to be adopted during the maintenance activity.	See K7 of PROMT10 (tests to be carried out on electrical circuits).
		Define the various test procedures that may be used when carrying out maintenance activities on electrical systems.
K22	How to compile planned maintenance records/ logs/ reports that comply with company policy and procedures.	Understands the organisational requirement for reporting following planned maintenance or breakdown activities.
		Define the typical information that will need to be recorded following planned maintenance activities.
		Understands how the information provided is used within the wider planned maintenance system to reschedule maintenance, produce extra work requests, and identify defects.
		Understands how defects are prioritised in line with company procedures.
K23	The equipment operating and control procedures, and how to apply them in order to carry out planned maintenance.	Define why it is important that you understand how a piece of plant/ equipment should operate prior to carrying out any planned maintenance.
		Can define why safety and standard operating functions may need to be overridden to complete maintenance activities, and how this process is managed within your organisation.
		Define how plant/ equipment is returned to service following maintenance activities, and the checks that are required to make sure is safe to operate.
K24	The problems that can occur whilst carrying out the planned maintenance activities, and how they can be avoided.	The statement is self-explanatory (expand within the portfolio questions).

K25	The organisational procedure to be adopted for the safe disposal of waste of all types of materials.	<i>The statement is self-explanatory (expand within the portfolio questions).</i>
K26	The extent of your own authority and to whom you should report if you have problems that you cannot resolve.	See K25 of PROMT10 (Responsibilities and limitations).

PROMT15 (MT15) – Carrying Out Fault Diagnosis on Electrical Equipment and Circuits

PROMT15 (MT15) – Carrying Out Fault Diagnosis on Electrical Equipment and Circuits		
Knowledge Statement		Elements
K1	The health and safety requirements of the area in which the fault diagnosis activity is to take place, and the responsibility these requirements place on you.	See K1 of PROMT10 (isolation procedures).
		See K3 of PROMT10 (permit systems).
		See K1 of PROMT11 (health and safety requirements).
K2	The isolation and lock-off procedure or permit-to-work procedure that applies.	See K1 of PROMT10 (isolation procedures).
		See K3 of PROMT10 (permit systems).
		Define any special circumstances that may exist within the organisation for carrying out isolations under fault/ breakdown conditions.
K3	How to recognise and deal with victims of electric shock (to include methods of safely removing victim from power source, isolating the power source, and methods of first aid resuscitation).	See K9 of PROMT10 (causes of electric shock).
		See K10 of PROMT10 (potential injuries from electric shock).
		See K11 of PROMT10 (equipment to deal with electric shock).
		See K12 of PROMT10 (treatment of electric shock).
K4	The importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities.	The statement is self-explanatory (expand within the portfolio questions).
K5	Hazards associated with carrying out fault diagnosis on electrical equipment (such as live electrical components, stored energy, misuse of tools), and how to minimise these and reduce any risks.	See K3 of PROMT13 (hazards with carrying out tests on electrical circuits).
		The potential impacts of testing on systems of different voltages.
K6	The procedure to be adopted to establish the background of the fault.	When fault finding, outline information that could be available from remote monitoring systems.
		When fault finding, outline information that could be available from diagnostic systems on the plant/ equipment.
		When fault finding, outline information that could be available from fault on the plant/ equipment.
		When fault finding, define some of the questions that you could ask the people that have been using the equipment to

		understand what has happened, or what has changed.
		Outline how your own sensors (sight/ sound/ smell/ touch) may assist in informing you of potential issues.
K7	How to evaluate the various types of information available for fault diagnosis.	Taking the information that is available, what is the process you would apply to start to narrow down the issue.
		What types of features may be available on the plant/ equipment to assist you in evaluating the information that you have available?
K8	How to use the various aids and reports available for fault diagnosis.	See K6 above (procedure to be adopted to establish the fault).
K9	How to use various items of fault diagnostic equipment to investigate the problem.	Not used in this section.
K10	The various fault finding techniques that can be used, and how they are applied (such as half-split, input-to-output, emergent problem sequence, six point technique, function testing, unit substitution, injection and sampling techniques and equipment self-diagnostics).	The statement is self-explanatory (expand within the portfolio questions).
K11	How to evaluate sensory information (sight, sound, smell, touch).	See K17 of PROMT14 (how to make sensory tests).
		See K6 above (procedure to be adopted to establish the fault).
K12	How to analyse evidence and evaluate possible characteristics and causes of specific faults/ problems.	Not used in this section.
K13	How to relate previous reports/ records of similar fault conditions.	See K21 of PROMT12 (documentation to be completed for work undertaken).
		See K22 of PROMT14 (completion of maintenance records).
		Define how information from previous faults/ breakdowns/ maintenance activities is accessed.
		Understands that suppliers may be an additional source of information, and may have experienced similar issues on other sites.

K14	The care, handling and application of electrical test instruments (such as multi-meters, insulation resistance testers).	The statement is self-explanatory (expand within the portfolio questions).
K15	How to calibrate electrical test instruments and check that they are free from damage and defects.	Define the checks that should be completed on test instruments prior to use. Outline your organisational procedure for periodically testing or calibrating a test instrument, and any arrangements that might be available at the site for you to carry out self-calibration tests. Define the actions that should be taken if a test instrument fails the calibration test/ checks.
K16	How to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/ maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations, and other documents needed in the maintenance process.	See K1 of PROMT09 (sources of drawings/ information). See K2 of PROMT09 (how drawings/ documents are obtained). See K7 of PROMT9 (types of drawing and how they interrelate). See K8 of PROMT13 (how to obtain and interpret).
K17	The basic principles of how the circuit functions, the operating sequence, the purpose of individual units/ components and how they interact.	Define what is meant by voltage. Define what is meant by current. Define what is meant by resistance. Define the relationship between voltage, current and resistance for a simple DC circuit. Define what is meant by the term open circuit. Define what is meant by the term closed circuit. Define what is meant by the term normally open in relation to a switch or relay condition. Define what is meant by the term normally closed in relation to a switch or relay condition. What is meant by a series circuit. What is meant by the term parallel circuit. How does the connection of a circuit in series or parallel influence resistance. When it comes to the ability of a circuit or system to do work, what is the relationship between voltage and current. Identify the various energy sources that may be present within an electrical circuit.
K18	The different types of cabling (such as multi-core cables, single-core	See K8 of PROMT11 (different types of cabling and their applications).

	cables, SWA cables, MI cables, screened cables), their associated fittings, and their application.	
K19	The different types of motors and starters, and their operation.	See K9 of PROMT11 (different types of motor and starter). See K11 of PROMT14 (different types of electric motors).
K20	The different types of control systems and components, and their operation.	See K12 of PROMT14 (different types of control systems).
K21	The different types of electrical components (such as plugs, switches, lighting and fittings, junction boxes, consumer units), and their operation.	See K11 of PROMT11 (application of a range of components). See K9 of PROMT12 (different types of electric components). See K13 of PROMT14 (application and use of electric components).
K22	How to evaluate the likely risk to yourself and others, and the effects the fault could have on the overall process or system.	Define the principle of fault level, under fault conditions and the magnitude of those levels within the operation. Outline the effects that large currents flowing in an uncontrolled manner may have on the system and mine environment. Define the organisational requirement/ process for carrying out a risk assessment. Outline the various ways that faults on low voltage control systems could affect the operation of the process or system.
K23	How to prepare and produce a risk analysis report, where appropriate.	The statement is self-explanatory (expand within the portfolio questions).
K24	How to prepare a report or take follow-up action which satisfies the company policy on concluding fault diagnosis.	Understands the process at the site for reporting the outcome of any fault diagnosis exercise. Understands the process by which additional work actions are registered in the asset maintenance system and these are turned in to work/ follow up actions. How any additional work items are formally closed off following their satisfactory completion.
K25	The organisational procedure to be adopted for the safe disposal of waste of all types of materials.	Outline the organisational procedure that is used to dispose of electronic waste items.

		Define how the waste disposal is recorded to meet the requirements of any licence or environmental permissions.
K26	The extent of your own authority and to whom you should report if you have problems that you cannot resolve.	See K25 of PROMT10 (responsibilities and limitations).

PROMT16 (MT16) – Identify and Address Mine Engineering Health and Safety Hazards and Risks

PROMT16 (MT16) – Identify and Address Mine Engineering Health and Safety Hazards and Risks		
Knowledge Statement		Elements
K1	Definitions of hazard, risk, accident, danger.	<i>The statement is self-explanatory (expand within the portfolio questions).</i>
K2	Workplace monitoring and hazard identification methods, e.g., formal and informal health and safety inspections, surveys, and audits.	Can define how the major mining hazards that exist within the workplace are monitored and reviewed.
		Can define how the information relating to the management and performance of the major hazard control is communicated.
		Understands the steps that need to be taken to control and reduce the risks.
		Can define how workplace inspections are completed to comply with the requirements of the Mines Regulations 2014.
		Can define how departmental inspections of plant/ equipment (and other items) is conducted and recorded.
		Understands how the information from departmental inspections is used to drive continuous improvement.
K3	Basic procedures for carrying out health and safety risk assessment.	Can identify the organisational procedure for carrying out a formal risk assessment.
		Understands the hierarchy of controls and how these are applied to a risk assessment process.
		Understands the process for evaluating/ scoring the risk and how this process is used to determine the level of risk following the application of controls.
		Understands where a point of work risk assessment may be used in their organisation, and the limits to which these may be applied.
K4	Organisational arrangements for identification and reporting of hazards and risks.	What method is used within the mine to formally identify and report hazards (in compliance with the Mines Regulations 2014).
		How does the electrical department identify potential risks and ensure that these are reported?

		The actions that you should be taking if you find a safety or operational risk with an electrical system.
		How those hazards and risk are brought to the attention of others within the organisation.
K5	The benefits of participation of persons at work.	The statement is self-explanatory (expand within the portfolio questions).
K6	Basic knowledge of the main types of occupational health risk – chemical (toxic, corrosive, dermatitis), physical (noise, dust, temperature, light, vibration, repetitive strain) and ergonomic.	The statement is self-explanatory (expand within the portfolio questions).
K7	Basic knowledge of the main hazards associated with mining (e.g.s. noxious gasses/ unsafe atmosphere, falls of ground, inrush, outburst, plant and machinery including transporting/ winding systems, slips/ trips/ falls, fire, explosions, surface hazards including tips).	See K8 of PROMT10 (different categories of hazards and hazardous situations in mines). Outline the major hazards defined within the Mines Regulations 2014 that are applicable to your organisation. Outline other hazards that might be present within the work environment, that have the potential for multiple casualty, multiple fatality events if they are not adequately controlled.
K8	Hazards and risks arising from plant/ machinery incorrectly used/ installed/ maintained.	The statement is self-explanatory (expand within the portfolio questions).
K9	Industrial Standards relevant to using electricity in mines.	Identify the requirements of the Electricity at Work Regulations 1999 (and schedule 1 – items relating to mines). See K16 of PROMT10 .
K10	Approved codes of practice and guidance for working safely with electricity in mines.	See K17 of PROMT10 .
K11	How to obtain and use information on plant/ machinery/ equipment (e.g.s. manufacturers manuals, engineering drawings, specifications).	See K1 of PROMT9 (information sources). See K2 of PROMT9 (organisational process for obtaining up to date drawings). See K3 of PROMT9 (how drawings/ documents are obtained). See K8 of PROMT13 (how to obtain and interpret information).
K12	How the incorporation of commonly used protective devices and	Identify the types of protective devices that might be found on electrical systems in a mine.

	correct plant maintenance contribute to the reduction of risks.	For each of the protective devices identified, give an indication of how they reduce the risk to using electricity in mines.
		For each of the protective devices listed, identify the typical maintenance requirements to ensure that it is rated correctly and has remained operational.
K13	Safe working practices for yourself to include all systems, procedures, equipment, and materials in use.	See K3 above (risk assessment).
		See K1 of PROMT10 (isolation procedures).
		See K1 of PROMT10 (permit procedures).
K14	Your scope, responsibility, and limitations for dealing with hazards and risks.	See K25 of PROMT10 (responsibilities and limitations).

PROMT19 (MT19) – Handing Over and Confirming Completion of Maintenance Activities

PROMT19 (MT19) – Handing Over and Confirming Completion of Maintenance Activities		
Knowledge Statement		Elements
K1	The health and safety requirements of the area in which the handover is to take place, and the responsibility they place on you.	The organisational procedure for passing on information to an oncoming shift.
		The organisational requirements relating to incomplete work activities and leaving the place safe for the oncoming/ following shift.
K2	The isolation and lock-off procedure or permit-to-work procedure that applies to the equipment being maintained.	See K1 of PROMT10 (isolation procedures).
		See K1 of PROMT10 (permit procedures).
K3	The specific health and safety precautions to be applied during the handover procedure, and their effects on others.	The requirement to identify any specific issues (such as lost monitoring, stoppage of ventilation).
		The arrangements for handing over permits and keys for the isolation locks.
		The arrangements for ensuring that on complex, remote isolations all parties are aligned on the status of the work activities.
		Any specific requirements to fence off areas or prevent inadvertent access due to the nature or consequence of the work activities.
K4	The importance of wearing protective clothing and other appropriate safety equipment whilst operating/ using the equipment during the handover operations and where it may be obtained.	Covered in various sections throughout the standards.
K5	The checking process to be followed before handing over the equipment (such as; are the safety and quality systems operable, does the equipment function to specification).	The arrangements to verify that the work has been completed to a correct standard before closing up any enclosures.
		The arrangements to verify that all people are clear of the work area before readmitting any energy source.
		The arrangements for ensuring that all tools have been removed and covers replaced before admitting any energy source.
		The requirement to carryout functionality testing to verify the maintenance/ repair/ modification before handing over the plant/ machinery.

K6	The appropriate handover procedure, depending on the maintenance activity carried out (repair, modification, preventative maintenance, scheduled servicing).	See K5 above (the checking process).
		Understands the organisational arrangements, and the difference between functionality testing and the requirement to re-commission a system.
K7	The procedure for involving the appropriate people when operating/ using the equipment.	Understands that as an electrical technician you may not have the required knowledge or competencies to operate the plant/ equipment.
		Understands how to organise, to have the correct people available, with the right competencies to assist in operating/ testing the plant/ equipment.
K8	The need to highlight, where appropriate, any new, current, or changed operating features of the maintained or installed equipment.	The organisational procedure for managing change, and recording any modifications made to the plant/ equipment or the control systems.
		Understands any paperwork or other reporting that needs to be completed.
K9	The importance of informing the appropriate person of any future maintenance requirements.	The organisational procedure for ensuring that any changes to the maintenance arrangements/ procedures are implemented.
		The organisational arrangements that may trigger a requirement to change or vary the existing maintenance procedures.
		Understands any paperwork or other reporting that needs to be completed.
K10	The need to confirm that the other person understands how to use/ operate the equipment before handing the equipment over to them.	The organisational arrangements to make operators aware of any changes made to the functionality or control of any plant or equipment.
		The organisational arrangements to make operators aware of any changes to operational limits or interlocks that may have been used or relied on to govern the operation of the plant/ equipment.
		Understands any paperwork or other reporting that needs to be completed.
K11	The need to ensure that the person you are handing over the	The organisational arrangements that exist between functions for the handover of plant/ equipment following installation.

	equipment to accept that it is in a satisfactory condition.	The organisational arrangements that exist between functions for the handover of plant/ equipment following modification. The organisational arrangements that exist between functions for the handover of plant/ equipment following maintenance. Understands any paperwork or other reporting that needs to be completed.
K12	The organisational documentation procedures to be used with regard to the handover.	See K8 above (highlight change). See K9 above (informing appropriate people). See K10 above (confirmation of understanding). See K11 above (acceptance). Understands the development of commissioning documents. Understands the organisational procedure for completing static commissioning. Understands the organisational procedure for completing dynamic commissioning. Understands the organisational procedure for sign off and handover following static and dynamic commissioning.
K13	How to create and maintain effective working relationships with appropriate people (such as encouraging, helping, politeness, open discussions both ways).	The statement is self-explanatory (expand within the portfolio questions).
K14	The problems that can occur during handover, and how they can be overcome.	The statement is self-explanatory (expand within the portfolio questions).
K15	The extent of your own authority and to whom you should report if you have problems that you cannot resolve.	See K25 of PROMT10 (responsibilities and limitations).

Other Knowledge Considerations

The existing National Occupational Standards are focused on safety and organisational process, and for a solid foundation for developing a competent technician. The standards could be light on technical content and it is suggested that these could be supplemented by adding some of the following.

It may be some theory elements are delivered as part of a college-based course, and therefore will not be required.

Power Distribution Systems

DUTY	CRITERIA FOR MEASURING PERFORMANCE
Understands the principles of alternating and direct current theories.	• Can identify the differences between the two systems. • Can identify the benefits, compromises, and the risk with each of the systems. • Can identify how the speed and direction of machines (motors) can be controlled under both systems. • Can understand the principles of resistance, impedance, capacitance, inductance, frequency has on the system.
Three phase systems.	• How a three-phase supply is generated. • The benefits of three phase systems. • The principles of power factor, and the influence on the system. • How the direction of machines can be altered on three phase systems.
Electrical network design, capabilities, and operation.	• The impact of fault level on the integrity of the system. • How faults are limited within the system. • Understanding the principles of conductor size. • Understanding the losses that occur within a system.
The operation of an electrical network under normal operating conditions.	• Principle of safe electrical switching. • Principles of a switching schedule and permit to work system to manage

	switching on the network. • The requirements for working dead on electrical equipment. • The control and requirements to work live, if applicable. • Means of maintaining essential supplies on the surface and underground.
The operation of an electrical network under any fault conditions.	• The suitable settings and operation of earth fault detection systems (to include core balanced systems, restricted earth fault systems, neutral monitoring systems etc.). • The maximum earth fault currents allowed within the underground mine environment (restricted earth fault). • The suitable settings for the operation of instantaneous overcurrent systems. • Establishing discrimination within the protections systems. • Isolating faults and restoring the power supplies (including the use of parallel and ring main feeder systems). • The suitable settings for overload/ over current protection systems. • Other specialised protections (for example harmonics). • The use of battery protection units as part of the electrical protection systems. • The arrangement to verify that a battery tripping unit is operation and can fulfil its function.
An understanding of the regulatory framework and guidance governing the operation of power systems in the mining environment, which would include the Health and Safety at Work Act 1974, the Mines Regulations 2014, the Electricity at Work Regulations 1989, the Management of Health and Safety at Work Regulations 2003, Dangerous Substances and Explosive Atmospheres Regulations 2002, HSG 230 Keeping Electrical Switchgear Safe, and HSG 278 Electrical Safety in Mines.	• Knowledge of the key legislation and how it applies to the systems used in underground mining operations.

Take the long-term requirements of the operation into consideration when developing or installing networks.	• Can apply design principles to the network. • Can calculate limiting factors when considering extension of the network or new equipment that will be operating on the network.
Engineering problems, including how to gather information and develop and implement a workable solution.	• Understand the diagnostic systems in place. • Can determine a solution using the information presented. • Can adapt the solution based on new information (from testing and implementation of the planned solution).
To be able to use engineering drawings, plans, schematic and wiring diagrams to support the installation and fault finding.	• Can locate the right drawings. • Can identify the key symbols on the drawing to allow it to be interpreted accurately and correctly.
The importance of the major mining hazards and the impact that an unstable network may have on the mine environment.	• Understands the major mining hazards, and how the electrical distribution impacts these (for example, the isolation of ventilating fans, mine winder systems etc.).
Understanding of various protection concepts which would include flameproof, intrinsically safe, encapsulated, ingress protection.	• Understands the protection concepts. • Is able to determine the right concept or combination of concepts for use in a given scenario. • Understands the maintenance requirements for maintaining the protection concept. • Understands the actions to be taken if the concept is compromised.
The use of test instruments to diagnose and locate faults on the network, control circuit or machine.	• Can identify the appropriate type of test instrument for the circuit to be tested. • Can define how the test instrument should be used, and the readings that would be expected for a normal and faulty circuit. • Understands the safety precautions to be taken before testing a circuit. • Can interpret the reading and decide on appropriate actions based on information from testing.

	• Can effectively locate the position of a system fault using appropriate test instruments.
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Automation and Control

DUTY	CRITERIA FOR MEASURING PERFORMANCE
Understands how to set up a wide range of hardware or software tools.	• Can establish the protocols to access the various systems for programming and diagnostic purposes. • Understands how the various elements that make up a system sit on the platform. • Understands the architecture that allows devices to communicate across various networks. • Understands the limitations of the various networks in relation to elements such as data speed, data integrity etc. • Understands the testing in the virtual world to ensure all safety critical functions work correctly.
Understands the principles of Supervisory Control and Data Acquisition Systems (SCADA).	• Can understand how the PLC (hardware) integrates to a common control system. • Can understand how the control system communicates with and operates remote devices. • Understands how the data that is returned from the device can be used and displayed. • Understands how that data can be configured to provide different information (speed, percentages, levels etc.). • Understands the importance of configuring the HMI part of the SCADA system to present information and operator interfaces in a usable manner.
Understands how the hardware and software links the control system to a range of products and systems, which could include, but is not limited to, Human Machine Interfaces (HMI), Variable Speed Drives, Soft Start Units, Instrumentation and Safety Systems.	• Developed knowledge for the key components that are linked to the operational and environmental systems underground. • The type of considerations would include (but are not limited to): ○ Installation of environmental monitors (appropriate for the work or mine environment). ○ The installation and configuration of local displays and places.

	○ The configuration of local alarms (audible and visual). ○ Installation of control system for starting and stopping equipment (locally). ○ Installation of a control system for starting and stopping equipment remotely (including surface control). ○ A means to vary the speed (or other controllable variables). • The effective commissioning of controls to ensure that the control parameter, inputs and outputs and actions are in line with the anticipated and programmed outcomes. • The setting of alarm/ trip parameters to prevent operation out of design specification.
Understands the arrangements that are designed into PLC operating system to maintain the overall integrity.	• Understands what is meant by safety integrity levels. • Understands the various levels of safety integrity. • What is meant by performance level. • What is meant by watchdog.
Understands how to alter and modify the programming configuration for the control system and the devices linked to the system.	• Can alter the programming of the system in relation to the above areas. • Can define how a system would need to be tested and commissioned after making alterations to ensure it continues to function and operate as designed. • Can define how the change process would be managed within their organisation.
Understands the requirements for commissioning following the installation, maintenance, or repair of the control system of equipment linked to that system.	• Can define how a system would need to be tested and commissioned after making alterations to ensure it continues to function and operate safely as designed. • Can define how the change process would be managed within their organisation.
Can modify the programming of the control system to maximise safety, reliability, and efficiency.	• Can interpret data to optimise the operational parameters (balance operational requirements with safety and longevity of the asset).

	• Can use data to ensure that the operation is compliant with manufactures standards and limitations. • Can use data to identify potential equipment failure.
The requirements to test and evaluate the control systems to ensure that they comply with company procedures, regulations, and standards.	• Understands how to produce a test protocol for systems that pick up on the key safety and operational functionality. • Understands how to carry out the tests to ensure that the operation complies to the defined standards. • Understands the actions to take if the testing fails to achieve the desired outcomes.
Fault escalation procedures through the hierarchy.	• Understands the actions to take if the testing fails to achieve the desired outcomes. • Has the ability to identify solutions and communicate the solution and timeline in an understandable manner. • Understands the actions to be taken to raise a defect on the issue.
Requirements for effective reporting using the IT systems that have been provided.	• Understands the requirement to accurately document the installation, examination, maintenance, testing and commissioning of any systems. • Understands the need to accurately record component changes to allow identification of common failures or mean time to failure to allow the development of the asset maintenance scheme. • Understands the role that reporting has on understanding the lifetime costs of assets. • Understands how information reported may be used to shape the installations and designs of the future.
The importance of the major mining hazards and the impact that an unstable network may have on the mine environment.	• Understands how the systems installed are used in the control of the major mining hazards. • Understands the implications of bypassing those systems, and the impact that this may have on the effective control.

	• Understands how the information is used to manage the operational environment remotely, and the decisions that the information helps facilitate.
Understanding of various protection concepts which would include flameproof, intrinsically safe, encapsulated, ingress protection.	• Understands the protection concepts. • Is able to determine the right concept or combination of concepts for use in a given scenario. • Understands the maintenance requirements for maintaining the protection concept. • Understands the actions to be taken if the concept is compromised.

Performance Elements

The performance elements have been captured directly into the portfolio layout, the tables in this section provide information on the performance statements listed within the National Occupational Standards.

MPQVG01 (MT17) – Operate Safely in the Mine Environment

These performance elements can be satisfied by completing the common induction module (working safely and efficiently in the underground environment).

MPQVG02 (MT18) – Confirm to Efficient Work Practices

These performance elements can be satisfied by completing the common induction module (working safely and efficiently in the underground environment).

PROMT8 (MT8) – Confirm Work Activities and Resources for Work

PROMT8 (MT8) – Confirm Work Activities and Resources for Work		
Performance Statement		Elements
P1	Identify the work activities and assess the resources required from the information available and plan the programme of work to be carried out.	Included within the portfolio
P2	Obtain clarification and advice where the resources required are not available.	Included within the portfolio
P3	Evaluate the work activities against project requirements and the requirements of any significant external factors.	Included within the portfolio
P4	Identify work activities which influence each other and make the best use of the resources available.	Included within the portfolio
P5	Identify changed circumstances that will require alterations to the work programme and justify them to the decision makers.	Included within the portfolio

PROMT9 (MT9) – Using Engineering Drawings and Documents in Maintenance Activities

PROMT9 (MT9) – Using Engineering Drawings and Documents in Maintenance Activities		
Performance Statement		Elements
P1	Use the approved source to obtain the required drawings and specifications.	Included within the portfolio
P2	Correctly interpret the drawings and specifications.	Included within the portfolio
P3	Identify, extract, and interpret the required information.	Included within the portfolio
P4	Use the information obtained to ensure that work output meets the specification.	Included within the portfolio
P5	Deal promptly and effectively with any problems within your control and report those which cannot be solved.	Included within the portfolio
P6	Report any inaccuracies or discrepancies in drawings and specifications.	Included within the portfolio

PROMT10 (MT10) – Working Safely on Electrical Equipment in Mines

PROMT10 (MT10) – Working Safely on Electrical Equipment in Mines		
Performance Statement		Elements
P1	Identify equipment to be worked on and their correct isolation point(s).	Included within the portfolio
P2	Communicate effectively with other members of the team should unscheduled work arise that may require the use of a permit to work.	Included within the portfolio
P3	Identify whether the isolation will have any effect on the safe operation of the mine and take appropriate action.	Included within the portfolio
P4	Where practicable ensure that circuit earthing is carried out.	Included within the portfolio
P5	Ensure that isolation points are locked in a safe position in accordance with company/ organisation procedures.	Included within the portfolio
P6	Post warning notices according to organisational procedure.	Included within the portfolio
P7	Check relevant safety equipment prior to acceptance/ use in accordance with manufacturers' instructions/ company procedures.	Included within the portfolio
P8	Carry out work in accordance with company/ organisational requirements.	Included within the portfolio
P9	Complete records/ reports according to legislative requirements and organisational procedures Correct use of permit to work system.	Included within the portfolio
P10	Recognise who is authorised to issue a permit to work.	Included within the portfolio
P11	Plan the job to minimise danger to those involved.	Included within the portfolio
P12	Communicate effectively with those involved in the activity.	Included within the portfolio
P13	Obtain a permit to work in accordance with organisational requirements.	Included within the portfolio
P14	Ensure relevant equipment is isolated.	Included within the portfolio

P15	Ensure equipment is locked off/ isolated.	Included within the portfolio
P16	Confirm all works completed and staff/ tools accounted for according to organisational procedures.	Included within the portfolio
P17	Cancel permit according to organisational procedures.	Included within the portfolio
P18	Restore electrical supply in accordance with company/ organisational requirements.	Included within the portfolio
P19	Complete permit as required by organisational procedures.	Included within the portfolio
P20	Identify/ mark/ trace cables in accordance with company/ organisational procedures.	Included within the portfolio
P21	Follow organisational procedure when it is not possible to trace a cable.	Included within the portfolio
P22	Check and ensure all tools/ equipment used have organisational approval.	Included within the portfolio
P23	Carry out tests on electrical equipment in accordance with statutory/ organisational requirements.	Included within the portfolio
P24	Use all test and ancillary equipment in accordance with manufacturers and organisational instructions.	Included within the portfolio
P25	Carry out tasks safely and in accordance with organisational procedures.	Included within the portfolio
P26	When required, carry out live work safely and in accordance with specific procedures.	Included within the portfolio
P27	Take appropriate steps to minimise danger from electrical equipment that is found to be defective.	Included within the portfolio
P28	Complete records/ reports according to legislative requirements and organisational procedures.	Included within the portfolio
P29	Isolate electrical supply to prevent further danger to self, casualty and others.	Included within the portfolio
P30	Administer first aid in accordance with current approved guidelines for dealing with electric shock/ associated injuries.	Included within the portfolio
P31	Instigate procedures to obtain help.	Included within the portfolio

P32	Complete relevant records relating to the emergency.	Included within the portfolio

PROMT11 (MT11) – Maintaining Electrical Equipment

PROMT11 (MT11) – Maintaining Electrical Equipment		
Performance Statement		Elements
P1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines.	Included within the portfolio
P2	Follow the relevant maintenance schedules to carry out the required work.	Included within the portfolio
P3	Carry out the maintenance activities within the limits of your personal authority.	Included within the portfolio
P4	Carry out the maintenance activities in the specified sequence and in an agreed time scale.	Included within the portfolio
P5	Report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule.	Included within the portfolio
P6	Complete relevant maintenance records accurately and pass them on to the appropriate person.	Included within the portfolio
P7	Dispose of waste materials in accordance with safe working practices and approved procedures.	Included within the portfolio

PROMT12 (MT12) – Modifying or Rewiring Electrical Circuits

PROMT12 (MT12) – Modifying or Rewiring Electrical Circuits		
Performance Statement		Elements
P1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines.	Included within the portfolio
P2	Obtain and follow the relevant modification specifications and job instructions.	Included within the portfolio
P3	Confirm and agree what modifications are to be carried out to meet the specification.	Included within the portfolio
P4	Prepare the electrical system for the required modification.	Included within the portfolio
P5	Carry out the system modification using approved materials, methods, and procedures.	Included within the portfolio
P6	Complete the modification within the agreed timescale.	Included within the portfolio
P7	Ensure that the modified electrical system meets the specified operating conditions.	Included within the portfolio
P8	Produce accurate and complete records of all modification work carried out.	Included within the portfolio
P9	Deal promptly and effectively with problems within your control and report those that cannot be solved.	Included within the portfolio

PROMT13 (MT13) – Testing Electrical Systems and Circuits

PROMT13 (MT13) – Testing Electrical Systems and Circuits		
Performance Statement		Elements
P1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines.	Included within the portfolio
P2	Follow the appropriate procedures for use of tools and equipment to carry out the required tests.	Included within the portfolio
P3	Set up and carry out the tests using the correct procedures and within agreed timescales.	Included within the portfolio
P4	Record the results of the tests in the appropriate format.	Included within the portfolio
P5	Review the results and carry out further tests if necessary.	Included within the portfolio

PROMT14 (MT14) – Carrying Out Preventative Planned Maintenance on Electrical Circuits

PROMT14 (MT14) – Carrying Out Preventative Planned Maintenance on Electrical Circuits		
Performance Statement		Elements
P1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines.	Included within the portfolio
P2	Follow the relevant maintenance schedules to carry out the required work.	Included within the portfolio
P3	Carry out the maintenance activities within the limits of your personal authority.	Included within the portfolio
P4	Carry out the maintenance activities in the specified sequence and in an agreed time scale.	Included within the portfolio
P5	Report any instances where the maintenance activities cannot be fully met or where they are identified.	Included within the portfolio
P6	Defects outside the planned schedule.	Included within the portfolio
P7	Complete relevant maintenance records accurately and pass them on to the appropriate person.	Included within the portfolio

PROMT15 (MT15) – Carrying Out Fault Diagnosis on Electrical Equipment and Circuits

PROMT15 (MT15) – Carrying Out Fault Diagnosis on Electrical Equipment and Circuits		
Performance Statement		Elements
P1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines.	Included within the portfolio
P2	Review and use all relevant information on the symptoms and problems associated with the products or assets.	Included within the portfolio
P3	Investigate and establish the most likely causes of the faults.	Included within the portfolio
P4	Select, use and apply diagnostic techniques, tools and aids to locate faults.	Included within the portfolio
P5	Complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved.	Included within the portfolio
P6	Determine the implications of the fault for other work and for safety considerations.	Included within the portfolio
P7	Use the evidence gained to draw valid conclusions about the nature and probable cause of the fault.	Included within the portfolio
P8	Record details on the extent and location of the faults in an appropriate format.	Included within the portfolio

PROMT15 (MT15) – Carrying Out Fault Diagnosis on Electrical Equipment and Circuits

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Performance Statement		Elements
P1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines.	Included within the portfolio
P2	Review and use all relevant information on the symptoms and problems associated with the products or assets.	Included within the portfolio
P3	Investigate and establish the most likely causes of the faults.	Included within the portfolio
P4	Select, use, and apply diagnostic techniques, tools, and aids to locate faults.	Included within the portfolio
P5	Complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved.	Included within the portfolio
P6	Determine the implications of the fault for other work and for safety considerations.	Included within the portfolio
P7	Use the evidence gained to draw valid conclusions about the nature and probable cause of the fault.	Included within the portfolio
P8	Record details on the extent and location of the faults in an appropriate format.	Included within the portfolio

PROMT16 (MT16) – Identify and Address Mine Engineering and Safety Hazards and Risks

PROMT16 (MT16) – Identify and Address Mine Engineering Health and Safety Hazards and Risks		
Performance Statement		Elements
P1	Identify hazards in your area of work.	Included within the portfolio
P2	Identify hazards and risks arising from your work.	Included within the portfolio
P3	Identify people who are at risk from hazards.	Included within the portfolio
P4	Assess the level of risk arising from the hazard.	Included within the portfolio
P5	Seek advice from managers or specialists in risk assessment, when appropriate.	Included within the portfolio
P6	Report hazards immediately to the responsible person(s).	Included within the portfolio
P7	Deal with hazards which constitute a low risk and are within your limits of responsibility in accordance with organisational and operational procedures.	Included within the portfolio
P8	Give suggestions to control or reduce risks to health and safety to the responsible persons.	Included within the portfolio
P9	Check tools and materials are suitable for the task.	Included within the portfolio
P10	Check and ensure plant/ machinery/ equipment is made safe for the task.	Included within the portfolio
P11	Carry out the task according to specified procedure/s.	Included within the portfolio
P12	Report problems and conditions outside the limits of your responsibility to the appropriate person/s.	Included within the portfolio
P13	On completion ensure plant/ machinery/ equipment is in an appropriate safe condition.	Included within the portfolio

P14	Report completion of task according to organisational procedures.	Included within the portfolio

PROMT19 (MT19) – Handing Over and Confirming Completion of Maintenance Activities

PROMT19 (MT19) – Handing Over and Confirming Completion of Maintenance Activities		
Performance Statement		Elements
P1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines.	Included within the portfolio
P2	Confirm that everyone involved accepts the product or asset is in a satisfactory condition for handover to take place.	Included within the portfolio
P3	Clearly identify any unusual features of the condition of the product or asset.	Included within the portfolio
P4	Make the handover and obtain agreement between everyone involved on the precise moment of transfer of responsibility.	Included within the portfolio
P5	Deal promptly and effectively with problems within your control and report those that you cannot solve.	Included within the portfolio
P6	Make sure that clear, accurate and complete records of the handover are made.	Included within the portfolio