



Mapping Exercise

Mine Ground Control Co-ordinator

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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 Geotechnical Engineers 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
Quality Assure Ground Control Installation.		MPQVG19
Coordinate Ground Control Activities.		MPQVG20
Design and Maintain Mine Ground Control and Support Methods.		MPQVG21
Establish Ground Control and Support Methods.		PROMS14

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.

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.

Pre-Entry Qualification

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).

Potential Qualifications

The National Occupational Standards identified on page three of this document cover two main areas:

1. Measuring and recording the effectiveness of ground control systems installed underground in a mine.
2. The planning, design, monitoring of ground control systems installed underground in a mine.

It is therefore proposed that the mapping exercise be used to produce two separate qualifications for the mines:

1. Ground Control (Rock Bolting) Co-ordinator.
2. Ground Control Engineers.

Portfolio Area	Co-ordinator	Engineer
MG1	✓	✓
MG2	✓	✓
Regulations relating to mining operations and ground control.		✓
Organisational procedures, policies relating to mining operations and ground control.	✓	✓
Methods of mining and mineral excavation.	✓	✓
Ground control planning, design, modelling.		✓
Mine planning process.		✓
Measurement and interpretation of ground control information.	✓	✓
Auditing and commissioning ground control systems.	✓	✓
Reacting appropriately to ground control measurements, and implementation of remedial actions.	✓	✓
Emergency preparedness and planning.	✓	✓

Mapping Exercise

MPQVG19 – Quality Assure Ground Control Installations

MPQVG19 – Quality Assure Ground Control Installations		
Knowledge Statement		Elements
K1	The organisational approved policies, procedures, and practices appropriate to the work activity.	Define the organisational procedure that must be followed prior to installing new support systems in your mine.
		Define the organisational procedure that must be followed when introducing an existing type of support system into a new area of the mine.
		Define the organisational procedure that must be followed if you want to make changes to the types of support system used in the mine.
		Outline the evaluation procedure that is used to verify the effectiveness of the support systems that have been selected and installed in your mine.
		Where ground is excavated without the need to install support systems, define the organisational process that is used to evaluate that the natural support offered by the strata is suitable.
		Where there are no support systems installed, outline the organisational procedure to evaluate the competence of the strata on an ongoing basis.
		Outline the type of assessment completed by your organisation when evaluating the suitability of a support system that has been introduced into the area of the mine and the requirement to reassess that suitability on an ongoing basis.
		Define how support rules are produced for use by those with a responsibility for supervising the installation of a support system or those responsible for the installation of a support system, and how these are commissioned and reviewed to ensure that the procedure can be followed.
		Outline the circumstances where it may be necessary to deviate from the defined support rules, where this is permissible and the process that needs to be followed as part of that deviation (for example abnormality procedures).
		Where a deviation from the support rules has been made due to a requirement to install additional support, outline the organisational procedures that are in place

		to allow that level of additional support to be removed.
		Define the action levels within the organisation should a support system fall outside of the normal operating parameters (for example, a Trigger Response Action Plan: TARP).
K2	The hazards and risks associated with the work activity, how they can affect yourself, others, or the environment, and how they are controlled.	Define the hazards that are present when carrying out excavations at the mine.
		Outline how the hazards identified may impact various elements of the operation, you should consider the potential impact on: • Material transport systems. • Mineral transport systems. • Mine ventilation systems. • Safe entry and egress to and from the mine. • Machine changeover in multi entry operations. • Rescue arrangements.
		Outline the hazards that are present when installing support systems, and how the design of the support systems seeks to mitigate those hazards.
K3	The purpose of quality assuring ground control systems and equipment in the mine.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K2 of MPQVG19 Quality Assure Ground Control Installations.
		Define why it is important that the mine has a quality control system in place.
		Outline how your organisation uses the data produced from the quality control system to evaluate the effectiveness of the ground control measures that are in place.
K4	The methods of auditing ground control and ascertaining risk.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K2 of MPQVG19 Quality Assure Ground Control Installations.
		Outline the organisational procedure for auditing the effectiveness of the ground control measures, and how the outcomes from those audits are used to evaluate any improvement actions
		Define your organisation's trigger point (TARP) based on risk, and the actions that are to be implemented should those trigger points be reached.

K5	Types of ground control systems, equipment, and monitoring devices.	Define the types of equipment that is installed at your mine to monitor the effectiveness of the ground control system installed.
		Outline the advantages and limitations of the various types of ground control monitoring systems that are installed at your mine.
		Outline alternative measurement devices/ systems that may be used to evaluate the effectiveness of ground control measures (whether used at your mine or not), within the answer outline the advantages and limitations of those devices or systems.
		For each of the devices that are outlines as measurement devices, define how they present that information, and how additional movement over time may be measured and tracked.
K6	The procedures for ensuring compliance with the ground control design.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K2 of MPQVG19 Quality Assure Ground Control Installations.
		See K3 of MPQVG19 Quality Assure Ground Control Installations.
		See K4 of MPQVG19 Quality Assure Ground Control Installations.
K7	The indicators of movement in strata.	See K5 of MPQVG19 Quality Assure Ground Control Installations.
K8	The limits of acceptable changes in ground, ground control systems, and equipment.	See K4 of MPQVG19 Quality Assure Ground Control Installations.
		For key action points within your organisation, outline the actions that you would require at various levels in the organisation. Who has the responsibility to respond to change?
		Outline the acceptable response and timeline for any response based on the trigger levels within your organisation.
K9	The problems or abnormalities that would indicate the requirement for remedial action to ground control systems or equipment.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		When carrying out an inspection or audit of a ground control system, outline the types of visual indications that you could be present that indicates that there is an

		abnormality present that requires remedial action.
		Define the appropriate actions that would be put in place to deal with the abnormalities that have been described.
K10	The potential solutions and permitted remedial work to maintain a safe condition.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K9 of MPQVG19 Quality Assure Ground Control Installations.
		Outline the requirements of the organisational procedure that covers the installation of remedial support activities, and the work that needs to be completed ahead of those activities taking place.
K11	The procedures for effecting improvements in routine and high-risk situations.	Define how your organisation monitors the effectiveness of major hazard controls, including the effectiveness of ground control measures.
		Outline the safety performance indicators that are used by your organisation to monitor the effectiveness of ground control issues. For the response you should outline: • Which measures are used. • What the measure indicates. • The set trigger points that moves it from a normal risk to high risk. • The required action levels.
		Outline the means and frequency of review for the safety performance indicators and how actions are allocated and escalated.
K12	Reporting structures and lines of authority.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K11 of MPQVG19 Quality Assure Ground Control Installations.
		Define the organisational/ management structure at your mine.
		Outline those with responsibility for ground control and the limits of that authority when it comes to making ground control changes. How the process is escalated to ensure issues are brought to the attention of the appropriate people.
		Define the process for verifying and signing off changes to ground control assessment and ground control measures.

K13	Reporting and recording requirements.	Define how your organisation records the information taken from audits and measurements.
		Outline how the information is used to produce reports that are used with those with a management or organisational responsibility for ground control matters.
		Define how long records must be kept for, and the purpose of keeping records for that amount of time.
K14	The limits of your personal responsibilities and authority.	Outline the limits of your responsibility and decision making as a Geotechnical Engineer.
		Outline the limits of your responsibility and decision making as a Rock Bolting Co-Ordinator.

MPQVG20 – Coordinate Ground Control Activities

MPQVG20 – Coordinate Ground Control Activities		
Knowledge Statement		Elements
K1	The organisational approved policies, procedures, and practices appropriate to the work activity.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
K2	The hazards and risks associated with the work activity, how they can affect yourself, others, or the environment, and how they are controlled.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K2 of MPQVG19 Quality Assure Ground Control Installations.
K3	The legislative requirements for controlling ground in mines.	Outline the requirement of the Health and Safety at Work Act 1974 when it comes to creating a safe place of work and ensuring that employees and contractors are provided with adequate information, instruction, and training.
		Outline the requirements of the Management of Health and Safety at Work Regulation 1999, when it comes to considering and controlling risks within the workplace.
		Outline the requirements of the Mines Regulations 2014, when considering the requirement to take ground control measures. You should relate these regulations to the organisational arrangements that are in place to ensure compliance.
		Outline the requirements of the Mines Regulations 2014, when considering the general duties of the mine operator. You should relate these regulations to the organisational arrangements that are in place to ensure compliance.
		Outline the requirements of the Mines Regulations 2014, when considering the development of a health and safety document, and what needs to be considered as part of that document. You should relate these regulations to the organisational arrangements that are in place to ensure compliance.
		Outline the requirements of the Mines Regulations 2014, when considering the need to have a management structure in place. You should relate these regulations to the organisational arrangements that are in place to ensure compliance.
		Outline the requirements of the Mines Regulations 2014, when considering the

		requirements for competence. You should relate these regulations to the organisational arrangements that are in place to ensure compliance.
		Outline the requirements of the Mines Regulations 2014, when considering the need to develop rules and schemes. You should relate these regulations to the organisational arrangements that are in place to ensure compliance.
		Outline what the Reporting of Disease and Dangerous Occurrence Regulations (RIDDOR) identify as dangerous occurrences relating to underground mining activities, and specifically to ground control activities.
K4	The mechanisms of failure and movement of ground in mines.	Outline the various mechanisms that may exist that could potentially result in: • Ground movement above the accepted limits within your organisation. • A failure of the roof. • A failure of the side wall/ rib. • Total failure of the support system.
		See K11 of MPQVG20 Coordinate Ground Control Activities.
K5	The methods of ground control in mines.	Outline what is meant by a passive support, and how these types of support are used in your operation.
		Outline what is meant by an active support, and how these types of support are used in your operation.
		Compare the advantages and disadvantages of active and passive support systems.
		Outline what is meant by a temporary support, and the limitations on the use within your organisation.
		Outline in detail some other support systems that may be used (in your or other types of mine). Within your answer you should provide detail of: • The type of support systems. • Typical applications where it would be appropriate to use. • Limitations on its use. • Advantages of this support system when chosen. • How the system is monitored to ensure that it is performing.

K6	The methods of auditing ground control.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K2 of MPQVG19 Quality Assure Ground Control Installations.
		See K4 of MPQVG19 Quality Assure Ground Control Installations.
K7	The principles of risk assessment.	Define the key terms associated with risk assessment. • Hazard. • Risk. • Hazard effect. • Controls. • Residual risk. • Risk score/ rating. • Hierarchy of controls. • Risk assessment. • Method statement.
		See K3 of MPQVG20 Coordinate Ground Control Activities.
		Define why you carry out a risk assessment, and the various levels of risk assessment used (for example bowtie).
		Outline the level of tolerable risk within your organisation when it comes to ground control.
		Outline the types of action that would be taken if the level of risk was outside the tolerance defined by your organisation.
		Define the types of key performance indicator that are used and the type of information that they provide to the management team.
K8	Types of ground control systems, equipment and monitoring devices, their uses, and limitations.	See K5 of MPQVG19 Quality Assure Ground Control Installations.
		See K8 of MPQVG19 Quality Assure Ground Control Installations.
K9	The indications of failure of ground control systems or equipment.	See K7 of MPQVG19 Quality Assure Ground Control Installations.
		See K8 of MPQVG19 Quality Assure Ground Control Installations.
K10	The indicators of movement in strata.	See K7 of MPQVG19 Quality Assure Ground Control Installations.
K11		See K4 of MPQVG20 Coordinate Ground Control Activities.

	The factors affecting the stability of ground support systems.	Outline how horizontal stresses may influence the movement and failure of ground in mines.
		Outline how vertical stresses may influence the movement and failure of ground in mines.
		Outline how the process of mining may alter vertical and horizontal stresses in a mine and the issues that this may create with highly stressed and destressed ground conditions and the implication for roof and rib support systems.
		Outline how the direction of the mining process relative to the horizontal and vertical stresses may influence the ground control techniques.
		Outline what is meant by tensile strength and how this influences the ground control techniques.
		Outline what is meant by lateral forces and how this influences the ground control techniques.
		Identify how faults may impact the strength of the ground and the support systems that are chosen.
		Identify how inclusions may impact the nature of the ground that is being worked, and the support systems that are utilised.
		Outline how the depth of works may influence ground control factors.
		Outline how workings that are above, below, or adjacent to mining operations may influence ground control factors.
		Define the influence that the excavated profile of the ground influences the stability of the excavated profile.
K12	Mine ground control documentation and associated plans.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K3 of MPQVG19 Quality Assure Ground Control Installations.
		See K4 of MPQVG19 Quality Assure Ground Control Installations.
		See K13 of MPQVG19 Quality Assure Ground Control Installations.
K13	How to ensure compliance with ground control designs.	See K4 of MPQVG19 Quality Assure Ground Control Installations.
		See K12 of MPQVG19 Quality Assure Ground Control Installations.

K14	The problems or abnormalities that would indicate the requirement for remedial action to ground control systems or equipment.	See K9 of MPQVG19 Quality Assure Ground Control Installations.
K15	The limits of acceptable changes in the condition of strata, systems, and equipment.	See K8 of MPQVG19 Quality Assure Ground Control Installations.
K16	The potential solutions and permitted remedial work to maintain a safe condition.	See K10 of MPQVG19 Quality Assure Ground Control Installations.
K17	The procedures for effecting improvements in routine and high-risk situations.	See K11 of MPQVG19 Quality Assure Ground Control Installations.
K18	Reporting structures and lines of authority.	See K12 of MPQVG19 Quality Assure Ground Control Installations.
K19	Reporting and recording requirements.	See K13 of MPQVG19 Quality Assure Ground Control Installations.
K20	The limits of your personal responsibilities and authority.	See K14 of MPQVG19 Quality Assure Ground Control Installations.

MPQVG21 – Design and Maintain Mine Ground Control and Support Methods

MPQVG21 – Design and Maintain Mine Ground Control and Support Methods		
Knowledge Statement		Elements
K1	The legislative framework (Acts, Regulations, Approved Codes of Practice, Guidance).	See K3 of MPQVG20 Coordinate Ground Control Activities.
		The principal requirements of rock bolting in mines and how this influences the procedures at your own mine.
K2	The legislative definition of a mine, and the classification of mines.	Outline the meaning of Regulation 3 of the Mines Regulations 2014, in relation to the 'meaning of a mine'.
		Summarise the requirements of the Mines Regulations 2014 in relation to Regulation 4, and the application of the regulations.
K3	The management and administration control structure and its purpose (including accountability and ultimate authority).	Outline the duties of the mine owner, as described by the Mines Regulations 2014.
		Outline the duties of the mine operator as described by the Mines Regulations 2014.
		Summarise the requirements of Regulation 10 of the Mines Regulations 2014, and the creation/ operation of a management structure.
K4	The statutory duties, roles and responsibilities of mine owner, management and supervision, and mine employees.	See K3 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K5	Personal statutory duties and responsibilities, and the limits of that responsibility.	Outline the organisational responsibilities of the person responsible for the design and monitoring of underground mine support systems.
		Outline what the Health and Safety at Work Act 1974 says in relation to personal responsibility.
		Outline the requirements of Regulation 11 of the Mines Regulations 2014, in relation to a person that is appointed to carry out a role at a mine.
K6	Statutory requirements and organisational approved policies, procedures, and practices for the operation of the mine.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K3 of MPQVG20 Coordinate Ground Control Activities.

K7	The statutory requirements in relation to ground control and support of strata.	See K3 of MPQVG20 Coordinate Ground Control Activities.
K8	The statutory requirements for a safe system of work.	See K3 of MPQVG20 Coordinate Ground Control Activities.
K9	Duties, powers, and responsibilities in the event of an emergency situation.	Define the roles and responsibilities of the geotechnical engineer/ rock bolting co-ordinator in the event of an underground emergency. Outline the planning considerations that are made when it comes to dealing with an underground emergency that involves ground control issues. Outline the organisational and legislative requirements to have support materials available for use in the event of an emergency that involves ground support issues.
K10	Statutory requirements and organisational approved policies, procedures and practices for the installation, commissioning, inspection, examination, testing and maintenance of plant and equipment.	Summarise the requirements of the Mines Regulations 2014 in relation to the Maintenance and Inspection of Equipment Regulation 15, and the application of the regulations. Summarise the requirements of the Provision and Use of Work Equipment Regulations when considering the design, installation, operation, and maintenance of plant and equipment. Outline the organisational requirements when considering the: • Design and purchase of plant and equipment. • Installation of plant and equipment. • Arrangements for commissioning and sign-off of plant and equipment. • Periodic testing of plant and equipment to ensure that it continues to operate within design tolerances. • Organisational requirements for maintenance to ensure the continued safe operation of plant and equipment.
K11	Statutory and organisational requirements for personal protective equipment.	Outline your organisational requirements for the carrying of PPE when underground at a mine, and in what circumstances the PPE should be worn. Define any equipment that is provided for use during self-escape from the mine, what

		are the requirements to carry such equipment and the limitation of its use (duration/ mine atmosphere).
		Outline the requirements of the Personal Protective Equipment Regulations when it comes to the purchase, issue, and use of personal protective equipment.
K12	Regulatory requirements and approved policies, procedures and practices for reporting and recording in relation to statutory requirements for ground control and support of strata, and related failures and problems.	See K12 of MPQVG19 Quality Assure Ground Control Installations.
		See K13 of MPQVG19 Quality Assure Ground Control Installations.
		See K12 of MPQVG20 Coordinate Ground Control Activities.
		See K18 of MPQVG20 Coordinate Ground Control Activities.
		Identify how the current mine layout at your operation is ventilated, and what the minimum organisational standards require.
		Identify how the mine is being developed, and how ventilation is considered as part of the planning process.
		Outline how the mine design, historical, and future planned workings influence the mine ventilation systems.
K13	The definitions of: hazard, risk, accident, danger, accident rate, frequency and severity, environmental aspect, environmental incident.	Apply the statement to the portfolio of questions.
K14	The major hazards and risks associated with mining in general, and with the specific mine, mining operations, and work activity.	Identify what Part 3 of the Mines Regulations 2014 identifies as the major mining hazards.
		Identify the types of major mining hazards that may exist within a range of underground mining operation, and the types of activities taking place that might introduce these types of hazards.
		Identify the major mining hazards that are present within the mine at which you operate.
		Describe how the mining operation at your mine causes the major mining hazards to develop.
K15	The scope and limitations of the mine, its design and layout, including current areas of use, abandoned areas and future development.	Identify how the current mine layout at your operation is ventilated, and what the minimum organisational standards require.
		Identify how the mine is being developed, and how geological and geotechnical features are considered as part of the mine design and planning process.
		Outline how the mine design, historical, and future planned workings influence the

		ground control systems that are designed and installed within the current working areas at your mine.
K16	The areas of the mine where ground control is required, and areas where it is no longer essential.	Outline the process that is used to determine where ground control measures need to be installed.
		Outline how the ground control measures which have been designed are verified to ensure that they are performing in line with the design criteria.
		Outline how you would review the ongoing requirements for support, and the process by which you would evaluate the changes in support design.
		Outline how different areas of the mine utilising different support systems are designated and displayed on the mine plans.
K17	Geological features that may affect the safe operation of a mine.	See K11 of MPQVG20 Coordinate Ground Control Activities.
		Define the geological features that may impact the ground control assessment and resulting ground control measures that have been planned.
K18	Geological and physical indications of potential deterioration of the mine or unsafe conditions.	See K5 of MPQVG19 Quality Assure Ground Control Installations.
		See K7 of MPQVG19 Quality Assure Ground Control Installations.
		Outline the visible signs of ground deterioration or failure due to lateral forces.
		Outline the visible signs and physical conditions of tensile failures.
K19	The acceptable conditions for excavations and roadway profiles, floors, walls, roofs, and working faces.	For your mine, outline how the excavated profile is determined.
		Outline the factors, including mineral recovery that influence the design and dimensions of the roadway.
		Outline how dimensional control is maintained, and the actions that would be taken if dimensional control is lost as part of the mining process.
K20		See K18 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.

	Geological and/ or physical indications of potentially deteriorating/ unsafe conditions.	
K21	The actions to be taken in the event of identifying an aspect of the ground condition of the mine that may lead to a hazardous situation or unsafe working.	Outline the type of inspections that are carried out at the mine on a shiftly basis, and the nature of the mine and mine infrastructure that is inspected.
		Outline how the information from shift reports is escalated so issues relating to the mine condition are brought to the attention of relevant persons within the management structure.
		Identify the actions that you would expect the person making the shiftly inspection to make to take to remedy or prevent the situation from deteriorating.
		Define the conditions at your mine that may if not recognised, or left unremedied lead to a hazardous situation or unsafe condition.
		Outline any routine inspections and audits of mine conditions that are completed to identify situations that may lead to a hazardous situation or unsafe condition.
K22	The effect that activities in one area of the mine can have on the activity, health, safety, or welfare of others.	See K3 of MPQVG20 Coordinate Ground Control Activities.
		Outline other non-geotechnical/ geological related activities that can impact the health, safety, and welfare of persons in other areas of the mine (for example, ventilation, dust control etc.).
		For each of the areas identified, define the types of monitoring and control the organisation has in place to reduce the risk to health.
K23	How emergency situations can arise in your area of responsibility.	Outline the types of emergencies that may occur in your areas of responsibility.
		Define your roles and responsibilities in the event of an emergency within the underground mine environment.
K24	The responsibilities of yourself and others and the approved policies, procedures, and practices in the event of an emergency.	Outline how the role of the Geotechnical Engineer and Rock Bolting Co-ordinator and how they might be utilised in the event of an emergency.
		Define how your organisation utilises various roles, including your own in the event of an emergency underground at the mine.
		Summarise the emergency response plan at your place of work, how it is brought in to

		action and the process to be followed thereafter.
K25	The approved policies, procedures, and practices for the maintenance of a safe mine environment.	Outline how mine gasses are monitored at your mine, and the alarm levels that are set for the gasses monitored.
		Define how dust emissions are monitored at your mine, and the limits that are being worked to.
		If combustion engines are utilised in the mine, outline how Diesel Exhaust Emissions (DEEE) are monitored, and the statutory and organisational limits imposed.
		Define the impact of heat and humidity on the operation, and how this is monitored and the controls that are in place to reduce the impact (if applicable) at your mine.
		Define the minimum ventilation quantities that must be supplied to the working and other areas of the mine, and how are these monitored and verified.
K26	How to allocate tasks and duties.	NA
K27	The benefits of, and methods to achieve team working.	Define your organisation's approach to fostering teamwork within the organisation.
		Outline what your organisation does to promote teamwork with the department/ function.
		What the benefits are from fostering a team approach brings within the department/ function and organisation.
K28	The importance of effective communications.	Various types of communications that exist within the organisation.
		Outline why the organisation uses different communication methods.
		Outline why having effective communication within an organisation is essential.
K29	Communications methods and systems in your area of responsibility.	See K28 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K30	The dangers of working in isolation.	Identify the potential issues if decisions are made in isolation, without taking the views of others within the organisation.

K31	Organisational arrangements for recording and monitoring personnel in your area of responsibility.	NA
K32	Mine maps, plans, designs, physical and seismic surveys, and related technical information.	Outline the type of information that would need to be gathered when making a geotechnical assessment relating to the control of ground conditions, this should include elements such as: • Geological surveys. • Information from drilling. • The use of seismic data. • The use of surface and underground survey. • Rock strength analysis. • Manufactures technical information. Define how the information gathered as part of the assessment process is used to develop operational plans and mine support systems.
K33	How to develop and draft an operational plan.	Define the organisational process for reviewing an operational design plan for the mine, consider: • Frequency. • Content. • Review periods. • Acceptance (sign off). Outline where services (geotechnical engineer and geology) are considered within the operational design plan.
K34	How to gain approval to proceed with operational design plans.	Take from the knowledge statement .
K35	How to check that the methods of ground control and support are compatible with mine design and operational constraints.	See K5 of MPQVG19 Quality Assure Ground Control Installations. See K5 of MPQVG20 Coordinate Ground Control Activities. See K11 of MPQVG20 Coordinate Ground Control Activities.
K36	The business planning cycle and budget preparation.	Identify how the operational plan links to the wider planning process. Identify how organisational and departmental budgets are formed to support the delivery of the operational plan.
K37		See K1 of MPQVG19 Quality Assure Ground Control Installations.

	The relevant Approved Codes of Practice and Guidance for working safely.	See K3 of MPQVG20 Coordinate Ground Control Activities.
		See K12 of MPQVG20 Coordinate Ground Control Activities.
		See K1 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
		See K10 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
		See K12 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K38	The principal activities in mining operations and mineral winning.	Within your organisation, define how new areas of the mine are identified as having the right characteristics for the extraction of minerals.
		Outline the process that the organisation goes through to plan access to and the development of those minerals.
		Outline the production process for the minerals and how this works to ensure that you achieve the: • Appropriate quality. • Appropriate extraction rates.
K39	The main functions within the mining operational cycle.	Give an overview of a complete operational cycle, you should include: • Establishing the equipment in advance of the cycle. • The cutting (or blasting cycles). • Mineral clearance process. • Installation of ground support. • Re-establishing ventilation.
		Where applicable, consideration should also be given to: • Installation/ extension of services (water/ compressed/ electricity) as applicable. • Extension of mineral conveying/ mineral clearance systems. • Extension of mine transport system.
K40	Mine logistics procedures and systems for the delivery of supplies.	See K39 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K41	Actions to be taken in the event of engineering or geological problems occurring that are not immediately rectifiable.	Take from the knowledge statement .
K42	The forces involved in mine rocks.	See K11 of MPQVG20 Coordinate Ground Control Activities.

K43	The behaviour under stress of different rock types.	See K11 of MPQVG20 Coordinate Ground Control Activities.
K44	The methods of identifying and testing rock and rock mass types and properties.	See K32 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K45	The effects of mining on rock mechanics.	See K11 of MPQVG20 Coordinate Ground Control Activities. See K19 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K46	The design and behaviour of mine openings and rock pillars.	Outline how pillar sizes are determined for long term mine openings (roadways) in your mine. Outline how the location, support systems and excavated profile of long-term openings (roadways) is varied at your mine, and why. Outline how the mining process may impact the viability of long-term openings (roadways) in a mine. Outline how the pillar sizes are determined for openings (roadways) that are required for a shorter duration at your mine. Outline the mining process for extracting the maximum reserve from short term roadways, and any changes that are made to pillar design as the mining process is undertaken. For both short term and long term mine openings (roadways) outline the type of monitoring that is carried out to ensure that the design is functioning within the design parameters.
K47	Rock mechanics modelling techniques.	For new areas of the mine, outline the various modelling techniques that are used to identify the impact of: • Excavated profile. • Support design. • Deterioration over time. • The interaction of other mining activities that have previously taken place or are expected to take place over time. For new or alternative support systems, identify the various types of modelling techniques that may be completed to verify the suitability of the planned

		excavation and ground control systems, this should include: • Excavated profile. • Support design. • Deterioration over time. • The interaction of other mining activities that have previously taken place or are expected to take place over time.
K48	The effects of underground working on the surface.	What are the potential issues on the surface of mining activities?
		Outline precautions that may be taken to reduce the influence of mining activities on the surface.
K49	The interaction between seams, working areas and adjacent mines.	See K11 of MPQVG20 Coordinate Ground Control Activities.
K50	The effects of rock discontinuities.	See K11 of MPQVG20 Coordinate Ground Control Activities.
K51	Sources of information in relation to ground control and support methods.	Outline the type of information (technical and performance related) that you would require when considering the design of a mine support systems.
		Define how that technical information may be used in the design and modelling process.
		Define the process within your organisation, to evaluate the information and determine the suitability of the ground control methods chosen .
		Outline how the information used as part of the design process is verified in practice.
K52	Mine geological and environmental factors that may affect the choice and performance of ground control and strata support systems and equipment.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K5 of MPQVG20 Coordinate Ground Control Activities.
		See K11 of MPQVG20 Coordinate Ground Control Activities.
		See K17 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
		See K18 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
		Outline the type of effect that the following may have on the choice and performance of the selected support systems: • Strata water that is either very acidic or very alkaline in nature.

		• The hardness of the strata. • The bedding plains within the strata. • The types of transport systems installed. • Movement of the ground (this may be sides (ribs), roof or floor). • Standup times.
		Define the considerations that your organisation makes when selecting the equipment to perform the mining operations, and where applicable the installation of the ground support systems.
K53	Industrial standards and specifications in relation to ground control and strata support systems and equipment.	Identify the standards (UK and International) that relate to the strata support systems For the standards identified, provide an overview of what the standards recommend when it comes to: • Mine planning. • Excavations. • Avoiding surface interactions. • Design and commissioning of support systems. • Human factors. • Automation.
K54	The types of materials used in ground control and strata support systems.	Provide an overview of the various types of materials that you may find with passive support systems, for each of the materials identified, outline the potential advantages and disadvantages of those types of materials. Provide an overview of the various types of materials that you may find with active support systems, for each of the materials identified, outline the potential advantages and disadvantages of those types of materials. Outline how sprayed concrete, or the use of various resins may be used as start reinforcement, identify the advantages and disadvantages of each type of system. Outline where cavity fill systems may be utilised underground, and what are the advantages and limitation of these types of system.
K55	The types of ground control and strata support systems; their strengths, performance, and limitations.	See K54 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K56		See K52 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.

	The types of ground control and strata support equipment; their performance and limitations.	See K53 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
		See K54 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K57	The loading of standing supports.	When looking at passive supports, outline how you would calculate the possible loading on the support, and determine if the support is capable of carrying/ distributing that load.
K58	Cost/ benefit analysis of implementing methods of ground control.	For your organisation outline the process of how you evaluate the types of support system, this should include: • Support performance. • Cost as a rate (for example per linear meter of excavation/ per tonne of production etc.). • Other methods that your organisation may use to evaluate the support system on a cost basis.
		Outline how your organisation tracks the cost of support (based on the units on the previous page).
		Define the actions that your organisation would take if the actual costs vary significantly from the design costs.
K59	The approved policies, procedures and practices for mine ground control and support.	See K1 of MPQVG19 Quality Assure Ground Control Installations.

PROMS14 – Establish Ground Control and Support Methods

Legislative

PROMS14 – Establish Ground Control and Support Methods (Legislative)		
Knowledge Statement		Elements
K1	Legislative framework including Acts, Regulations, Approved Codes of Practice, and Guidance.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K1 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K2	The legislative definition of a mine, and the classification of mines.	See K2 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K3	The management and administration control structure and its purpose, including accountability and ultimate authority.	See K3 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K4	The statutory duties, role, and responsibilities of the mine owner, management, and supervision.	See K4 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K5	Your statutory duties and personal responsibilities, and the limits of that responsibility.	See K5 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K6	Personal area/ district of responsibility.	N/A
K7	Responsibilities of mine employees.	Outline the responsibilities of mine employees when it comes to: • Cooperating with the employer on matters of safety. • Following the information and instruction that employers provided on matters of safety. • Reporting things that come to their attention that may result in unsafe conditions.
K8	Legislation and statutory requirements in relation to ground control and support of strata.	See K3 of MPQVG20 Coordinate Ground Control Activities.
		See K7 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.

K9	Statutory requirements for a safe system of work.	See K3 of MPQVG20 Coordinate Ground Control Activities. See K8 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K10	Definitions of hazard, risk, accident, danger, accident rate, frequency and severity, environmental aspect, environmental incident.	See K7 of MPQVG20 Coordinate Ground Control Activities. Outline how the regulation in the UK designates accident severity from a legal perspective. Outline how your organisation categorises accidents, injuries, and incidents and how it calculates the accident or incident frequency rate for your mine.
K11	Duties, powers, and responsibilities in the event of an emergency situation.	See K9 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K12	Statutory requirements and organisational procedures for the installation, commissioning, inspection, examination, testing and maintenance of plant and equipment.	See K10 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K13	Statutory and organisational requirements for personal protective equipment (routine and emergency).	See K11 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods. Outline the type of personal protective equipment that each person underground is provided with at your mine for use in the event of an emergency.
K14	Recording procedures in relation to statutory requirements.	See K13 of MPQVG19 Quality Assure Ground Control Installations. See K19 of MPQVG20 Coordinate Ground Control Activities.
K15	Statutory requirements and organisational procedures for the operation of the mine.	See K12 of MPQVG19 Quality Assure Ground Control Installations. See K3 of MPQVG20 Coordinate Ground Control Activities. See K3 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.

		See K4 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
		See K5 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
		Outline what the Mines Regulations 2014 require in relation to the arrangements for: • A management structure at a mine. • Developing a safety management system. • Having competent people to manage, supervise and carryout work activities. • The requirement for information and instruction.

Condition of the Mine

PROMS14 – Establish Ground Control and Support Methods (Condition)		
Knowledge Statement		Elements
K16	The major hazards and risks associated with mining in general and the specific mine/ mining operations.	See K14 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K17	The scope and limitations of the mine, its design and layout, including current areas of use, abandoned areas and future developments as appropriate.	See K15 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K18	Areas of the mine where ground control is required, and areas where it is no longer essential.	See K16 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K19	Geological features that may affect the safe operation of the mine.	See K11 of MPQVG20 Coordinate Ground Control Activities.
		See K17 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K20	Geological and/ or physical indications of potentially deteriorating/ unsafe conditions.	See K5 of MPQVG19 Quality Assure Ground Control Installations.
		See K7 of MPQVG19 Quality Assure Ground Control Installations.
		See K18 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.

K21	Acceptable condition of roadways profile (including roof and sides and if applicable working face/s).	See K19 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K22	Acceptable condition of ground support system/s and indications of deterioration.	See K4 of MPQVG19 Quality Assure Ground Control Installations. See K5 of MPQVG19 Quality Assure Ground Control Installations. See K8 of MPQVG19 Quality Assure Ground Control Installations. Outline your organisation's limitations when it comes to assessing the condition of ground support systems and the rate of deterioration.
K23	Actions to be taken in the event of identifying an aspect of the condition of the mine that may lead to a hazardous situation or unsafe working.	See K21 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K24	The effect that activities in one area can have on the activity, health, and safety of others.	See K22 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K25	How emergency situations can arise in your area of responsibility.	See K23 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K26	Responsibilities of self and others and procedures to follow in the event of an emergency situation.	See K24 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K27	Operational policies and procedures for the maintenance of a safe mine environment.	See K25 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K28	Regulatory requirements and organisational procedures for reporting and recording failure or problems with ground control and support.	See K3 of MPQVG20 Coordinate Ground Control Activities.

PROMS14 – Establish Ground Control and Support Methods (Others)		
Knowledge Statement		Elements
K29	Procedures for ensuring activities are carried out by competent personnel.	Outline the requirements of the competency management system in place at your mine, identify how: - Competencies required for certain roles/ tasks are identified. - How training and assessments of competencies are uploaded into the system. - How the competency management system is utilised by those with responsibility for managing, deploying, supervising persons to ensure that only person with the required competencies are deployed to tasks.
		Identify how your organisation deals with the requirement of putting people to work under supervision for tasks for which they are not yet competent.
K30	Arrangements for first aid, health, and welfare of personnel.	Identify the requirements of the First Aid Regulations when it comes to having trained first aiders, and first aid arrangements on site.
		Outline how your organisation complies with the requirements of these regulations.
K31	Your own responsibilities and the limits of those responsibilities.	See K14 of MPQVG19 Quality Assure Ground Control Installations.
		See K20 of MPQVG20 Coordinate Ground Control Activities.
K32	The allocation of tasks and duties.	See K26 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K33	The benefits of team working and methods to achieve this.	See K27 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K34	Organisational reporting and recording procedures.	See K13 of MPQVG19 Quality Assure Ground Control Installations.
		See K19 of MPQVG20 Coordinate Ground Control Activities.

K35	The importance of effective communications.	See K28 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K36	Communication systems/ procedures in area of responsibility.	See K29 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K37	The dangers of working in isolation.	See K30 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K38	Organisational requirements for recording/ monitoring personnel in your area of responsibility.	See K31 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.

Mine Operations

PROMS14 – Establish Ground Control and Support Methods (Operations)		
Knowledge Statement		Elements
K39	Operational procedures for ground control and support.	See K1 of MPQVG19 Quality Assure Ground Control Installations.
		See K3 of MPQVG20 Coordinate Ground Control Activities.
K40	Types, features, advantages, and limitations of methods of ground control and support.	See K54 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
		See K55 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
		See K56 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K41	The mine geological/ environmental factors that may affect the choice and performance of ground control and support operational systems.	See K52 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K42		See K58 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.

	Cost/ benefit analysis of implementing methods of ground control and support.	
K43	Sources of information in relation to ground control and support methods.	
K44	Mine plans/ maps/ designs/ technical information.	See K53 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K45	How to develop and draft an operational plan.	See K33 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K46	Procedures for obtaining approvals to proceed with operational plan.	See K34 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K47	How to check that the method of ground control and support is compatible with mine design and operational constraints.	See K35 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K48	Business planning cycle and budget preparation.	See K36 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K49	Relevant approved codes of practice and guidance for working safely.	See K37 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K50	Industrial standards/ specifications in relation to ground control and support plant and equipment.	See K53 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K51	The principal activities involved in mining operations and mineral winning.	See K38 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.
K52	The main functions within the operational cycle.	See K39 of MPQVG21 Design and Maintain Mine Ground Control and Support Methods.

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) – Conform to Efficient Work Practices

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

MPQVG19 – Quality Assure Ground Control Installations

MPQVG19 – Quality Assure Ground Control Installations		
Performance Statement		Elements
P1	Establish a systematic approach to auditing ground control systems and equipment.	Included within the portfolio.
P2	Audit ground control systems and equipment.	Included within the portfolio.
P3	Identify changes in ground conditions and ground control systems.	Included within the portfolio.
P4	Determine if the changes are significant.	Included within the portfolio.
P5	Identify areas for improvement.	Included within the portfolio.
P6	Make recommendations for improvements.	Included within the portfolio.
K7	Audit improvements and corrective actions.	Included within the portfolio.
K8	Report results and complete records.	Included within the portfolio.
K9	Carry out work according to organisational approved policies, procedures, and practices.	Included within the portfolio.

MPQVG20 – Coordinate Ground Control Activities

MPQVG20 – Coordinate Ground Control Activities		
Performance Statement		Elements
P1	Determine the ground control auditing requirements.	Included within the portfolio.
P2	Supervise mine ground control auditing.	Included within the portfolio.
P3	Ensure measurements and samples are taken according to planned requirements.	Included within the portfolio.
P4	Organise and undertake mine ground control surveys.	Included within the portfolio.
P5	Analyse and interpret results of audits and surveys.	Included within the portfolio.
P6	Identify and prioritise areas for improvement.	Included within the portfolio.
P7	Complete records and report results.	Included within the portfolio.
P8	Carry out work according to organisational approved policies, procedures, and practice.	Included within the portfolio.

MPQVG21 – Design and Maintain Mine Ground Control and Support Methods

MPQCG21 – Design and Maintain Mine Ground Control and Support Methods		
Performance Statement		Elements
P1	Identify and confirm the objective requiring ground control and support.	Included within the portfolio.
P2	Obtain relevant, current, and applicable sources of information.	Included within the portfolio.
P3	Ascertain the direct and indirect risks associated with the proposed methods of working and methods of ground control, including potential effects of plans on the surface, underground features, and other workings.	Included within the portfolio.
P4	Enlist advice and support from other specialists or management as required for the work activity.	Included within the portfolio.
P5	Conduct ground control geotechnical assessments.	Included within the portfolio.
P6	Transfer assessment information into ground control plans.	Included within the portfolio.
P7	Prepare specifications for proposed ground control systems and equipment.	Included within the portfolio.
P8	Specify sensors or monitoring devices or systems.	Included within the portfolio.
P9	Check the compliance of the proposed ground control systems with health, safety, and welfare requirements and planning conditions.	Included within the portfolio.
P10	Prepare rules or procedures for ground control system implementation.	Included within the portfolio.
P11	Specify monitoring arrangements for routine working and exceptional circumstances.	Included within the portfolio.
P12	Specify action levels based on monitoring results.	Included within the portfolio.

P13	Commission the designed systems.	Included within the portfolio.
P14	Monitor the effectiveness of the implemented method, system, and equipment.	Included within the portfolio.
P15	Validate the installation is working to specification.	Included within the portfolio.
P16	Implement ongoing system auditing.	Included within the portfolio.
P17	Adjust or amend the designs to respond to changes in circumstances and audit information.	Included within the portfolio.
P18	Review and, where necessary revise, ground control assessments and design documents.	Included within the portfolio.
P19	Record and report according to organisational procedures and requirement.	Included within the portfolio.

PROMS14 – Establish Ground Control and Support Methods

PROMS14 – Establish Ground Control and Support Methods		
Performance Statement		Elements
P1	Discuss and agree the key objectives and scope of the proposed project and the available resources with the key stakeholders.	Included within the portfolio.
P2	Identify how the proposed project fits with the overall vision, objectives, and plans of the organisation and any programmes of work or other projects being undertaken.	Included within the portfolio.
P3	Obtain relevant, current, and applicable sources of information (including where applicable previous extraction plans)	Included within the portfolio.
P4	Develop, in consultation with relevant people, a realistic and thorough plan for undertaking the project and achieving the key objectives.	Included within the portfolio.
P5	Identify the preferred method of extraction.	Included within the portfolio.
P6	Specify plant and equipment appropriate to the method of extraction.	Included within the portfolio.
P7	Identify and specify requirements for supporting ground control measures, ventilation, transportation, communications, emergency provision, and services.	Included within the portfolio.
P8	Specify safe systems of work to be used.	Included within the portfolio.
P9	Discuss and agree the project plan with the key stakeholders, making changes where necessary.	Included within the portfolio.
P10	Brief any project team members on the project plan and their roles and responsibilities and provide ongoing support, encouragement, and information.	Included within the portfolio.

P11	Put processes and resources in place to manage potential risks arising from the project and deal with contingencies.	Included within the portfolio.
P12	Implement the project plan, selecting and applying a range of basic project management tools and techniques to monitor, control and review progress.	Included within the portfolio.
P13	Commission the designed systems.	Included within the portfolio.
P14	Communicate progress to the project sponsor(s), any key stakeholders, and any project team members on a regular basis.	Included within the portfolio.
P15	Achieve project objectives using the agreed level of resources.	Included within the portfolio.
P16	Confirm satisfactory completion of the project with any key stakeholders.	Included within the portfolio.
P17	Evaluate the success of the project, identifying what lessons can be learned and recognising the contributions of any project team members.	Included within the portfolio.