

Standard in development

L6: Mine Management

Title of occupation

Mine Management

UOS reference number

ST1309

Core and options

No

Option title/s

Level of occupation

Level 6

Route

Engineering and manufacturing

Typical duration of apprenticeship

48 months

Degree apprenticeship

integrated degree

Target date for approval

01/07/2022

Resubmission

No

Would your proposed apprenticeship standard replace an existing framework?

No

Does professional recognition exist for the occupation?

Yes

The group are engaged with the Institute of Materials, Minerals and Mining to ensure that the candidate can achieve IEng (Incorporated Engineer) professional recognition.

Occupation summary

This occupation is found in underground mining operations across the whole of the UK sector. The occupation is relevant to small and large operations, and applicable regardless of the mineral produced. The employers in the UK range in size from large multi-nationals, employing more than 10,000 people to small privately owned operations who employ fewer than 10 people. Apprentices will have transferrable skills that can be used across organisations, these organisations are not limited to mine operations, but can expand to include key suppliers, specialist consultants and those with the responsibilities for other services such as mines rescue (required under Regulation 53 of the Mines Regulations 2014)

The broad purpose of the occupation is to lead and manage underground mining operations, in a way that is safe, sustainable, ecologically, and socially acceptable, recognising the essential part that these raw materials have on maintaining and improving the fabric of society and everyday lives. This includes ensuring the operation is managed in line with strict regulatory requirements using appropriate technical mining competencies. Underground mine management is managing the extraction of minerals from mines for commercial purposes.

In their daily work, an employee in this occupation interacts with a range of internal departments and individuals. These can include safety managers, production managers, development managers, transport and infrastructure managers, product preparation or processing managers, finance managers, HR managers, owners or directors, shafts and winding engineers, engineering managers and mechanical engineering or electrical engineering functions. The occupation can also include interaction with specialist roles (for example geotechnical engineering, ventilation engineering, geologists and surveyors), ensuring that necessary support and advice is available and utilised as part of the mine planning and safe operating process. The apprentice may also be required to interact with various external organisations, such as suppliers (including specialist service organisations), trade organisations, engineering service providers, engineering manufacturers, regulators, and the emergency services. In this role the apprentice would be both office and site based within the mine on a frequent basis.

An employee in this occupation will be responsible for the management of a highly regulated major hazard sector for people, projects, operations, and the hazards which are unique to an underground environment to deliver long term organisational business success, with the professional recognition of their ability to deliver impact, whilst acting in a sound ecological and socially acceptable way.

Typical job titles

Engineer manager Head of operations Head of technical services Mine manager Operations engineering manager Operations manager Operations superintendent Planning manager Principal mining engineer Production manager Production superintendent Shift manager Shift superintendent Technical services manager

Are there any statutory/regulatory or other typical entry requirements?

Yes

Entry requirements

There are no specific entry requirements for the apprenticeship, however some candidates that undertake this apprenticeship will have most likely worked at other levels within the organisation and are ready to progress as part of a longer-term succession plan, however other candidates will be new entrants to the sector, who would typically come from a STEM background at A-Level or equivalent.

Occupation duties

DUTY	KSBS
Duty 1 Lead in securing the safety and health of all persons and operations at the site through the exercise of management, supervision, inspection, leadership, teamwork, the application of technical mining competencies and suitable and sufficient risk assessment to ensure regulatory compliance with the Safety at Work Act, Mines Regulations 2014 and other relevant legislation and guidance.	K3 K4 K5 K8 K11 K12 K14 K17 K18 K24 K27 S1 S4 S6 S7 S8 S9 S10 S14 S17 S20 B1 B2 B3 B4 B5 B7 B8
Duty 2 Identify and implement changes within their function that supports the achievement of organisational objectives in line with a suitable change management process.	K6 K7 K8 K11 K13 K15 K20 K21 K22 K24 K25 K27 S3 S4 S5 S6 S7 S9 S11 S12 S13 S19 B1 B2 B3 B4 B7
Duty 3 Ensure the life of mine plan is adequately developed, incorporating stakeholder input and ensuring that the plan considers the sustainability of the operation, giving adequate consideration of sequencing, resourcing, engineering, and capital required to deliver in an ecologically sound, environmentally sustainable way	K2 K3 K4 K5 K6 K7 K8 K9 K11 K16 K23 K27 S1 S2 S3 S5 S6 S11 S13 S14 S15 S19 B3 B5 B7 B8
Duty 4 Manage the delivery of the organisational objectives to meet defined operational, technical, financial and time parameters.	K16 K20 K21 K22 K23 K24 K28 S3 S6 S11 S14 S15 S16 S17 S18 S19 B3 B6 B8
Duty 5 Complete vetting and reviews of others employed in the organisation to ensure only suitably qualified and competent persons are appointed to the	K1 K21 K24 K25 S7 S14 B1 B3 B5 B6 B8

DUTY	KSBS
management structure and those persons maintain their professional currency.	
Duty 6 Ensure that a range of information is recorded in sufficient detail to demonstrate that any management duties are effectively being discharged.	K1 K7 K10 K11 K12 K13 K18 S3 S4 S5 S6 S7 S8 S9 S13 S18 S19 B2 B4
Duty 7 Ensure that the facilities and equipment used as part of the mining and preparation process are adequately scoped using where appropriate the latest technologies to ensure that they allow for safe construction and remain safe whilst in operation or undergoing maintenance activities.	K4 K6 K9 K13 K17 K22 S4 S6 S8 S10 S12 S13 S14 S15 S19 S20 B1 B4
Duty 8 Plan and manage schemes that ensure that equipment is installed to an agreed standard and is commissioned and recorded as part of the planned maintenance scheme prior to use, and then subjected to a defined inspection and maintenance regime to ensure it remains safe for use.	K1 K7 K9 K10 K12 K13 K14 K22 S10 S11 S12 S14 B2
Duty 9 Ensure that the product is produced to the required customer specification and quality.	K4 K7 K9 K10 K22 K25 K28 S12 S13 S14 S15 S16 S19 B7
Duty 10 Manage the planning, implementation and testing of robust and effective emergency arrangements and ensure that relevant persons are trained to implement the emergency arrangements.	K8 K11 K12 K14 K15 K16 K22 K25 K26 K27 S2 S4 S7 S8 S10 S15 B1 B4 B8
Duty 11 Consult and engage with communities or other interested parties to ensure they are engaged and informed of the mining operation and that the environment is protected.	K19 K20 K22 K23 K25 S4 S10 S13 S14 S15 S16 S19 B2 B5

KSBS

Knowledge

K1: The mining life cycle including the key regulations, standards and guidance that influence the design, construction and operations and closure of mining operations.

K2: Physical geology on the mine environment, including the physical properties of rock, soil and mineral deposits and the impact of weathering, plate tectonics and geomorphic features.

K3: The impact of structural geology, including features such as dip, faulting, rock strength and the principles of elasticity.

K4: Design principles of mines and layout including geology and geomechanics, layout, size and position of mine entries and roadways, and the systems and equipment used for extraction and mine support.

K5: Stress analysis in the mine environment, including the means of measuring pre-mining stress, induced mining stress and stress redistribution.

K6: Types of support systems, considering the design, intended life, suitability of support systems and strata reinforcement.

K7: Rock mechanics and the impact on mine design and the surrounding environment.

K8: The influence and requirements of mechanical and electrical engineering principles and procedures have on the safe, efficient operation of the mine.

K9: Mine surveying techniques for measuring and mapping of mine workings, including the recording of information and the use of analytical measures to verify the results.

K10: Mineral preparation, processing, and waste management techniques including the use of separation techniques, methods of concentrating and further refining, the handling and transport of bulk solids and the safe, sustainable disposal of mineral waste and tailings.

K11: How to design the operation to extract the reserves in a legislatively compliant, economic, ecological and socially acceptable manner.

K12: The influence and requirements of legislation on the principles of risk management and the methods that are used to deal with major and occupational hazards, operational, safety, health, financial and environmental risks. The evaluation and implementation of appropriate control measures to reduce risk to As Low as Reasonably Practicable (ALARP).

K13: The principles of major hazard control, and the impact that preventative and mitigating control failure had have on elevating the propensity for mine disasters.

K14: The principles of scenario planning to recognise the factors that influence the implementation of mine emergency plans including suitable considerations for self-escape and the use of mines rescue. The use of data collected through simulated exercises to improve the planned response.

K15: The factors controlling the planning and deployment of automated and digital technologies in mine environments to improve operational efficiency, productivity, and safety.

K16: The different stages of projects including the principles of planning, scheduling, and sequencing to ensure effective life of mine plans. The ways of managing, influencing, and controlling outcomes. through the application of project management techniques

K17: Underground mining management principles, including the role that mine ventilation systems and ventilation techniques have on the release and presence of toxic, noxious, and explosive gasses through the mining process. The generation and control of inhalable and respirable dust and increased levels of heat and humidity.

K18: The mine environment and the impact that it has on operational performance, safety, and long-term health of employees.

K19: The principles of mine closure and legacy risk management.

K20: The impact of a mining operation through its life cycle using the principles of asset integrity, environmental and social impact assessment methodologies and the application of current industry best practice to support an environmentally robust and sustainable operation.

K21: Financial and economic strategies, including budgets, financial management and accounting. The influence of commodity prices, feasibility studies, financial reports incorporating cash flow, capital, profit and loss.

K22: Approaches to costing & procurement, contracting, sales, marketing, and the route to market, including consideration of any legal requirements.

K23: Communication techniques, including written, verbal, nonverbal and digital, and different types of interpersonal skills including questioning and listening.

K24: Different, inclusive leadership styles and models, how to develop diverse teams and support people using coaching and mentoring.

K25: Approaches to stakeholder, customer, and supplier management.

K26: Time management, how to set SMART targets, prioritise activities and undertake forward planning in a business environment.

K27: Data analysis techniques used to examine complex and interacting issues, to assist in developing appropriate solutions solving and support the decision-making process.

K28: How to develop and implement operational strategy and plans including approaches to identify and classify mineral reserves.

Skills

S1: Specify the system for supporting the excavation, using information such as the characteristics of the geology, rock formations, data from modelling and measurements taken.

S2: Undertake the mine design process, incorporating elements such as mine layout, roadway design, scheduling, resourcing and ventilation. Determine the impact that these decisions have on the safe, efficient, and sustainable operation of the mine.

S3: Undertake mine surveys and use the information to evaluate mine development against the agreed layout and design.

S4: Collect, analyse and use data from mining and asset management systems to review the impact on operation, using the outputs to improve the safety, efficiency and effectiveness of the mining system.

S5: Develop and implement operational mine plans that have SMART targets and are supported by key performance indicators.

S6: Use project management and planning techniques. Allocate resource requirements. Monitor progress towards project goals and identify corrective actions.

S7: Identify and utilise risk assessment techniques appropriate for the identified hazards such as major mining hazards with the use of Bowtie methodology. Use these techniques to identify and implement key controls and use safety performance indicators to monitor the effectiveness of those controls.

S8: Plan and manage emergency arrangements, including simulated exercises. Determine the effectiveness of those emergency arrangements, and to inform potential improvements.

S9: Undertake ventilation surveys such as measuring airflow, heat and dust to identify how the mine environment is being maintained.

S10: Identify the statutory and company requirements for monitoring and maintaining records and plans and complete a suitable audit and evaluation to ensure compliance.

S11: Manage and adapt budgets and control expenditure. Review and produce financial reports that provide analysis and draw conclusions on financial risk and evaluation of short and long term mine strategies.

S12: Review quality control standards and ensure that these are effectively and consistently applied and where necessary take corrective action.

S13: Communicate with colleagues, stakeholders and other interested parties using a range of different methods and techniques, challenging, influencing, and negotiating where appropriate.

S14: Build teams, empower, mentor, coach, motivate and delegate to others, providing clear guidance and ensuring inclusivity.

S15: Developing others; taking account of diversity, equality and inclusivity.

- S16:** Work collaboratively with all stakeholders, including regulators (Health and Safety Executive), customers, suppliers, and trade unions.
- S17:** Manage and lead others including conflict management.
- S18:** Plan and manage own time.
- S19:** Use evidence-based tools, qualitative and quantitative analysis techniques to demonstrate an ethical approach to problem solving and making decisions that improve the safety, operational and environmental performance of the underground operation.
- S20:** Specify the machinery and equipment to support the overall safety and production.

Behaviours

- B1:** Act as a role model and advocate for health and safety across the team.
- B2:** Act as a role model and advocate environmental, ethical, and sustainable practices.
- B3:** Collaborate and promote teamwork across disciplines.
- B4:** Adapt and is resilient to challenging or changing situations.
- B5:** Lead by example to promote accessibility, diversity and inclusion.
- B6:** Commit to their own and support others' professional development.
- B7:** Take responsibility for their own actions and challenge the behaviours and actions of others.
- B8:** Recognise the limits of their capabilities and authorisation and work to those limits.

Qualifications

English & Maths

Apprentices without level 2 English and maths will need to achieve this level prior to taking the End-Point Assessment. For those with an education, health and care plan or a legacy statement, the apprenticeship's English and maths minimum requirement is Entry Level 3. A British Sign Language (BSL) qualification is an alternative to the English qualification for those whose primary language is BSL.

Does the apprenticeship need to include any mandated qualifications in addition to the above-mentioned English and maths qualifications?

Yes

Other mandatory qualifications

BEng (Hons) Mining Engineering & Management

Level: 6 (integrated degree)

Additional information:

Professional recognition

This standard aligns with the following professional recognition:

- Incorporated Engineer (IEng) for Institute of Minerals, Mining and Metallurgy

Involved employers

Albion Stone PLC, British Fluorspar Ltd, British Gypsum Ltd, Cleveland Potash Ltd, Compass Minerals UK Ltd, Energybuild Ltd, Schlumberger Oilfield UK PLC (MI UK Division), Anglo American Woodside Project (York Potash Ltd)

Consultation

The consultation process involved representatives from the full spectrum of underground mining operations. The mine operators involved represent small mines employing between 5-10 persons, up to multinationals employing almost 100,000 globally. The table below summarises the mine operators and mine operations the following operations:

Operator/ Owner	Mine
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Albion Stone Group	
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Albion Stone	
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Anglo American	
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Woodsmith Mine	
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British Gypsum	
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Barrow Mine	
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Welsh Assembly	
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Big Pit	
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ICL	
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Boulby Mine	
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British Gypsum	
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Brightling Mine	
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British Gypsum	
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Fauld Mine	
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MI Drilling	
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Foss Mine	
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British Gypsum	
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Kirkby Thore Mine	
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Localine Quartz Sand Ltd	
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Lochaline	
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British Gypsum	
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Marblaegis Mine

British Fluorspar

Mildam Mine

Compass Minerals

Winsford Mine

Energy Build

Aberpergwm Colliery

The consultation was undertaken in three disparate parts:

- **Part 1** – General Information to the mine operators on the progress with the development of the degree apprenticeship.
- **Part 2** – Consultation on the core content and in particular the knowledge skills and behaviours required to fulfil a range of roles.
- **Part 3** – Review of the changes to the standard resulting from the part 2 discussion and an initial review of the end point assessment process.

Part 1 – General Information

The discussion took place on 16th November 2021 as part of the sector wide, Mines Qualification Committee. This committee consisting of mine operator representatives from across the UK has originally asked for the apparatus route to manager qualifications be reviewed, and if possible, peruse a replacement for the Ordinary Degree which is currently no longer being offered in the UK. The committee agreed to the inclusion of the BEng (Hons) Mining Engineering and Management on the completion of the apprenticeship.

The meeting was informed of the progress with the development of the degree apprenticeship, and information was shared relating to:

- Roles requiring the level of qualification
- Role profiles
- Key knowledge, skills, and behaviours

The objective of this meeting was to provide a general overview and allow the group to review the information ahead of the formal consultation process.

Part 2 – Consultation on Core Content

This was split in to two separate meetings to allow the maximum number of participants, these took place on:

- 3rd December 2021
- 6th December 2021

The key points raised at this meeting were:

1. The introduction of something covering mine surveying and the mapping of mine workings
2. A recognition of the part that asset integrity has on the operation throughout the planned lifecycle of the mine
3. Increase the emphasis that mechanical and electrical engineering has on the planning, safety, and operation of the mine

Part 3 – Review of Changes/ Initial Review of the End Point Assessment

As with part 2, this was split in to two separate meetings to allow maximum participation and contribution to the process, these meetings took place on:

- 5th January 2022
- 6th January 2022

The key points raised at the meeting were:

1. Reviewing the basic principles of geology, an understanding of geological time and the stratigraphic column, plate tectonics, the rock cycle, the laws of superposition and uniformitarianism, an understanding of basic structural geology, folds, faults, basic three-point problems.
2. Reviewing the basic principles of mechanical engineering, an understanding covering; strength of materials, forces and pressures, stresses, and strains, bending moments, kinematics, basic hydraulic principles and circuits, gas laws.
3. Reviewing the basic principles of electrical engineering, An understanding of the relationship between voltage, current, resistance and power, DC, AC and three phase supplies and circuits, impedance and power factors, transformers, protective devices.
4. As part of the end point assessment, how the candidate demonstrates leadership of others through the alignment and maximisation of the efforts of others towards the achievement of a common goal.
5. Recognising that mineral reserve assessments need to be completed to a standard, and for publicly listed companies there are some specific requirements.

There was a broad discussion about how the candidates from small operations would get access to a learning and practical environment that would allow them to develop the knowledge and practice the skills. It was broadly agreed that the sector would come together to facilitate that process, and each site would review what they could provide that would support their own, and candidates from other mines.

Outcomes from the Consultation

The table below summarises the changes made because of the consultation:

Point Raised Changes Made

The introduction of something covering mine surveying and the mapping of mine workings

- A new knowledge statement was added
- A skill statement was updated

A recognition of the part that asset integrity has on the operation throughout the planned lifecycle of the mine

- A knowledge statement was modified to include asset integrity
- A skills statement was modified to include asset integrity

Increase the emphasis that mechanical and electrical engineering has on the planning, safety, and operation of the mine

- A knowledge statement was modified to include asset integrity
- A skills statement was modified to include asset integrity

Reviewing the basic principles of geology, an understanding of geological time and the stratigraphic column, plate tectonics, the rock cycle, the laws of superposition and uniformitarianism, an understanding of basic structural geology, folds, faults, basic three-point problems.

- No changes made; the group considered that the existing knowledge statements adequately covered these principles (implied not specific)

Reviewing the basic principles of mechanical engineering, an understanding covering; strength of materials, forces and pressures, stresses, and strains, bending moments, kinematics, basic hydraulic principles and circuits, gas laws.

- No changes made; the group considered that the existing knowledge statements adequately covered these principles (implied not specific)

Reviewing the basic principles of electrical engineering, An understanding of the relationship between voltage, current, resistance and power, DC, AC and three phase supplies and circuits, impedance and power factors, transformers, protective devices.

- No changes made; the group considered that the existing knowledge statements adequately covered these principles (implied not specific)

As part of the end point assessment, how the candidate demonstrates leadership of others through the alignment and maximisation of the efforts of others towards the achievement of a common goal.

- It was considered that this was not a behaviour, and more of a skill and there was a statement that covered the requirement for leadership, and the alignment of a team around common goals. There were no changes made

Recognising that mineral reserve assessments need to be completed to a standard, and for publicly listed companies there are some specific requirements.

- The knowledge statements were reviewed, and it was considered that that the principles of reserve assessment were adequately covered within the statements, and that the changes that introduced any specific reporting standard may make it more difficult for candidates to demonstrate the right knowledge and skills. There were no changes to the existing standard

Progression Routes

Supporting uploads

Mandatory qualification uploads

[ST1309 standard hard sift evidence Anglo American Advert - Shift Manager - Feb 2022.pdf](#)

[ST1309 standard hard sift evidence Anglo American Advert - Shift Superintendent - Deep Shafts - Nov 2021.pdf](#)

[ST1309 standard hard sift evidence Anglo American Advert - Shift Superintendent - MTS - Nov 2021.pdf](#)

[ST1309 standard hard sift evidence Anglo American Advert- Mine Manager \(Site director\) - Feb 2022.pdf](#)

[ST1309 standard hard sift evidence Anglo American Job description - Technical Services Manager.pdf](#)

[ST1309 standard hard sift evidence Anglo American Job description - Engineering Manager.pdf](#)

[ST1309 standard hard sift evidence Anglo American Role Profile - Head of Engineering.pdf](#)

[ST1309 standard hard sift evidence Anglo American Role Profile - Project Engineering Manager.pdf](#)

[ST1309 standard hard sift evidence British Gypsum \(Saint Gobain\) Central Mining Engineer Advert Dec 2021.pdf](#)

[ST1309 standard hard sift evidence British Gypsum \(SaintGobain\) Graduate Mining Engineer Feb 2022.pdf](#)

[ST1309 standard hard sift evidence ICL Boulby Mechanical Operations Engineer Sept 2020.pdf](#)

[ST1309 standard hard sift evidence ICL Boulby Operations Manager April 2021 Advert May 2021.pdf](#)

[ST1309 standard hard sift evidence ICL Boulby Production Manager - Mining May 2020.pdf](#)

[ST1309 standard hard sift evidence VACANCY - Deputy Mine Manager \(24-01-2022\).docx](#)

[ST1309 standard off-the-job-type-2-evidence Further information on mandatory qualification.docx](#)

ST1309 standard off-the-job-type-2-evidence HM Inspectorate of Mines - Letter of support.pdf

Professional body confirmation uploads

ST1309 standard professional-body-confirming-alignment Mining Eng Apprenticeship Lett.1.pdf

Involved employers

Albion Stone PLC, British Fluorspar Ltd, British Gypsum Ltd, Cleveland Potash Ltd, Compass Minerals UK Ltd, Energybuild Ltd, Schlumberger Oilfield UK PLC (MI UK Division), Anglo American Woodside Project (York Potash Ltd)