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REPUBLIC OF SOUTH AFRICA
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AIDS HELPLINE: 0800-0123-22 Prevention is the cure



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GOVERNMENT NOTICES

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 336

22 March 2002

**SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

In accordance with regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Hospitality, Tourism, Travel, Leisure and Gaming

Registered by NSB 11, Services, publishes the following unit standard for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the unit standard upon which qualifications are based. The full unit standards can be accessed via the SAQA web-site at www.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, 659 Pienaar street, Brooklyn, Pretoria.

Comment on the unit standards should reach SAQA at the address *below and no later than 20 April 2002*. All correspondence should be marked **Standards Setting – SGB Hospitality, Tourism, Travel, Leisure and Gaming** and addressed to

The Director: Standards Setting and Development
SAQA

Attention: Mr. D Mphuthing

Postnet Suite 248

Private Bag X06

Waterkloof

0145

or faxed to 012 – 482 0907

PP **SAMUEL B.A. ISAACS**
EXECUTIVE OFFICER

SOUTH AFRICAN QUALIFICATIONS AUTHORITY**UNIT STANDARD : GRADE AN ESTABLISHMENT****Field** : Services**Sub-field** : Hospitality, Tourism, Travel, Leisure and Gaming**NQF level** : 5**Credits** : 20**Purpose of the Unit Standard:**

On completion of this unit standard, the learner should be able to determine whether or not establishments meet the criteria laid down in one of the national grading systems and recommend a grading level for establishments based on those criteria. This unit standard will develop the industry and ensure that consumers are able to accurately anticipate the quality of service and facilities in a graded establishment.

Rationale of the unit standard

The unit standard has been developed to build up a pool of grading assessors who will be competent to evaluate establishments against the Grading council criteria for Star grading.

The star grading system is the National scheme for grading in South Africa as constituted by the Minister of Environmental Affairs and Tourism.

The unit standard can be incorporated as an elective unit within Hospitality and Tourism qualifications registered on the NQF. This unit standard may be included as an elective in the following registered qualifications, amongst others:

- National Certificate in Hospitality Reception at NQF level 4
- National Diploma in Accommodation Services at NQF level 5
- National Certificate in Tourism: Reception at NQF level 4
- National Diploma in Service Management at NQF level 5
- National Diploma in Event Co-ordination at NQF level 5

Unit Standards at NQF Level 5

1. Title : Grade an establishment.

UNIT STANDARDS TITLE AND SPECIFIC OUTCOMES – NQF LEVEL 5

1. TITLE : Grade an establishment.

- Specific outcome 1. Differentiate a grading system from other grading systems.
- Specific outcome 2. Plan and schedule grading assessments for a range of different establishments.
- Specific outcome 3. Communicate findings on the grading to the management of the establishment and to the grading authority.
- Specific outcome 4. Advise the establishment on what needs to be done to attain a higher grading.
- Specific outcome 5. Further the image of the grading council.
- Specific outcome 6. Reflect on own performance and suggest ways of improving it.

ASSESSMENT CRITERIA

This unit standard must be assessed through observing the learner apply an existing grading system to real establishments. Although simulation can be used against certain outcomes, it may not form the basis of assessment for the whole unit standard.

When conducting assessments, assessors must ensure that they are familiar with the full text of the Unit Standards being assessed.

They must ensure that the assessment covers the specific outcomes, critical cross-field outcomes and essential embedded knowledge.

As each situation is different, it will be necessary to develop assessment activities and tools, which are appropriate to the contexts in which practitioners are working. These activities and tools may include self-assessment, peer assessment, formative and summative assessment.

The specific outcomes and essential embedded knowledge must be assessed **in relation to each other**. If a practitioner is able to explain the essential embedded knowledge but is unable to perform the specific outcomes, they should not be assessed as competent. Similarly, if a practitioner is able to perform the specific outcomes but is unable to explain or justify their performance in terms of the essential embedded knowledge, they should not be assessed as competent.

Integrated assessment**Demonstrated ability to make DECISIONS about practice and to ACT accordingly:**

1. Grade an establishment according to the requirements of the grading system, ensuring compliance with grading council requirements.
2. Prepare a report on the grading and discuss the grading with the management of the establishment, placing emphasis on what needs to be done in order to attain a higher grading. Give reasons for awarding a particular grade.
3. Given that a client does not agree with the grade you have given, deal with the situation in a way that is fair and that does not compromise the grading system. Give reasons for your actions.
4. Given that a follow up grading visit is necessary, describe what should be covered in such a visit and give reasons for your decision.

Demonstrated ability to learn from our actions and to ADAPT PERFORMANCE:

5. Analyse the grading system and point out weaknesses in the system and ways that these weakness can be overcome or permanently corrected.
6. Analyse your own performance while grading and describe problems with your performance and what steps you will take to improve.
7. Analyse the system and give suggestions on potential improvements in the system in terms of support and guidance to "grading assessors"
8. Given a grading council regulation that can be interpreted in a number of ways, interpret the regulation and describe the decision one would make in regard to specific situations.

Demonstrated KNOWLEDGE and UNDERSTANDING of the information listed under the Essential Embedded Knowledge below.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 337

22 March 2002

In accordance with regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Manufacturing and Engineering

Registered by NSB 06, Manufacturing, Engineering and Technology, publishes the following unit standard for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the unit standard upon which qualifications are based. The full unit standards can be accessed via the SAQA web-site at www.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, 659 Pienaar street, Brooklyn, Pretoria.

Comment on the unit standards should reach SAQA at the address ***below and no later than 20 April 2002***. All correspondence should be marked **Standards Setting – SGB Manufacturing and Assembly** and addressed to

The Director: Standards Setting and Development
SAQA

Attention: Mr. D Mphuthing

Postnet Suite 248

Private Bag X06

Waterkloof

0145

or faxed to 012 – 482 0907



SAMUEL B.A. ISAACS
EXECUTIVE OFFICER

Unit Standards

Field : Engineering, Manufacturing and Technology

Sub-Field : Manufacturing and Assembly

Purpose : These Telecommunications unit standards are part of the Certificate in Telecommunications for Customer Premises Equipment (NQF 4)

In the context of the telecommunications sector, this qualification will enable the installation and maintenance and upgrade PC based Customer Premises Equipment. A qualifying learner will be capable of applying skills and knowledge within the telecommunications industry and other sectors on a national and international level. In addition they will be positioned to further their learning, practice and career within the telecommunications and other sectors, either at further levels or in other areas of practice.

Unit Standards at NQF Level 3

Title
• Perform indoor wiring and cabling for Customer Premises Equipment
• Locate and rectify mobile communication installation faults
• Cut over new customer equipment
• Provide advice & support to customer
• Organise resources
• Install Multi Line Customer Equipment
• Perform a functional equipment test on complex Customer Premises Equipment

Unit Standards at NQF Level 4

Title
• Communication & Language Studies
• Mathematics and Science
• Commission very complex customer equipment
• Perform maintenance on very complex Customer Premises Equipment
• Prepare site for installation
• Perform a quality installation inspection
• Perform an acceptance test on new equipment and sign off
• Perform periodic quality testing of new or enhanced basic Customer Premises equipment
• Recover customer equipment
• Install PC based equipment
• Install an antenna and antenna feeder
• Perform equipment / software upgrades
• Verify new software / hardware releases
• Schedule customer equipment installation
• Programme PC based equipment
• Install PC based equipment programmes
• Schedule customer equipment maintenance (on contract bases)
• Operate very complex test equipment

Unit Standards at NQF Level 5

Title
• Train customers on new and/or enhanced equipment
• Provide lightning and power protection for structures or equipment

Unit Standards Titles and Specific outcomes at NQF Level 3

Title: Perform a functional equipment test on complex Customer Premises Equipment

Specific Outcomes:

- Plan to perform the functional equipment test.
- Prepare to perform the functional equipment test.
- Conduct the functional equipment test.
- Conclude the functional equipment test.

Title: Perform indoor wiring and cabling for CPE

Specific Outcomes:

- Plan the wiring of indoor cabling for customer premises equipment.
- Prepare the wiring of indoor cabling for customer premises equipment.
- Perform the wiring of indoor cabling for customer premises equipment.
- Conclude the wiring of indoor cabling for customer premises equipment.

Title: Organise resources

Specific Outcomes:

- Identifying required resources for customer premises equipment.
- Obtain required resources for customer premises equipment.
- Validate required resources for customer premises equipment.
- Control required resources for customer premises equipment.

Title: Provide advice & support to customer

Specific Outcomes:

- Plan to provide advice and support.
- Prepare to provide advice and support.
- Provide advice and support.
- Conclude advice and support.

Title: Cut over new customer equipment

Specific Outcomes:

- Plan the cut over of new customer premises equipment.
- Prepare the cut over of new customer premises equipment.
- Execute the cut over of new customer premises equipment.
- Conclude the cut over of new customer premises equipment.

Title: Locate and rectify mobile communication installation faults

Specific Outcomes:

- Plan mobile communication installation fault clearance.
- Prepare mobile communication installation fault clearance.
- Conduct mobile communication installation fault clearance.
- Conclude mobile communication installation fault clearance.

Title: Install Multi line Customer Equipment

Specific Outcomes:

- Plan the installation of customer premises equipment.
- Prepare for the installation of customer premises equipment.
- Conduct the installation of customer premises equipment.
- Conclude the installation of customer premises equipment.

Unit Standards Titles and Specific outcomes at NQF Level 4

Title: Perform maintenance on very complex Customer Premises Equipment

Specific Outcomes:

- Plan the maintenance on very complex customer premises equipment.
- Conduct the maintenance on very complex customer premises equipment.
- Conclude the maintenance on very complex customer premises equipment.

Title: Prepare site for installation

Specific Outcomes:

- Inspect the site for installation.
- Analyse the site's installation requirements.
- Plan for the site's installation requirements.
- Execute the preparation of the site's installation plan.
- Control the site's preparation activities.

Title: Perform a quality installation inspection

Specific Outcomes:

- Plan the quality installation inspection.
- Prepare the quality installation inspection.
- Conduct the quality installation inspection.
- Conclude the quality installation inspection.

Title: Perform periodic quality testing of new or enhanced basic Customer Premises equipment

Specific Outcomes:

- Plan for performing quality testing of new or enhanced customer premises equipment.
- Prepare for performing quality testing of new or enhanced customer premises equipment.
- Conduct quality testing of new or enhanced customer premises equipment.
- Conclude quality testing of new or enhanced customer premises equipment.

Title: Recover customer equipment

Specific Outcomes:

- Plan the recovery of customer premises equipment.
- Prepare the recovery of customer premises equipment.
- Execute the recovery of customer premises equipment.
- Conclude the recovery customer premises equipment.

• Title: Commission very complex customer equipment

Specific Outcomes:

- Plan the commissioning of customer premises equipment.
- Prepare the commissioning of customer premises equipment.
- Perform the commissioning of customer premises equipment.
- Conclude the commissioning of customer premises equipment.

• Title: Install PC based equipment

Specific Outcomes:

- Plan the installation of PC-Based customer premises equipment.
- Prepare for the installation of PC-Based customer premises equipment.
- Conduct the installation of PC-Based customer premises equipment.
- Conclude the installation of PC-Based customer premises equipment.

Title: Install an antenna and antenna feeder

Specific Outcomes:

- Plan the installation of antenna and antenna feeder.
- Prepare for the installation of antenna and antenna feeder.
- Conduct the installation of antenna and antenna feeder.
- Conclude the installation of antenna and antenna feeder.

Title: Perform an acceptance test on new equipment and sign off

Specific Outcomes:

- Plan the acceptance test on new customer premises equipment.
- Prepare the acceptance test on new customer premises equipment.
- Conduct the acceptance test on new customer premises equipment.
- Conclude the acceptance test on new customer premises equipment.

Title: Perform equipment / software upgrades

Specific Outcomes:

- Plan the upgrading of hardware / software of customer premises equipment.
- Prepare the upgrading hardware / software of customer premises equipment.
- Perform the upgrading hardware / software of customer premises equipment.
- Conclude the upgrading hardware / software of customer premises equipment.

Title: Verify new software / hardware releases

Specific Outcomes:

- Plan the verification of hardware / software releases of customer premises equipment.
- Prepare the verification of hardware / software releases of customer premises equipment.
- Conduct the verification of hardware / software releases of customer premises equipment.
- Conclude the verification of hardware / software releases of customer premises equipment.

Title: Schedule customer equipment installation

Specific Outcomes:

- Plan the scheduling for installation of customer equipment.
- Prepare the scheduling for installation of customer equipment.
- Conduct the scheduling for installation of customer equipment.
- Conclude the scheduling for installation of customer equipment.

Title: Install PC based equipment programmes

Specific Outcomes:

- Plan the installation of PC-Based equipment programs.
- Prepare for the installation of PC-Based equipment programs.
- Conduct the installation of PC-Based equipment programs.
- Conclude the installation of PC-Based equipment programs.

Title: Programme PC based equipment

Specific Outcomes:

- Plan the programming of PC-Based Equipment.
- Prepare the programming of PC-Based Equipment.
- Conduct the programming of PC-Based Equipment.
- Conclude the programming of PC-Based Equipment.

Title: Schedule customer equipment maintenance (on contract bases)

Specific Outcomes:

- Plan the scheduling of equipment maintenance.
- Prepare the scheduling of equipment maintenance.
- Conduct the scheduling of equipment maintenance.
- Conclude the scheduling of equipment maintenance.

Title: Operate very complex test equipment

Specific Outcomes:

- Plan for operating very complex test equipment.
- Prepare for operating very complex test equipment.
- Operate very complex test equipment.
- Conclude operating very complex test equipment.

Unit Standards Titles and Specific outcomes at NQF Level 5

Title: Train customers on new and/or enhanced equipment

Specific Outcomes:

- Plan the training event with customers.
- Prepare the training event for customers.
- Conduct training on new and / or enhanced equipment.
- Conclude the training on new and / or enhanced equipment.

Title: Provide lightning and power protection for structures or equipment

Specific Outcomes:

- Plan lightning and power protection for structures or equipment.
- Prepare lightning and power protection for structures or equipment.
- Conduct lightning and power protection for structures or equipment.
- Conclude lightning and power protection for structures or equipment.

Unit Standards

- Field : Engineering, Manufacturing and Technology
- Sub-Field : Manufacturing and Assembly
- Purpose : These Telecommunications unit standards are part of the Certificate in Telecommunications for Customer Premises Equipment (NQF 3)

In the context of the telecommunications sector, this qualification will enable the installation and maintenance of Complex Customer Premises Equipment. A qualifying learner will be capable of applying skills and knowledge within the telecommunications industry and other sectors on a national and international level. In addition they will be positioned to further their learning, practice and career within the telecommunications and other sectors, either at further levels or in other areas of practice.

Unit Standards at NQF Level 2

Title
• Perform a functional equipment test on Customer Premises Equipment

Unit Standards at NQF Level 3

Title
• Communication & Language Studies
• Mathematics and Science
• Cut over new customer equipment
• Perform indoor wiring and cabling for Customer Premises Equipment
• Provide advice & support to customer
• Organise resources
• Operate complex test equipment
• Install Multi Line Customer Premises Equipment
• Commission complex customer equipment
• Perform periodic quality testing of new or enhanced basic Customer Premises equipment
• Perform maintenance on Complex Customer Premises Equipment

Unit Standards at NQF Level 4

Title
• Prepare site for installation
• Perform a quality installation inspection
• Perform an acceptance test on new equipment and sign off
• Recover customer equipment
• Install an antenna and antenna feeder
• Install PC based equipment

Unit Standards at NQF Level 5

Title
• Train customers on new and/or enhanced equipment

Unit Standards Titles and Specific outcomes at NQF Level 2

Title: Perform a functional equipment test on Customer Premises Equipment

Specific Outcomes:

- Plan to perform the functional equipment test.
- Prepare to perform the functional equipment test.
- Conduct the functional equipment test.
- Conclude the functional equipment test.

Unit Standards Titles and Specific outcomes at NQF Level 3

Title: Operate complex test equipment

Specific Outcomes:

- Plan for operating complex test equipment.
- Prepare for operating complex test equipment.
- Operate complex test equipment.
- Conclude operating complex test equipment.

Title: Perform indoor wiring and cabling for CPE

Specific Outcomes:

- Plan the wiring of indoor cabling for customer premises equipment.
- Prepare the wiring of indoor cabling for customer premises equipment.
- Perform the wiring of indoor cabling for customer premises equipment.
- Conclude the wiring of indoor cabling for customer premises equipment.

Title: Organise resources

Specific Outcomes:

- Identifying required resources for customer premises equipment.
- Obtain required resources for customer premises equipment.
- Validate required resources for customer premises equipment.
- Control required resources for customer premises equipment.

Title: Provide advice & support to customer

Specific Outcomes:

- Plan to provide advice and support.
- Prepare to provide advice and support.
- Providing advice and support.
- Conclude advice and support.

Title: Perform maintenance on complex Customer Premises Equipment

Specific Outcomes:

- Plan the maintenance on complex customer premises equipment.
- Conduct the maintenance on complex customer premises equipment.
- Conclude the maintenance on complex customer premises equipment.

Title: Perform periodic quality testing of new or enhanced basic Customer Premises equipment

Specific Outcomes:

- Plan for performing quality testing of new or enhanced customer premises equipment.
- Prepare for performing quality testing of new or enhanced customer premises equipment.
- Conduct quality testing of new or enhanced customer premises equipment.
- Conclude quality testing of new or enhanced customer premises equipment.

Title: Commission complex customer equipment

Specific Outcomes:

- Plan the commissioning of customer premises equipment.
- Prepare the commissioning of customer premises equipment.
- Perform the commissioning of customer premises equipment.
- Conclude the commissioning of customer premises equipment.

Title: Cut over new customer equipment

Specific Outcomes:

- Plan the cut over of new customer premises equipment.
- Prepare the cut over of new customer premises equipment.
- Execute the cut over of new customer premises equipment.
- Conclude the cut over of new customer premises equipment.

Title: Install Multi line Customer Equipment

Specific Outcomes:

- Plan the installation of customer premises equipment.
- Prepare for the installation of customer premises equipment.
- Conduct the installation of customer premises equipment.
- Conclude the installation of customer premises equipment.

Unit Standards Titles and Specific outcomes at NQF Level 4

Title: Install PC based equipment

Specific Outcomes:

- Plan the installation of PC-Based customer premises equipment.
- Prepare for the installation of PC-Based customer premises equipment.
- Conduct the installation of PC-Based customer premises equipment.
- Conclude the installation of PC-Based customer premises equipment.

Title: Prepare site for installation

Specific Outcomes:

- Inspect the site for installation.
- Analyse the site's installation requirements.
- Plan for the site's installation requirements.
- Execute the preparation of the site's installation plan.
- Control the site's preparation activities.

Title: Perform a quality installation inspection

Specific Outcomes:

- Plan the quality installation inspection.
- Prepare the quality installation inspection.
- Conduct the quality installation inspection.
- Conclude the quality installation inspection.

Title: Recover customer equipment

Specific Outcomes:

- Plan the recovery of customer premises equipment.
- Prepare the recovery of customer premises equipment.
- Execute the recovery of customer premises equipment.
- Conclude the recovery customer premises equipment.

Title: Install an antenna and antenna feeder

Specific Outcomes:

- Plan the installation of antenna and antenna feeder.
- Prepare for the installation of antenna and antenna feeder.
- Conduct the installation of antenna and antenna feeder.
- Conclude the installation of antenna and antenna feeder.

Title: Perform an acceptance test on new equipment and sign off

Specific Outcomes:

- Plan the acceptance test on new customer premises equipment.
- Prepare the acceptance test on new customer premises equipment.
- Conduct the acceptance test on new customer premises equipment.
- Conclude the acceptance test on new customer premises equipment.

Unit Standards Titles and Specific outcomes at NQF Level 5

Title: Train customers on new and/or enhanced equipment

Specific Outcomes:

- Plan the training event with customers.
- Prepare the training event for customers.
- Conduct training on new and / or enhanced equipment.
- Conclude the training on new and / or enhanced equipment.

Unit Standards

- Field : Engineering, Manufacturing and Technology
- Sub-Field : Manufacturing and Assembly
- Purpose : These Telecommunications unit standards are part of the Certificate in Telecommunications for Customer Premises Equipment (NQF 2)

In the context of the telecommunications sector, this qualification will enable the installation and maintenance of basic Customer Premises Equipment. A qualifying learner will be capable of applying skills and knowledge within the telecommunications industry and other sectors on a national and international level. In addition they will be positioned to further their learning, practice and career within the telecommunications and other sectors, either at further levels or in other areas of practice.

Unit Standards at NQF Level 2

Title
• Communication & Language Studies
• Mathematics and Science
• Operate basic test equipment
• Perform a functional equipment test on basic Customer Premises Equipment
• Install single line Customer Premises Equipment
• Perform maintenance on basic Customer Premises Equipment
• Perform periodic quality testing of new or enhanced basic Customer Premises equipment

Unit Standards at NQF Level 3

Title
• Perform indoor wiring and cabling for CPE
• Provide advice & support to customer
• Organise resources

Unit Standards at NQF Level 4

Title
• Prepare site for installation
• Perform a quality installation inspection
• Schedule customer equipment installation
• Recover customer equipment

Unit Standards at NQF Level 5

Title
• Train customers on new and/or enhanced equipment

Unit Standards Titles and Specific outcomes at NQF Level 2**Title: Install Single Line Customer Premises Equipment**

Specific Outcomes:

- Plan the installation of customer premises equipment .
- Prepare for the installation of customer premises equipment.
- Conduct the installation of customer premises equipment.
- Conclude the installation of customer premises equipment.

Title: Perform Maintenance on Basic CPE

Specific Outcomes:

- Plan the maintenance on basic customer premises equipment.
- Conduct the maintenance on basic customer premises equipment.
- Conclude the maintenance on basic customer premises equipment.

Title: Operate Basic Test Equipment

Specific Outcomes:

- Plan for operating basic test equipment.
- Prepare for operating basic test equipment.
- Operate basic test equipment.
- Conclude operating basic test equipment.

Title: Perform a Functional Equipment Test on Basic Customer Premises Equipment

Specific Outcomes:

- Plan to perform the functional equipment test.
- Prepare to perform the functional equipment test.
- Conduct the functional equipment test.
- Conclude the functional equipment test.

Title: Perform Periodic Quality Testing of New or Enhanced Basic Customer Premises Equipment

Specific Outcomes:

- Plan for performing quality testing of new or enhanced customer premises equipment.
- Prepare for performing quality testing of new or enhanced customer premises equipment.
- Conduct quality testing of new or enhanced customer premises equipment.
- Conclude performing quality testing of new or enhanced customer premises equipment.

Unit Standards Titles and Specific outcomes at NQF Level 3**Title: Perform Indoor Wiring and Cabling for CPE**

Specific Outcomes:

- Plan the wiring of indoor cabling for customer premises equipment.
- Prepare the wiring of indoor cabling for customer premises equipment.
- Perform the wiring of indoor cabling for customer premises equipment.
- Conclude the wiring of indoor cabling for customer premises equipment.

Title: Provide Advice & Support to Customer

Specific Outcomes:

- Plan to provide advice and support.
- Prepare to provide advice and support.
- Providing advice and support.
- Conclude advice and support.

Title: Organise Resources

Specific Outcomes:

- Identifying required resources for customer premises equipment.
- Obtain required resources for customer premises equipment.
- Validate required resources for customer premises equipment.
- Control required resources for customer premises equipment.

Unit Standards Titles and Specific outcomes at NQF Level 4**Title: Prepare Site for Installation**

Specific Outcomes:

- Inspect the site for installation.
- Analyse the site's installation requirements.
- Plan for the site's installation requirements.
- Execute the preparation of the site's installation plan.
- Control the site's preparation activities.

Title: Perform a Quality Installation Inspection

Specific Outcomes:

- Plan the quality installation inspection.
- Prepare the quality installation inspection.
- Conduct the quality installation inspection.
- Conclude the quality installation inspection.

Title: Schedule Customer Equipment Installation**Specific Outcomes:**

- Plan the schedule for installing customer premises equipment.
- Prepare the schedule for installing customer premises equipment.
- Schedule the workload for installing customer premises equipment.
- Conclude the schedule for installing customer premises equipment.

Title: Recover Customer Equipment**Specific Outcomes:**

- Plan the recovery of customer premises equipment.
- Prepare the recovery of customer premises equipment.
- Execute the recovery of customer premises equipment.
- Conclude the recovery customer premises equipment.

Unit Standards Titles and Specific outcomes at NQF Level 5**Title: Train Customers on New and / or Enhanced Equipment****Specific Outcomes:**

- Plan the training event with customers.
- Prepare the training event for customers.
- Conduct training on new and / or enhanced equipment.
- Conclude the training on new and / or enhanced equipment.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 338

22 March 2002

In accordance with regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Manufacturing and Assembly

Registered by NSB 06, Manufacturing, Engineering and Technology, publishes the following qualifications and unit standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purposes of the qualifications, and the titles and specific outcomes of the unit standards upon which qualifications are based. The full qualifications and unit standards can be accessed via the SAQA web-site at www.saga.co.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, 659 Pienaar street, Brooklyn, Pretoria.

Comment on the unit standards should reach SAQA at the address *below and no later than 20 April 2002*. All correspondence should be marked **Standards Setting – SGB for Manufacturing and Assembly** and addressed to

The Director: Standard Setting and Development
SAQA

Attention: Mr. D Mphuthing

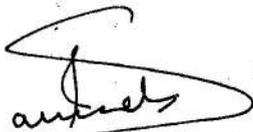
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✓✓ SAMUEL B.A. ISAACS
EXECUTIVE OFFICER

SOUTH AFRICAN QUALIFICATIONS AUTHORITY**National Introductory Certificate to Mining and Minerals****Field:** NSB 06: Manufacturing, Engineering and Technology**Sub-field:** Fabrication and Extraction**Level:** 1**Credit:** 120 credits**Issue date:****Review date:****Rationale of the qualification**

The majority of the candidates for this qualification are likely to be working in the mining and minerals sector. The qualification will give them the opportunity to acquire the essential knowledge needed to enter further formal qualifications on the NQF.

There is also a critical need in the industry to provide learners with the opportunity to overcome the gap between ABET Level 3 and NQF Level 2.

Purpose:

This qualification is aimed at people who work or intend to work within a mineral extraction context, and who seek to acquire recognition in essential skills in mining operations.

The qualification is designed to be flexible and accessible so that learners are able to acquire the competencies required to form the basis of all further life-long learning.

People credited with this qualification are able to:

- communicate in a variety of ways
- use mathematics in real life situations
- apply basic knowledge and understanding of scientific concepts
- apply basic knowledge and understanding of safety, health and environment awareness issues
- apply basic knowledge of business principles relating to Mining & Minerals sector
- use basic IT knowledge to function in the workplace
- use and apply basic principles of HR & IR

Opportunities for specialisation are:

- Mining
- Metallurgy
- Engineering
- Other areas:
 - Technical Services
 - Survey
 - Geology
 - Rock mechanics
 - Assay

Access to the Qualification

This qualification is open to anyone with access to learning and work experience opportunities in the areas reflected in the exit level outcomes and unit standards. It is advisable that candidates should already have addressed the areas reflected under "learning assumptions" before embarking on learning towards this qualification, although the exact starting point depends on the available resources for learning.

Learning assumed to be in place

It is assumed that candidates embarking on learning towards this qualification are already competent in the following areas:

- ABET Level 3 – fundamentals
- Or other equivalent qualifications

Exit Level Outcomes**Fundamental exit level outcomes:**

- Communicate in a variety of ways
- Use mathematics in real life situations

See Annexure A for the list of unit standards that relate to these exit level outcomes.

Core exit level outcomes:

- Apply basic knowledge and understanding of Scientific concepts.
- Show a basic understanding of Occupational Health & Safety.
- Demonstrate a knowledge of basic Business Science principals related to MMS.
- Show knowledge of basic Life Orientation skills.
- Show capability to use basic IT in workplace.
- Use and apply basic HR / IR principals.

See Annexure B for the list of unit standards that relate to these exit level outcomes. There are further generic standards that are required and are listed in Annexure B.

Elective exit level outcomes

- Understand mining processes such as drilling, blasting, cleaning, stoping, transport And other related issues as well as issues related to Mining Science.
- Demonstrate a critical understanding of relative Engineering Technology and knowledge of principals of basic drawings.
- Demonstrate a critical understanding and knowledge of material handling in a plant.
- Understand the scope of chemistry handled within the workplace.

See Annexure C for the list of unit standards that relate to these exit level outcomes. Candidates may also select individual unit standards from the list in Annexure C.

Credits and rules of combination

Fundamental (See Annexure A for the detail):

- 20 Communications credits from the list specified
- 18 Mathematics credits from the list specified

Core (See Annexure B for the detail):

- All 50 credits from the list of standards provided in Annexure B

Elective (See Annexure C for the detail):

- A minimum of 12 credits specified from the specialisation areas of the candidate's choice
- A Minimum of 20 credits from Unit Standards applicable to individuals.

Summary of credit composition

	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
LEVEL 1	38	50		
LEVEL 2				
LEVEL 3				
LEVEL 4				
TOTAL	38	50	32	120

Exit Level Outcomes

Exit Level 1: *Communicate in a variety of ways*

Associated Assessment Criteria

- Show a critical awareness of language usage.
- Engage with aesthetic, effective, cultural and social values in texts
- Identify, access, analyse, use and present information.
- Use appropriate communication skills, conventions and structures for specific purposes and situations.
- Explore and use a variety of strategies to learn.
- Engage with meaning, organization and structure of texts.

Exit Level 2: *Use mathematics in real life situations.*

Associated Assessment Criteria

- Working with numbers in various contexts
- Work with patterns in various contexts.
- Work with measurement in a variety of contexts
- Collect, analyse, use and communicate numerical data
- Use algebraic notation, conventions and terminology to solve problems.
- Use maps to access and communicate information concerning routes, locations and direction.

Exit Level 3: To apply a basic knowledge of specific concepts

Associated Assessment Criteria

- Demonstrate a critical awareness of the self as a physical, mental, intellectual and social being with a particular belief system.
- Understand human mental and physical development, health and sexuality and their consequences.
- Display critical insight into one-to-one; family and community dynamics and value systems.
- Display critical understanding of social diversity
- Display a critical understanding of human rights and alternative perspectives.
- Practice effective self management skills.
- Demonstrate skills that relate to a safe and secure environment.

Exit Level 4: Understand safety and health procedures

Associated Assessment Criteria

- Demonstrate an understanding of the procedures related to accidents and incidents.
- Demonstrate an understanding of a workplace hazard, identification and treatment thereof.
- Understand and describe accidents, injuries and treatment.
- Demonstrate basic knowledge of emergency preparedness and response.
- Demonstrate a basic knowledge of systems, causes and implication of AIDS, TB, STD's and substance abuse in the workplace.

Exit Level 5: Knowledge of basic business principals related to MMS

Associated Assessment Criteria

- Demonstrate knowledge pertaining to the basic process in MMS as a business.
- Demonstrate an understanding of the individual role of responsibility within the bigger business.
- Demonstrate a basic knowledge of starting a small business

Exit Level 6: Basic IT Skills

Associated Assessment Criteria

- Demonstrate a basic understanding and knowledge of the application of technology within the workplace.
- Demonstrate basic functional ability to use a Personal Computer.

Exit Level 7: Management

Associated Assessment Criteria

- Demonstrate a basic understanding of the concept of Employment Equity and Diversity Management within the workplace
- Demonstrate basic understanding and knowledge of the corrective action procedure specific to the workplace

- Demonstrate a basic understanding and knowledge of people management in the workplace
- Demonstrate a basic understanding and knowledge of the principles related to Quality Management of workplace process

International comparability.

No evidence exists of any other related qualification internationally, however the contents of the qualification have been successfully implemented without formal recognition within the MMS.

Integrated Assessment

For award of the qualification, a candidate must achieve each unit standard.

In addition, candidates must demonstrate the ability to engage in the operations selected in an integrative way, dealing with divergent and "random" demands related to these work operations, effectively. Evidence is required that the candidate is able to achieve the purpose of the qualification as a whole at the time of the award of the qualification.

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

The qualification can act as a springboard from which people may progress to other qualifications in mining, mining-related sub-fields and mining supervision.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. The bulk of the unit standards are vocationally based and adequate facilities must be provided for the learner to practise and gain experience in a protected environment prior to assessment.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The assessor must have contextual competence in the form of a certificate, qualification or experience related to the unit standards in which assessments intend being conducted.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable,

then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.

- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.
- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.
- *Systematic:* Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open:* Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent:* The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
- All Core unit standards are compulsory (107 Credits)
- A selection of Elective unit standards (minimum of 10 Credits)

These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

ANNEXURE A**FUNDAMENTAL UNIT STANDARDS**

The following unit standards are fundamental to the learning process in terms of the exit level outcomes:

Communication

Number	Title	Level	Credit
Exit level outcomes: Communicate in a variety of ways			
Com / 001	Show a critical awareness of language usage.	1	3
Com / 002	Engage with aesthetic, effective, cultural and social values in texts.	1	3
Com / 003	Identify, access, analyse, use and present information.	1	4
Com / 004	Use appropriate communication skills, conventions and structures for specific purposes and situations.	1	4
Com / 005	Explore and use a variety of strategies to learn.	1	3
Com / 006	Engage with meaning, organization and structure of texts.	1	3
	TOTAL		20

Mathematics/Numeracy

Number	Title	Level	Credit
Exit level outcomes: Use mathematics in real life situations			
Math / 001	Working with numbers in various contexts.	1	6
Math / 002	Work with patterns in various contexts.	1	4
Math / 004	Work with measurement in a variety of contexts	1	2
Math / 005	Collect, analyse, use and communicate numerical data.	1	2
Math / 007	Use algebraic notation, conventions and terminology to solve problems.	1	3
Math / 008	Use maps to access and communicate information concerning routes, locations and direction.	1	1
	TOTAL		18

ANNEXURE B**CORE UNIT STANDARDS**

The following unit standards are generic to the workplace or society in general and are core to the learning process in the learning of exit level outcomes.

Natural Science:

Number	Title	Level	Credit
Exit level outcomes: To apply a basic knowledge of specific concepts			
NatSci. 001	Demonstrate an understanding of the concept of science.	1	2
NatSci. 002	Use an investigation to explain a phenomenon or solve problems related to natural science.	1	4
NatSci. 003	Demonstrate an understanding of fundamental concepts and principles in natural science.	1	5
NatSci. 004	Demonstrate an understanding of how scientific skills and knowledge could contribute to sustainable use of resources.	1	2
NatSci. 005	Demonstrate an understanding of the impact of scientific innovation on quality of life.	1	1
	TOTAL		14

Work / Life Orientation:

Number	Title	Level	Credit
Exit level outcomes: Understanding and awareness of issues related to life skills			
LO / 001	Demonstrate a critical awareness of the self as a physical, mental, intellectual and social being with a particular belief system.	1	2
LO / 002	Understand human mental and physical development, health and sexuality and their consequences.	1	2
LO / 003	Display critical insight into one-to-one; family and community dynamics and value systems.	1	2
LO / 004	Display critical understanding of social diversity	1	2
LO / 005	Display a critical understanding of human rights and alternative perspectives.	1	2

LO / 006	Practice effective self management skills.	1	2
LO / 007	Demonstrate skills that relate to a safe and secure environment.	1	2
	TOTAL		14

Safety and Health:

Number	Title	Level	Credit
Exit level outcomes: To understand safety and health procedures			
	Demonstrate an understanding of the procedures related to accidents and incidents.	1	1
	Demonstrate an understanding of a workplace hazard, identification and treatment thereof.	1	1
	Understand and describe accidents, injuries and treatment.	1	2
	Demonstrate basic knowledge of emergency preparedness and response.	1	2
	Demonstrate a basic knowledge of systems, causes and implication of AIDS, TB, STD's and substance abuse in the workplace.	1	4
	Total		10

Business Science:

Number	Title	Level	Credit
Exit level outcomes: Knowledge of basic business principals related to MMS			
	Demonstrate knowledge pertaining to the basic process in MMS as a business.	1	4
	Demonstrate an understanding of the individual role of responsibility within the bigger business.		4
	Demonstrate a basic knowledge of starting a small business		2
	Total		10

Basic IT Skills:

Number	Title	Level	Credit
Exit level outcomes: Skills to function within the workplace			
	Demonstrate a basic understanding and knowledge of the application of technology within the workplace.	1	2
	Demonstrate basic functional ability to use a Personal Computer.	1	4
	Total		6

Management:

Number	Title	Level	Credit
Exit level outcomes: Understanding of Employment Equity, Diversity and Quality Management and other issues related to the workplace			
	Demonstrate a basic understanding of the concept of Employment Equity and Diversity Management within the workplace	Level 1	1
	Demonstrate basic understanding and knowledge of the corrective action procedure specific to the workplace	Level 1	2
	Demonstrate a basic understanding and knowledge of people management in the workplace	Level 1	3
	Demonstrate a basic understanding and knowledge of the principles related to Quality Management of workplace process	Level 1	2
	Total		8

ANNEXURE C**ELECTIVE UNIT STANDARDS**

Candidates are required to achieve all the credits from any one of the following main streams.

Engineering Technology:

Number	Title	Level	Credit
Exit level outcomes: Basic knowledge of Engineering Technology			
Tech 001	Demonstrate a critical understanding of the role and impact of technology in society.	1	3
Tech 002	Understanding and apply the technological process to solve problems.	1	1
Tech 003	The learner as a critical consumer of Technological products and systems.	1	1
Tech 004	Know, use and select various modes to communicate technological ideas.	1	2
Tech 005	Understand and apply technological knowledge and skills in systems and control.	1	3
Tech 006	Understand and apply technological knowledge and skills in structures.	1	2
Tech 007	Understand and apply technological knowledge and skills in process.	1	2
Tech 008	Know, select and use materials, tools and equipment safely for technological purposes.	1	1
Tech 009	Energy in technological product and systems.	1	1
	Demonstrate an understanding of the uses of applicable hand tools.	1	
	Total		16

Engineering Drawings:

Number	Title	Level	Credit
Exit level outcomes: Basic knowledge of Engineering Drawings			
	Demonstrate knowledge of basic principles of engineering drawings.	1	
	Demonstrate knowledge of characteristics, importance, use and care of drawing equipment.	1	
	Demonstrate knowledge of the application of line work.	1	

	Demonstrate knowledge of Free Hand Drawing.	1	
	Demonstrate knowledge of construction of geometric shapes.	1	
	Demonstrate knowledge of the principles of basic dimensioning.	1	
	Total		16

Mining: Underground Handrock

Candidates must obtain a maximum of 32 credits from the options within the different Mining streams.

Number	Title	Level	Credit
Exit level outcomes: Basic knowledge of basic supporting activities			
	Knowledge and understanding of basic strata control principles	1	
	Install timber support	1	
	Install and remove mechanical support / prop	1	
Exit level outcome: Basic knowledge of drilling activities			
	Demonstrate a knowledge of the process of face preparation for hole marking.	1	
Exit level outcomes: Basic knowledge of blasting activities			
	Transport and store explosives in the work place.	1	1
	Identify and understand the use of explosives and / or chemicals.	1	
Exit level outcomes: Basic knowledge of cleaning activities			
	Install a winch signaling arrangement in an underground workplace.	1	1
	Join steel ropes by means of splicing.	1	
	Install scraper rigs and rig scraper ropes in an underground workplace.	2	2
Exit level outcomes: Basic knowledge of ancillary services in mines			
	Install and remove pipes and accessories.	1	
	Install ventilation ducting in underground workings.	1	
	Transport material by means of a mono rope systems.	1	
Exit level outcomes: Basic knowledge of development activities			
MnH-G008	Extend tracks by means of jump sets and sliding rails.	1	2
MnH-G047	Install a set of rails plus drain in an underground workplace.	2	2
MnH-G063	Install grout support.	1	1
Exit level outcome: Basic knowledge of stoping activities			
MnH-G064	Install a blasting barricade.	1	1

Exit level outcome: Basic knowledge of constructing activities			
MnH-G067	Construct a winch bed	1	1
Exit level outcomes: Basic knowledge of transport activities			
MnH-G040	Re-rail a track bound unit	1	1
MnH-G044	Perform transport duties by means of track bound units underground	1	1
MnH-G071	Transport of explosives by means of rolling stock	1	1
	Transport of timber by means of rolling stock	1	
Exit level outcomes: Basic knowledge of applicable tools			
	Demonstrate an understanding of the uses of applicable hand tools	1	
Exit level outcomes: Basic knowledge of ventilation activities			
	Describe and understand how the principles of mine ventilation function <ul style="list-style-type: none"> • Intake and return air • Legal requirements • Failure of ventilation 	1	
	Describe and understand the device used to control mine ventilation <ul style="list-style-type: none"> • Doors, regulators, brattices and curtains 	1	
OcH-G012	Issue and retrieve personal monitoring equipment	1	1

Number	Title	Level	Credit
Exit level outcome: Basic knowledge of prevention of dust			
	Identify and describe the formation and prevention of dust encountered in mines <ul style="list-style-type: none"> • properties • effects on humans • sources • minimising / allaying 	1	
Exit level outcomes: Basic knowledge of gasses			
	Identify, describe and display knowledge on gases encountered in mines <ul style="list-style-type: none"> • explosive • toxic 	1	
	Demonstrate knowledge of the definition and composition of mine air <ul style="list-style-type: none"> • legal requirements / permissible quantities 	1	
Exit level outcome: Basic knowledge of heat			
	Identify, describe and understand sources and controlling of heat underground	1	

Exit level outcome: Basic knowledge of noise			
	Identify and describe sources and controlling of noise in working place	1	
Exit level outcome: Basic knowledge of applicable instruments			
	Identify and describe instruments using the correct terminology	1	

Coal Mining

Candidates are required to achieve 32 credits from the options within Coal Mining streams.

Number	Title	Level	Credit
Exit level outcome: Geology			
	Give an elementary description within the aid of diagrams, of the formation of coal bearing strata	1	
	Describe a typical coal section by means of a sectional diagram	1	
	Give an elementary description of the various coal fields		
Exit level outcome: Methodology coal mining			
	Describe and understand basic mining methods in coal by using relevant terminology	1	
Exit level outcome: Ventilation			
	Demonstrate a basic knowledge of ventilation appliances	1	
Exit level outcome: Gasses			
	Demonstrate a basic knowledge of applicable gasses	1	
Exit level outcome: Terminology			
	Demonstrate a basic knowledge of applicable terminology pertaining to collieries	1	

Candidates are required to achieve 32 credits from the options within metallurgy stream operation theory.

Number	Title	Level	Credit
Exit level outcomes: Basic knowledge of plant operation theories			
	Understand and demonstrate a basic knowledge of material handling in a plant	1	
	Understand and know the specific plant parameters	1	
	Understand and demonstrate knowledge pertaining to the separation of material by means of crushing	1	
	Demonstrate a basic knowledge of geological concepts relating to the hand sorting of materials	1	
	Understand and demonstrate knowledge pertaining to plant operating philosophies	1	
	Understand and demonstrate knowledge pertaining to the grinding of material by means of a mill	1	
	Understand and demonstrate knowledge pertaining to the separation of material by means of cyclones	1	
	Understand and demonstrate knowledge pertaining to the separation of material by means of thickening	1	
	Understand and demonstrate knowledge pertaining to the separation of material by means of filtration	1	
	Understand and demonstrate a basic knowledge pertaining to smelting process	1	
	Discuss sampling and evaluation and assessing of data in plant	1	
	Identify and explain pipes, fittings and valves used in a plant (using relevant terminology)	1	
	Demonstrate basic knowledge on the types of and operating procedures of pumps	1	
	Demonstrate a basic knowledge of the types of reagents used in the metallurgical process	1	
	Demonstrate a basic knowledge of applicable rigging and slinging	1	
	Demonstrate an understanding of the uses of applicable hand tools	1	
Exit level outcomes: Basic knowledge of Industrial Chemistry			
	Demonstrate the ability to describe the scope of chemistry within the workplace	1	

	Understand, explain and categorise the concept of matter	1	
	Demonstrate and understand chemical reactions	1	
	Demonstrate and understand basic concepts of electricity	1	
	Demonstrate an understanding of chemical formulae	1	
	Perform the balancing of chemical equations	1	
	Demonstrate basic knowledge pertaining to acids, bases and salts	1	
	Demonstrate a knowledge of pertaining to the taking of samples in a laboratory	1	
	Demonstrate an understanding of handling chemicals in a laboratory	1	

Exit level outcomes: Basic knowledge of Engineering Technology

Tech 001	Demonstrate a critical understanding of the role and impact of technology in society.	1	3
Tech 002	Understanding and apply the technological process to solve problems.	1	1
Tech 003	The learner as a critical consumer of Technological products and systems.	1	1
Tech 004	Know, use and select various modes to communicate technological ideas.	1	2
Tech 005	Understand and apply technological knowledge and skills in systems and control.	1	3
Tech 006	Understand and apply technological knowledge and skills in structures.	1	2
Tech 007	Understand and apply technological knowledge and skills in process.	1	2
Tech 008	Know, select and use materials, tools and equipment safely for technological purposes.	1	1
Tech 009	Energy in technological product and systems.	1	1
	Demonstrate an understanding of the uses of applicable hand tools.	1	

Candidates will be required to achieve a total of 32 credits on Level 1 within one of the following areas:

- Technical Services
 - Survey
 - Geology
 - Rock Mechanics
- Assay

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 339

22 March 2002

National Certificate in Mining Operations: Underground Coal**Field:** Manufacturing Engineering and Technology**Sub-field:** Fabrication and Extraction**Level:** 3**Credit:** 120**Issue date:****Review date:****Rationale of the qualification**

The majority of the candidates for this qualification are likely to be working in the mining and minerals sector. The qualification will give them the opportunity to balance their practical skills with the essential knowledge needed to earn a formal qualification in coal mining operations.

There is also a critical need in the industry to identify and recognise people who are able to conduct the essential operations associated with efficient and safe coal mining extraction in at least one of Blasting operations, Continuous Mining operations or Long Wall operations.

Purpose:

This qualification is aimed at people who work or intend to work within a coal mining context and seek recognition for essential skills in coal mining operations.

Recipients of this qualification have the knowledge and skills to conduct the essential operations associated with safe mining in any one of the following specialisation areas in underground coal mines:

- Underground coal - Blasting operations,
- Underground coal - Continuous miner operation, or
- Underground coal - Long Wall mining operations.

The qualification is designed to be flexible and accessible so that people are able to demonstrate the competencies required to work safely in an underground coal mine in general and effectively and safely in one of the Blasting, Continuous Mining or Long Wall specialisation areas.

People credited with this qualification are able to:

- Conduct blasting operations in an underground coal mine
- Carry out mining activities in an underground coal mine

- Mine Coal in a Long Wall section
- Mine Coal in a Continuous miner section

Access to the Qualification

This qualification is open to anyone with access to learning opportunities and work experience in the areas reflected in the exit level outcomes and unit standards. It is advisable that candidates should already have addressed the areas reflected under "learning assumptions" before embarking on learning towards this qualification, although the exact starting point depends on the available resources for learning.

Learning assumed to be in place

It is assumed that candidates embarking on learning programmes towards this qualification are already competent in the following areas:

- Knowledge and ability to work underground.
- Knowledge of specific ventilation.
- Knowledge of mine standards and procedures.
- ABET level 3 in language, literacy and communication

Exit Level Outcomes

This qualification has the following exit level outcomes, the details of which are indicated in the Annexures:

Fundamental exit level outcomes

- Communicate in a variety of ways
- Use mathematics in a real life situations

See Annexure A for the list of unit standards that relates to these level outcomes

Core exit level outcomes

- Sustain health and safety in the workplace
- Conduct blasting operations in an underground coal mine
- Carry out mining activities in an underground coal mine

See Annexure B for the list of unit standards that relates to these exit level outcomes. There are further generic unit standards that are required and are listed in Annexure B.

Elective exit level outcomes

- Load and transport coal from underground
- Conduct drilling operations in an underground coal mine

See Annexure C for the list of unit standards that relates to these exit level outcomes. Candidates may also select individual unit standards from the list in Annexure C.

Exit Level Outcomes**Exit Level 1: Language and Communications standards****Associated Assessment Criteria**

- Be assertive in a range of specified situations
- Communicate with people from other cultures
- Participate in a team or group to complete routine tasks
- Write letters and reports
- Answer supervisor enquiries.
- Communicate within an organisational context
- Recognise and apply non-verbal communication
- Demonstrate knowledge of workplace communication requirements
- Read personal payslip and employee file
- Build rapport with colleagues
- Apply listening techniques
- Participate in groups and/or teams to gather ideas and information
- Participate in groups and/or teams to recommend solutions to problems
- Present ideas and information orally to a specified audience in a predictable situation
- Be interviewed in a formal situation
- Communicate information in a specified workplace

Exit Level 2: Mathematics standards**Associated Assessment Criteria**

- Solve problems which require calculations with whole numbers
- Solve problems using calculations with numbers expressed in different forms
- Read and interpret information presented in tables and graphs
- Recognise geometric forms in mining contexts and operation
- Read and convert basic units of measure used in mining or Mining & Minerals Support Services
- Use standard units of measurement
- Perform calculations for the workplace

Exit Level 3: Carry out mining activities in an underground coal mine.**Associated Assessment Criteria**

- Sound and bar down roof and side walls in an underground coal mine
- Demonstrate an understanding of the prevention of flammable gas ignition through the use of flame proofing in an underground coal mine.
- Conduct statutory examination in an underground coal mine.
- Test, monitor and control the common gases in an underground coal mine.
- Ventilate a production section in an underground coal mine.
- Conduct visual inspection on flameproof equipment in an underground coal mine.
- Demonstrate knowledge of mine health and safety act, regulations and definitions.
- Control dust in a production section in an underground coal mine.
- Demonstrate knowledge and ability to work in an underground coal mine.
- Demonstrate knowledge of strata control principle.

Exit Level 4: Conduct blasting operations in an underground coal mine**Associated Assessment Criteria**

- Control operations in a blasting section in an underground coal mine
- Treat misfires and sockets in an underground coal mine
- Conduct blasting operations in an underground coal mine
- Charge up a face for blasting in an underground coal mine

Exit Level 5: Mine Coal in a Long Wall section**Associated Assessment Criteria**

- Support roof using hydraulic chock shields in a Long Wall mining section in an underground coal mine
- Control operations in a long wall section in an underground coal mine

Exit Level 6: Continuous Miner Operations**Associated Assessment Criteria**

- Control operations in a continuous miner section in an underground coal mine

International comparability.

This qualification and the component unit standards have been compared with similar qualifications from the following countries:

- New Zealand
- Australia.

In addition, the abilities described in the unit standards have also been compared with the findings of related experiences and practical exercises carried out in the sub-field of Mining and Minerals.

In general this qualification and its component unit standards compare well with their international counterparts. The only differences are in formatting and scope of coverage or focus. The qualification found to be the most comparable to this one is the Australian qualification entitled Certificate in Mining Operations.

Integrated Assessment

For awarding of the qualification, a candidate must achieve each unit standard for one of the specialisation areas, stoping and developing, horizontal transport or horizontal transport services.

The assessment criteria in the unit standards are performance-based (applied competence as opposed to required knowledge only). This means that workplace experience may be recognised when awarding credits towards this qualification.

The candidate must demonstrate the ability to effectively engage in operations selected in an integrative way, dealing with divergent and "random" demands related to the work operations

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

The qualification can act as a springboard from which people may progress to other qualifications in mining, mining - related sub-fields and mining supervision.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. Particular accreditation requirements related to this qualifications are:
 - Underground training environment
 - Have all the relevant training material and aids.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures. Particular moderation requirements related to this qualification are:
 - The moderator to be competent in moderation and assessment
 - Moderator to comply with the requirements of the ETQA of moderation
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The following criteria are specified for assessors concerning the technical aspects of the qualification:
 - Must be qualified to conduct an assessment
 - Must have the technical background in mining, in either Blasting Operations, Long Wall Mining or Continuous Mining Operations

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.

- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.
- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.
- *Systematic:* Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open:* Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent:* The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
 - All Core unit standards are compulsory (107 Credits)
 - A selection of Elective unit standards (minimum of 10 Credits)
- These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

ANNEXURE A

FUNDAMENTAL

Language and Communications standards

Candidates must select at least 20 credits from:

	Level	Credit
Be assertive in a range of specified situations	2	4
Communicate with people from other cultures	2	2
Participate in a team or group to complete routine tasks	1	2
Write letters and reports	3	4
Answer supervisor enquiries	2	2
Communicate within an organisational context	2	2
Recognise and apply non-verbal communication	3	4
Demonstrate knowledge of workplace communication requirements	2	2
Read personal payslip and employee file	1	2
Build rapport with colleagues	2	2
Apply listening techniques	2	4
Participate in groups and/or teams to gather ideas and information	2	3
Participate in groups and/or teams to recommend solutions to problems	4	3
Present ideas and information orally to a specified audience in a predictable situation	3	3
Be interviewed in a formal situation	2	2
Communicate information in a specified workplace	2	3

Mathematics standards

Candidates must select at least 16 credits from:

	Level	Credit
Solve problems which require calculations with whole numbers	2	4
Solve problems using calculations with numbers expressed in different forms	2	8
Read and interpret information presented in tables and graphs	2	8
Recognise geometric forms in mining contexts and operation	2	2
Read and convert basic units of measure used in mining or Mining & Minerals Support Services	2	2
Use standard units of measurement	2	3
Perform calculations for the workplace	2	4

ANNEXURE B

CORE

Generic to the workplace and society. The following unit standards are generic to the workplace or society in general. Candidates are required to achieve all the following credits:

Title	Level	Credit
Demonstrate basic knowledge of AIDS	2	3
Supervision?	3	5
Protect Health & Safety in the Workplace	3	3

Core to underground coal mining

The following unit standards are core to underground coal mining in terms of the exit level outcome:

Carry out mining activities in an underground coal mine.

Candidates are required to achieve all the following credits:

Unit Standard Number	Unit Standard Title	Level	Credits
MnC-G-004	Sound and bar down roof and side walls in an underground coal mine.	2	4
MnC-G-005	Demonstrate an understanding of the prevention of flammable gas ignition through the use of flame proofing in an underground coal mine.	2	5
MnC-G-008	Conduct statutory examination in an underground coal mine.	3	3
MnC-G-010	Test, monitor and control the common gases in an underground coal mine.	3	17
MnC-G-011	Ventilate a production section in an underground coal mine.	2	5
MnC-G-020	Conduct visual inspection on flameproof equipment in an underground coal mine.	1	2
MnC-G-029	Demonstrate knowledge of mine health and safety act, regulations and definitions.	2	5
MnC-G-030	Control dust in a production section in an underground coal mine.	2	3
MnC-G-031	Demonstrate knowledge and ability to work in an underground coal mine.	1	8

MnC-G-037	Demonstrate knowledge of strata control principle	3	3
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Blasting operations Specialisation Area

The following unit standards are core to blasting operations are core to blasting operations, in terms of the exit level outcome:

Conduct blasting operations in an underground coal mine.

Unit Standard Number	Unit Standard Title	Level	Credits
MnC-G-023	Control operations in a blasting section in an underground coal mine	3	15
MnC-G-022	Treat misfires and sockets in an underground coal mine	3	6
MnC-G-028	Conduct blasting operations in an underground coal mine	3	6
MnC-G-035	Charge up a face for blasting in an underground coal mine	3	5

Long Wall Operations Specialisation Area

The following unit standards are core to long wall operations, in terms of the exit level outcome:

Mine Coal in a Long Wall section

Unit Standard Number	Unit Standard Title	Level	Credits
MnC-G-018	Support roof using hydraulic chock shields in a Long Wall mining section in an underground coal mine	1	3
MnC-G-036	Control operations in a long wall section in an underground coal mine	3	12

Continuous Miner Operations

The following unit standards are core to continuous miner operations, in terms of the exit level outcome:

Mine Coal in a continuous miner section

Unit Standard Number	Unit Standard Title	Level	Credits
MnC-G-044	Control operations in a continuous miner section in an underground coal mine	3	8

ANNEXURE C

ELECTIVES

At least 5 credits from the following unit standards must be selected in terms of exit level outcome:

Carry out mining activities in an underground coal mine

Unit Standard Number	Unit Standard Title	Level	Credits
MnC-G-009	Load coal using a gathering arm loader in an underground coal mine.	2	7
MnC-G-013	Transport coal using shuttle-mining equipment in an underground coal mine.	2	8
MnC-G-021	Operate a mobile compressor to deliver compressed air in an underground coal mine.	?	?
MnH-G-025	Drill holes by means of a hand held rock drill machine.	2	4
MnC-G-024	Drill coal face using mobile drilling equipment in an underground coal mine.	2	8
MnC-G-025	Drill coal face using hand held drilling equipment in an underground coal mine.	2	8
MnC-G-026	Cut coal face using universal type coal cutter in an underground coal mine.	2	13
MnC-G-027	Cut coal face using arc wall type coal cutter in an underground coal mine.	2	4
MnC-G-022	Treat misfires and sockets in an underground coal mine	3	6
MnC-G-035	Charge up a face for blasting in an underground coal mine	3	5
MnC-G-001	Cut coal face using a continuous mining equipment in an underground coal mine	3	8

At least 5 credits from the following unit standards must be selected in terms of exit level outcome:

Mine coal in a continuous miner section

Unit Standard Number	Unit Standard Title	Level	Credits
MnC-G-001	Cut coal face using continuous mining equipment in an underground coal mine	3	28
MnC-G-012	Transport coal using a continuous haulage system in an underground coal mine	2	6
MnC-G-013	Transport coal using shuttle mining equipment in an underground coal mine	2	8

The following unit standards are elective to individuals

The candidate must choose a total of at least 5 credits

Unit Standard Number	Unit Standard Title	Level	Credits
MnC-G-003	Support roof and side walls using a roof bolter machine in an underground coal mine	2	13
MnC-G-006	Install a ventilation curtain in an underground coal mine	1	1
MnC-G-007	Place and operate an auxiliary fan in an underground coal mine	1	1
MnC-G-014	Operate belt conveyor to convey coal in an underground coal mine	1	2
MnC-G-015	Transport material and equipment using a Load Haul Dumper in an underground coal mine	2	5
MnC-G-016	Supervise the installation and operation of belt conveyors in an underground coal mine	2	15
MnC-G-017	Support roof using mine pole in an underground coal mine	1	2
MnC-G-019	Feed and break coal using a feeder breaker in an underground coal mine	1	3
MnC-G-033	Apply stonedust using stonedust equipment in an underground coal mine	2	6
MnC-G-034	Pump water using electrically operated pumping equipment in an underground coal mine	1	3
MnC-G-038	Transport personnel, material or equipment using flameproof diesel machines in an underground coal mine.	2	12
Other SGG	Pollution control	2	3
Other SGG	Basic engineering	2	3
Other SGG	Basic budgeting	2	3
Other SGG	Employee relations	3	3
Other SGG	Occupational health and hygiene	3	3

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 340

22 March 2002

National Certificate: Surface Mining Rockbreaking**Field:** Manufacturing, Engineering and Technology**Sub-field:** Fabrication and Extraction**Level:** 3**Credit:** 134 credits**Issue date:****Review date:****Rationale of the qualification**

The majority of the candidates for this qualification are likely to be working in the mining and minerals sector. This qualification will give them the opportunity to balance their practical skills with the essential knowledge needed to earn a formal qualification in open pit or strip mining operations.

There is also a critical need in the industry to identify people who are able to conduct the essential operations associated with efficient and safe mineral extraction in open pit and strip-mining operations.

Purpose:

This qualification is aimed at people who work or intend to work within a surface mining mineral extraction context, and who seek recognition for essential skills in rockbreaking operations.

Recipients of this qualification know about and are able to conduct the essential operations associated with efficient and safe mineral excavation in open pit and strip mining operations.

The qualification is designed to be flexible and accessible to people who are able to demonstrate the competencies required to work safely in open pit and strip-mining operations.

Access to the Qualification

This qualification is open to anyone with access to both learning opportunities and work experience in the areas reflected in the exit level outcomes and unit standards. It is advisable that candidates should already have addressed the areas reflected under "learning assumptions" before embarking on learning towards this qualification, although the exact starting point depends on the available resources for learning.

Learning assumed to be in place

The credit calculation is based on the assumption that learners are already competent in terms of the following outcomes or areas of learning when starting to learn towards this unit standard:

- Company induction
- Appropriate licence to operate in the work area
- Workplace health and safety standards
- Communication skills (Language at ABET Level 3)
- Basic knowledge of in-pit or strip-mining operations
- An understanding of basic principles of information technology

Exit Level Outcomes

This qualification has the following exit level outcomes, the detail of which are indicated in the Annexures:

Fundamental exit level outcomes:

- Communicate in a variety of ways
- Use mathematics in real life situations

See **Annexure A** for the list of unit standards that relate to these exit level outcomes.

Core exit level outcomes

Generic Core:

- Sustain health and safety in the workplace
- Understand emergency preparedness and response

Machine Operation:

- Dewatering blast holes using vehicle mounted dewatering pump
- Operate skid steer loader
- Drill holes using large diameter rotary drill above 170mm.

Explosives:

Charge shot holes with explosives and initiate blast.

See **Annexure B** for the list of unit standards that relate to these exit level outcomes. There are further generic standards that are required and are listed in Annexure B.

Credits and rules of combination

Candidates for a National Certificate in Mining Operations: Surface Mining must achieve the credits as per the following summary. The detailed lists of unit standards for each category are presented in Annexures A, B and C:

Fundamental (See Annexure A for the detail):

- 20 Communications credits from the list specified in Annexure A
- 16 Mathematics credits from the list specified in Annexure A

Core (See Annexure B for the detail):

- All 68 credits from the list of standards identified in Annexure B as core to open pit or strip-mining rockbreaking.

Elective (See Annexure C for the detail):

- A minimum of 20 credits from the list of standards identified in Annexure C as applicable to this qualification.

Elective to the individuals (See Annexure C for the detail):

- A minimum of 10 credits from the list of standards identified in Annexure C as applicable to this qualification.

Summary of credit composition

These figures do not include those for Generic to the work place and Elective to the individual.

	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
LEVEL 1		16	30	134
LEVEL 2	36	37		
LEVEL 3		15		
LEVEL 4		0		
TOTAL	36	68	30	134

Exit Level Outcomes**Exit Level 1: Communication Standards****Associated Assessment Criteria**

- Be assertive in range of specified situations
- Communicate with people from other cultures
- Participate in a team or group to complete routine task
- Write letters and reports
- Answer supervisors enquiries
- Communicate with an organisational context
- Demonstrate knowledge of workplace communication requirements
- Read personal pay slips and employee file
- Apply listening techniques
- Participate in groups and/or teams to recommend solutions to problems
- Communicate information in a specified workplace
- Be interviewed in a formal situation

Exit Level 2: Mathematics Standards**Associated Assessment Criteria**

- Solve problems which require calculations with whole numbers
- Solve problems Solve problems using calculations with numbers expressed in different forms..
- Read and interpret information presented in tables and graphs
- Recognise geometric forms in mining context
- Read and convert basic units of measure used in mining or Mining and Minerals Services
- Use standard units of measurement
- Perform calculations for the work place

Exit Level 3: Health & safety**Associated Assessment Criteria**

- Demonstrate basic understanding of AIDS
- Carry out basic first aid treatment in the workplace of First aid
- Protect health and safety in the workplace
- Extinguish a fire by means of a fire extinguisher.
- Understand emergency preparedness and response
- Understand the identification of hazards and risk and relevant response.
- Understanding of legislation and compliance in terms of the Mining and Minerals Sector.
- Understanding of Quality Management principles and processes

Exit Level 4: CORE to Surface Mining Rockbreaking**Associated Assessment Criteria**

- Demonstrate knowledge regarding legal aspects, types and application of Explosives and Accessories.
- Prepare and mark off work area for drilling
- Charge shot holes with explosives and initiate blast
- Treat and blast misfires
- Destroy old explosives in the workplace
- Remove hazardous ground by means of blasting
- Transport and distribute explosives using a light delivery vehicle
- Transport and distribute explosives using a heavy duty explosives vehicle
- Dewater blast holes using vehicle mounted dewatering pump
- Operate a skid steer loader.
- Drill holes using large diameter rotary drill above 170mm.
- Load, transport and place explosive components into blast holes using mixer-placer truck

International comparability.

This qualification and the component unit standards have not been compared with similar qualifications of other countries.

Integrated Assessment

For award of the qualification, a candidate must achieve each unit standard.

In addition, candidates must demonstrate the ability to engage in the operations selected in an integrative way, dealing with divergent and "random" demands related to these work operations, effectively. Evidence is required that the candidate is able to achieve the purpose of the qualification as a whole at the time of the award of the qualification.

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

The qualification can act as a springboard from which people may progress to other qualifications in mining, mining-related sub-fields and mining supervision.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. The bulk of the unit standards are vocationally based and adequate facilities must be provided for the learner to practise and gain experience in a protected environment prior to assessment.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The assessor must have contextual competence in the form of a certificate, qualification or experience related to the unit standards in which assessments intend being conducted.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.
- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.

- *Systematic*: Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open*: Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent*: The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
- All Core unit standards are compulsory (107 Credits)
- A selection of Elective unit standards (minimum of 10 Credits)

These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

ANNEXURE: A**FUNDAMENTAL**

The following unit standards are fundamental to the learning process.

All candidates must achieve the following fundamental unit standards. (awaiting generic list of standards)

Communication Standards

Unit Standard Number	Unit Standard Title	Level	Credits
FET-C/01	Maintain and adapt oral communication	2	5
FET-C/02	Access and use information from texts	2	5
FET-S/10	Read and respond to literary texts	2	5
FET-S/16	Use language and communication in occupational learning programmes	2	5
Total			20

Mathematics Standards

Unit Standard Number	Unit Standard Title	Level	Credits
8982	Demonstrate understanding of rational and irrational numbers, and number systems, with the context of relevant calculations	2	3
8983/Math Lit2002	Use mathematics to investigate and monitor the financial aspects of personal and community life	2	2
9007/Math Lit2005	Work with a range of patterns and functions to solve problems	2	5
9008	Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in 2-dimensions in different life or workplace contexts	2	3
9009/2003	Apply basic knowledge of statistics and probability in order to investigate life-related problems	2	3
Total			16

ANNEXURE: B**CORE UNIT STANDARDS**

- Generic to the workplace or society in general

All candidates must achieve the following generic unit standards.

Unit Standard Number	Unit Standard Title	Level	Credits
	Demonstrate basic understanding of AIDS	1	1
	Carry out basic first aid treatment in the workplace of First aid	1	2
	Protect health and safety in the workplace	1	2
	Extinguish a fire by means of a fire extinguisher.	1	2
	Understand emergency preparedness and response	1	2
	Understand the identification of hazards and risk and relevant response.	1	2
	Understanding of legislation and compliance in terms of the Mining and Minerals Sector.	2	2
	Understanding of Quality Management principles and processes.	1	2
	Total		15

CORE to Surface Mining Rockbreaking

The candidate must achieve the following unit standards

Unit Standard Number	Unit Standard Title	Level	Credits
MnS-G070	Demonstrate knowledge regarding legal aspects, types and application of Explosives and Accessories.	3	15
MnS-G071	Prepare and mark off work area for drilling	2	1
MnS-G072	Charge shot holes with explosives and initiate blast	2	15
MnS-G073	Treat and blast misfires	2	1
MnS-G074	Destroy old explosives in the workplace	2	1
MnS-G075	Remove hazardous ground by means of blasting	2	1
MnS-G011	Transport and distribute explosives using a light delivery vehicle	1	4
MnS-G012	Transport and distribute explosives using a heavy duty explosives vehicle	1	4
MnS-G013	Dewater blast holes using vehicle mounted dewatering pump.	1	4

MnS-G014	Operate a skid steer loader.	1	4
MnS-G016	Drill holes using large diameter rotary drill above 170mm.	2	12
MnS-G019	Load, transport and place explosive components into blast holes using mixer-placer truck.	2	6

Total: 68

ANNEXURE: C**ELECTIVES**

The candidate must select a minimum of 20 credits from the following unit standards

Unit Standard Number	Unit Standard Title	Level	Credits
MnS-G 015	Drill holes using small diameter rotary drill not exceeding 170mm. <i>For credit, evidence must be presented for one of: Any Rotary Drill with a bore Diameter of 170mm and smaller.</i>	2	10
MnS-G 024	Doze material using a Track Dozer with mass exceeding 30 000 kg.	2	16
MnS-G 037	Transport personnel, material and equipment using Light Delivery Vehicle.	1	4
MnS-G 042	Transport and distribute fuel using Off Highway Fuel Bowser.	1	4
MnS-G 054	Doze material using a Rubber Tyre Dozer.	2	14
MnS-G 057	Relocate machines and equipment using Lowbed without dolly.	2	10
MnS-G 017	Drill holes using down the hole drill.	2	6
MnS-G 018	Drill holes using track type percussion drill.	2	6
MnS-G 045	Illuminate area using lighting plant.	1	1
MnS-G 051	Pump water using diesel dewatering pump.	1	1
MnS-G 052	Pump water using electric dewatering pump.	1	1
MnS-G 053	Pump water using submersible dewatering pump.	1	1

ELECTIVES TO THE INDIVIDUALS

The candidate must select 10 credits from any of the following unit standards

Unit Standard Number	Unit Standard Title	Level	Credits
	Demonstrate knowledge of problem solving and apply a problem solving technique to a problem	2	2
	Deal with hazardous substances in the workplace	1	2
	Pollution control	3	3
	Basic engineering	3	4
	Basic budgeting	2	3
	Employee relations	2	2
	Occupational health and hygiene	1	2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 341

22 March 2002

National Certificate in Rockbreaking for Underground Hard Rock Tabular Ore Bodies

- Stoping
- Developing

Field: Manufacturing, Engineering and Technology**Sub-field: Fabrication and Extraction****Level: 3****Credit:****Issue date:****Review date:****Rationale of the qualification**

The majority of the candidates for this qualification are likely to be working in the mining and minerals sector. The qualification will give them the opportunity to balance their practical skills with the essential knowledge needed to earn a formal qualification in rock breaking operations. There is also a critical need in the industry to identify people who are able to demonstrate the required competencies for the safe and efficient blasting of rock and its associated activities in an underground environment.

Purpose:

This qualification is aimed at people who work or intend to work in underground rockbreaking operations and seek recognition for the skills required for conducting blasting operations in a stoping or development (excluding shaft sinking and rock boring) environment.

Recipients of this qualification know about and are able to conduct the essential rock breaking activities associated with safe and efficient underground mining operations.

The qualification is designed to be flexible and accessible so that people are able to demonstrate the required competencies to work in a safe and effective manner in the underground environment.

Access to the Qualification

This qualification is open to anyone with access to learning opportunities and work experience in the areas reflected in the unit standards. It is advisable that candidates should already have addressed the areas reflected under "learning assumptions" before embarking on learning towards this qualification, although the exact starting point depends on the available resources for learning.

Learning assumed to be in place

It is assumed that candidates embarking on learning towards this qualification are already competent in the outcomes required for the National Certificate in Mining Operations for Underground Hard Rock - Tabular (Level 2).

Exit Level Outcomes

There are no exit level outcomes contained in this qualification.

Candidates for a National Certificate in Rockbreaking for Underground Hard Rock Tabular (Level 3) must achieve the credits as per the following summary. The detailed lists of unit standards for each category are presented in Annexures A, B and C:

Fundamental (See Annexure A for the detail):

- ◆ 18 Communications credits from the list specified below.
- ◆ 10 Mathematics credits from the list specified below.
- ◆ 15 Science credits from the list specified below.

Core (See Annexure B for the detail):

- ◆ All (??) credits from the list of Unit Standards generic to Work/Life.
- ◆ All (??) credits from the list of Unit Standards generic to the Manufacturing, Engineering and Technology (MET), the Mining and Minerals (M&M) and Mining Operations.
- ◆ All (??) credits from the list of Unit Standards generic to both Rockbreaking Stopping and Developing.
- ◆ All (??) credits from the list of Unit Standards specific to Rockbreaking Stopping.
or
All (??) credits from the list of Unit Standards specific to Rockbreaking Developing.

Elective (See Annexure C for the detail):

- ◆ A minimum of (??) credits from the list of Unit Standards specific to Rockbreaking Stopping.
or
A minimum of (??) credits from the list of Unit Standards specific to Rockbreaking Developing.

Summary of credit composition

	Fundamental	Core	Elective	Total
ABET 4	28			
LEVEL 1	15			
LEVEL 2		14		
LEVEL 3		71		
LEVEL 4		6		
TOTAL	43	91		

Exit Level Outcomes

Exit Level 1: Communications

Associated Assessment Criteria

- Engage in a range of speaking and listening interactions
- Read and respond to a range of text types
- Write for a variety of different purposes and context

Exit Level 2: Mathematics**Associated Assessment Criteria**

- Working with numbers in various contexts
- Work with patterns in various contexts.
- Work with measurement in a variety of contexts
- Collect, analyse, use and communicate numerical data
- Use algebraic notation, conventions and terminology to solve problems.
- Use maps to access and communicate information concerning routes, locations and direction.

Exit Level 3: Science**Associated Assessment Criteria**

- Demonstrate an understanding of concept of science
- Use an investigation to explain phenomena and solve a problem relating to natural science
- Demonstrate an understanding of the fundamental concepts and principles in natural sciences
- Demonstrate an understanding of how scientific skills and knowledge could contribute to sustainable use of resources
- Demonstrate an understanding of the impact of scientific innovation on quality of life

Exit Level 4: Health & safety**Associated Assessment Criteria**

- Investigate an accident or incident and record the findings
- Conduct a issue based risk assessment
- Conduct a workplace hazard identification and deal with the hazards
- Demonstrate an understanding of Planning, Organising, Leading and Controlling and apply these principles in the context of rock breaking activities.
- Demonstrate knowledge and understanding of business principles (profit/loss, budgeting, cost control, material ordering)

Exit Level 5: QUALIFICATION CORE TO STOPING AND DEVELOPING ROCKBREAKING**Associated Assessment Criteria**

- Demonstrate knowledge and understanding of blasting related Strata Control principles in an underground mining environment (influence of drilling and blasting in development ends and stope faces stability(surrounding rock), stress, high stress areas, stress fractures, action to deal with it, prime functions of support and mechanisms of different support units))
- Demonstrate knowledge and understanding of the rock breaking techniques to be applied in various situations in an underground environment
- Read and interpret geological and stratigraphical features on an underground plan
- Demonstrate knowledge of Mine Health & Safety Act, Minerals Act and Regulations and definitions relating to rock breaking operations ie protection in workings, safety in workings, blasting times, re-entry periods, ventilation gases and dust, scraper winch installations, remnants, holings
- Destroy old explosives underground
- Remove support by means of blasting
- Remove hazardous ground by means of blasting
- Break big rocks by means of blasting

- Install and maintain an initiating system used in blasting operations underground
- Demonstrate knowledge and understanding of various initiating systems used in blasting operations underground
- Demonstrate knowledge of Mine Health & Safety Act, Minerals Act and Regulations and definitions relating to explosives and use of explosives.
- Plan and control the use of explosives
- Demonstrate knowledge and understanding of the characteristics and properties of types of explosives used underground
- Demonstrate understanding of rock fragmentation and ore dilution relating to stoping operations

Exit Level 6: QUALIFICATION CORE TO STOPING ROCKBREAKING

Associated Assessment Criteria

- Determine the marking pattern of shot holes to meet varying conditions in a stope with respect to geological discontinuities, adequacy of support, stope width, rock type, rock stresses, types and quantity of explosives and drill steel length
- **Mark a stope panel for drilling with respect to position, direction and dip of shot holes (will include ASG's, produce according to mining parameters, control actual excavation relative to ideal parameters, prevent error mining in the working places)**
- Demonstrate knowledge and understanding in analysing inefficiencies in advance per blast and apply corrective measures relating to stoping operations
- Time, connect and initiate a blast a stope face by means of fuses and igniter cord

Exit Level 7: QUALIFICATION CORE TO DEVELOPING ROCKBREAKING

Associated Assessment Criteria

- Determine the marking pattern of shot holes to meet varying conditions in a development end with respect to geological discontinuities, adequacy of support, size of excavation, rock type, rock stresses, types and quantity of explosives and drill steel length
- Mark a development end for drilling with respect to position, direction and dip of shot holes
- Demonstrate knowledge and understanding in analysing inefficiencies in advance per blast and apply corrective measures relating to development operations
- Time, connect and initiate a blast in a development end by means of fuses and igniter cord

International comparability.

This qualification and the component unit standards have been compared with similar qualifications from the following countries:

- Australia - MNM Metalliferous Mining
- New Zealand - Introductory Skills underground metalliferous

In general this qualification and its component unit standards compare well with their international counterparts. The only major differences are in formatting and scope of coverage or focus.

Integrated Assessment

For award of the qualification, a candidate must achieve each unit standard.

In addition, candidates must demonstrate the ability to engage in the operations selected in an integrative way, dealing with divergent and "random" demands related to these work operations,

effectively. Evidence is required that the candidate is able to achieve the purpose of the qualification as a whole at the time of the award of the qualification.

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

The qualification can act as a springboard from which people may progress to other qualifications in mining, mining-related sub-fields and mining supervision.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. The bulk of the unit standards are vocationally based and adequate facilities must be provided for the learner to practise and gain experience in a protected environment prior to assessment.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The assessor must have contextual competence in the form of a certificate, qualification or experience related to the unit standards in which assessments intend being conducted.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.

- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.
- *Systematic:* Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open:* Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent:* The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
- All Core unit standards are compulsory (107 Credits)
- A selection of Elective unit standards (minimum of 10 Credits)

These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

ANNEXURE A**QUALIFICATION FUNDAMENTAL UNIT STANDARDS**

All these unit standards must be achieved.

Number	UNIT STANDARD TITLE	Level	Credits
	Communications		
Com 401	Engage in a range of speaking and listening interactions	ABET 4	6
Com 402	Read and respond to a range of text types	ABET 4	8
Com 403	Write for a variety of different purposes and context	ABET 4	4
		SUB TOTAL	18
	Mathematics		
NUM 401	Demonstrate and apply understanding of the number system	ABET 4	2
NUM 402	Solve realistic and abstract problems involving whole numbers, fractions, decimals and percentages	ABET 4	4
NUM 403	Describe, analyze, interpret and represent the environment geometrically in terms of location, shape and motion	ABET 4	2
NUM 404	Extract and use information from simple tables and graphs and represent numeric information onto tables and graphs	ABET 4	1
NUM 405	Select and use standard measures for time, length, mass, volume and capacity in real situations and solve measurement problems	ABET 4	1

		SUB TOTAL	10
	Science		
Nat Sci	Demonstrate an understanding of concept of science	NQF 1	2
Nat Sci 002	Use an investigation to explain phenomena and solve a problem relating to natural science	NQF 1	4
Nat Sci 003	Demonstrate an understanding of the fundamental concepts and principles in natural sciences	NQF 1	5
Nat Sci 004	Demonstrate an understanding of how scientific skills and knowledge could contribute to sustainable use of resources	NQF 1	2
Nat Sci 005	Demonstrate an understanding of the impact of scientific innovation on quality of life	NQF 1	2
		SUB- TOTAL	15
		TOTAL	43

QUALIFICATION CORE UNIT STANDARDS

The following unit standards are generic to the Manufacturing, Engineering and Technology (MET), the Mining and Minerals (M&M) and Mining Operations.

<u>Number</u>	Unit Standard Title	Level	Credit
	Investigate an accident or incident and record the findings	3	2
	Conduct a issue based risk assessment	3	2
	Conduct a workplace hazard identification and deal with the hazards	3	3
	Demonstrate an understanding of Planning, Organising, Leading and Controlling and apply these principles in the context of rock breaking activities.	3	3
	Demonstrate knowledge and understanding of business principles (profit/loss, budgeting, cost control, material ordering)	3	3
		TOTAL	13

QUALIFICATION CORE TO STOPING AND DEVELOPING ROCKBREAKING

The following unit standards are generic to both Stopping and Developing Rockbreaking

Number	Unit Standard Title	Level	Credit
RoC-G	Demonstrate knowledge and understanding of blasting related Strata Control principles in an underground mining environment (influence of drilling and blasting in development ends and stope faces stability(surrounding rock), stress, high stress areas, stress fractures, action to deal with it, prime functions of support and mechanisms of different support units))	3	6
MnH-G	Demonstrate knowledge and understanding of the rock breaking techniques to be applied in various situations in an underground environment	3	10
GeO-G	Read and interpret geological and stratigraphical features on an underground plan	3	4
MnH-G	Demonstrate knowledge of Mine Health & Safety Act, Minerals Act and Regulations and definitions relating to rock breaking operations ie protection in workings, safety in workings, blasting times, re-entry periods, ventilation gases and dust, scraper winch installations, remnants, holings	3	5
MnH-G033	Destroy old explosives underground	2	2
MnH-G032	Remove support by means of blasting	3	4
MnH-G030	Remove hazardous ground by means of blasting	3	4
MnH-G031	Break big rocks by means of blasting	2	2
MnH-G	Install and maintain an initiating system used in blasting operations underground	3	4
MnH-G	Demonstrate knowledge and understanding of various initiating systems used in blasting operations underground	3	5
MnH-G	Demonstrate knowledge of Mine Health & Safety Act, Minerals Act and Regulations and definitions relating to explosives and use of explosives.	3	4
MnH-G	Plan and control the use of explosives	2	1
MnH-G	Demonstrate knowledge and understanding of the characteristics and properties of types of explosives used underground	3	4
MnH-G	Demonstrate understanding of rock fragmentation and ore dilution relating to stopping operations	3	3
		TOTAL	55

QUALIFICATION CORE TO STOPING ROCKBREAKING

The following unit standards are specific to Stoping Rockbreaking

Number	Unit Standard Title	Level	Credit
MnH-G	Determine the marking pattern of shot holes to meet varying conditions in a stope with respect to geological discontinuities, adequacy of support, stope width, rock type, rock stresses, types and quantity of explosives and drill steel length	4	10
MnH-G	Mark a stope panel for drilling with respect to position, direction and dip of shot holes (will include ASG's, produce according to mining parameters, control actual excavation relative to ideal parameters, prevent error mining in the working places)	3	4
MnH-G	Demonstrate knowledge and understanding in analysing inefficiencies in advance per blast and apply corrective measures relating to stoping operations	2	4
MnH-G	Time, connect and initiate a blast a stope face by means of fuses and igniter cord	3	2
		TOTAL	23

QUALIFICATION CORE TO DEVELOPING ROCKBREAKING

The following unit standards are specific to Developing Rockbreaking

Number	Unit Standard Title	Level	Credit
MnH-G	Determine the marking pattern of shot holes to meet varying conditions in a development end with respect to geological discontinuities, adequacy of support, size of excavation, rock type, rock stresses, types and quantity of explosives and drill steel length	4	10
MnH-G	Mark a development end for drilling with respect to position, direction and dip of shot holes	3	4
MnH-G	Demonstrate knowledge and understanding in analysing inefficiencies in advance per blast and apply corrective measures relating to development operations	3	4
MnH-G	Time, connect and initiate a blast in a development end by means of fuses and igniter cord	3	2
		TOTAL	20

ANNEXURE C**QUALIFICATION ELECTIVE TO ROCKBREAKING**

The candidate must choose a total of at least 15 credits.

The following unit standards are generic to both stoping and development rockbreaking.

Number	Unit Standard Title	Level	Credit
MnH-G053	Charge up a shot hole with pumpable emulsion explosives	2	2
MnH	Initiate a blast using a portable blasting device	2	1
MnH-G034	Remove an obstruction in an orepass by means of blasting.	3	4

The following unit standards are specific to stoping rock breaking.

Number	Unit Standard Title	Level	Credit
MnH-G	Time, connect and initiate a blast in a stope face by means of electric/electronic delay detonators	3	2
MnH-G	Time, connect and initiate a blast in a stope face by means of non-electric detonators	3	2

The following unit standards are specific to developing rock breaking.

Number	Unit Standard Title	Level	Credit
MnH-G	Mark off for specialized peripheral blasting (smoothwall/post-splitting/pre-splitting)	3	4
MnH-G	Mark off large excavations <ul style="list-style-type: none"> • Hoist chambers • Fridge plant chambers • Fan chambers • Pump stations and settlers • Workshops • Raise bore site 	3	4
MnH-G	Mark a round for shaft sinking	3	4
MnH-G	Time, connect and initiate a blast in a development end by means of electric/electronic delay detonators	3	2
MnH-G	Time, connect and initiate a blast in a development end by means of non-electric detonators	3	2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**No. 342****22 March 2002****National Certificate: Mining Operations Underground Hard Rock Tabular****Field: NSB 06: Manufacturing, Engineering and Technology****Sub-field: Fabrication and Extraction****Level: 2****Credit: 164 credits****Issue date:****Review date:****Rationale of the qualification**

The majority of the candidates for this qualification are likely to be working in the mining and minerals sector. The qualification will give them the opportunity to balance their practical skills with the essential knowledge needed to earn a formal qualification in mining operations.

There is also a critical need in the industry to identify people who are able to conduct the essential operations associated with safe and efficient mineral extraction in underground hard rock mining operations.

Purpose:

This qualification is aimed at people who work or intend to work within a mineral extraction context, and who seek recognition for essential skills in mining operations.

Recipients of this qualification know about and are able to conduct the essential operations associated with safe and efficient mining processes related to underground hard rock excavation in tabular ore bodies.

The qualification is designed to be flexible and accessible so that people are able to demonstrate the competencies required to work in a safe, healthy and effective manner in an underground environment.

Access to the Qualification

This qualification is open to anyone with access to learning opportunities and work experience in the areas reflected in the exit level outcomes and unit standards. It is advisable that candidates should already have addressed the areas reflected under "learning assumptions" before embarking on learning towards this qualification, although the exact starting point depends on the available resources for learning.

Learning assumed to be in place

Learning assumed to be in place

It is assumed that candidates embarking on learning towards this qualification are already competent in the following areas:

- Communications/literacy – ABET Level 2
- Mathematics/numeracy – ABET Level 2
- Sciences – ABET Level 2

Exit Level Outcomes

The exit level outcomes for this qualification are reflected in the grouping of the unit standard titles in the Core section, viz:

- Perform making safe and support installation activities
- Conduct drilling operations
- Carry out blasting activities
- Conduct cleaning operations

Candidates for a National Certificate in Mining Operations Tabular must achieve the credits as per the following summary. The detailed lists of unit standards for each category are presented in Annexures A, B and C.

Fundamental (See Annexure A for the detail):

- 21 Communications credits from the list specified below.
- 16 Mathematics credits from the list specified below.
- 7 Science credits from the list specified below.

Core (See Annexure B for the detail):

- All 7 credits from the list of standards generic to Work/Life from the list specified below.
- All 16 credits from the list of standards generic to Manufacturing, Engineering and Technology (MET), Mining and Minerals (M&M) and Mining Operations from the list specified below.
- All 87 credits from the list of standards specific to underground hard rock tabular from the list specified below.

Elective (See Annexure C for the detail):

- A minimum of 10 credits specific to underground hard rock tabular from the list specified below.

Summary of credit composition

	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
ABET 3	44			44
LEVEL 1		5		5
LEVEL 2		94		94
LEVEL 3		12		12
LEVEL 4				
TOTAL	44	107	10	165

Exit Level Outcomes**Exit Level 1: Language, Literacy and Communication****Associated Assessment Criteria**

- Engage in a range of speaking and listening interactions.
- Read and respond to a range of text types.
- Write for a variety of different purposes and context.

Exit Level 2: Numeracy and math.**Associated Assessment Criteria**

- Demonstrate and apply understanding of the number system.
- Solve realistic and abstract problems involving whole numbers, fractions, decimals and percentages.
- Describe, analyze, interpret and represent the environment geometrically in terms of location, shape and motion.
- Extract and use information from simple tables and graphs and represent numeric information onto tables and graphs.
- Select and use standard measures for time, length, mass, volume and capacity in real situations and solve measurement problems.
- Work with number patterns and relationships involving multiples, factors, even numbers, odd numbers and prime numbers.
- Demonstrate knowledge of different ways of expressing fractions and work with fractions, percentages and decimals to describe situations and calculate change situations.
- Demonstrate understanding of appropriate measures and the relationships between different units of measure, and solve problems involving measurement, perimeter, area, volume and time.
- Construct use tables and graphs to organise and interpret information.
- Describe, draw, analyse and construct planar shapes and patterns and spatial objects and describe, interpret and represent the environment geometrically.
- Apply concepts of lines of sight, views and perspectives in drawings, pictures, photographs and the environment to make sense of and decisions relative to the world around us.

Exit Level 3: Science (matter and materials)**Associated Assessment Criteria**

- Demonstrate an understanding of concept of science.
- Use an investigation to explain phenomena and solve a problem relating to natural science.

Exit Level 4: Generic to Work/Life.**Associated Assessment Criteria**

- Demonstrate basic knowledge of AIDS.
- Work with diverse groups in the workplace.
- Demonstrate knowledge and understanding of the consequences of substance abuse.
- Demonstrate knowledge and understanding of personal finance (budgeting, banking, savings, insurance, hire purchase).
- Demonstrate knowledge and understanding of business principles e.g. 6M.

Exit Level 5: Health and safety.**Associated Assessment Criteria**

- Demonstrate an understanding of the procedures related to accidents and incidents.

- Demonstrate an understanding of workplace hazard identification and the treatment thereof.
- Demonstrate an understanding and apply principles in respect of planning, organising, leading and controlling in a workplace.
- Demonstrate knowledge and understanding of principles and practices of working in teams.
- Demonstrate knowledge of problem solving and apply a problem solving technique to a problem.
- Demonstrate knowledge and application of measurement systems within a workplace to achieve production targets.
- Demonstrate knowledge and understanding of emergency preparedness and response.
- Demonstrate a knowledge and understanding of work ethic, disciplinary and grievance procedures and apply in the workplace.
- Carry out basic first aid treatment in the workplace.
- Extinguish a fire by means of a portable fire extinguisher.

Exit Level 6: Perform making safe and support installation activities (ELO).

Associated Assessment Criteria

- Make safe a workplace by means of barring.
- Support an underground workplace by means of stick support.
- Identify, demarcate and support geological discontinuities.
- Install and remove mechanical props.
- Support an underground workplace by means of timber pack support.
- Install grout rods manually in an underground workplace.
- Knowledge and understanding of basic strata control principles.

Exit Level 7: Conduct drilling operations (ELO).

Associated Assessment Criteria

- Prepare a face for hole marking.
- Drill holes by means of a hand held rock drill.
- Mark service holes underground.

Exit Level 8: Carry out blasting activities (ELO).

Associated Assessment Criteria

- Treat misfires.
- Charge shot holes with cartridge explosives.
- Charge shot holes with ammonium nitrate based explosives.

Exit Level 9: Conduct cleaning operations (ELO).

Associated Assessment Criteria

- Join steel ropes by means of splicing.
- Equip scraper winch drums with scraper ropes.
- Rig scraper rope for scraping operations in an underground workplace.
- Install a winch signaling arrangement in an underground workplace.
- Remove broken rock by means of a scraper winch.
- Extend tracks by means of jump-sets and sliding rails.
- Remove an accumulation of water in an orepass.

- Remove broken rock by means of a track-bound loader.

Exit Level 10: Provide ancillary services.

Associated Assessment Criteria

- Follow basic Health and Safety practices underground.
- Read and interpret basic features on an underground plan.
- Install a dust allaying device.
- Install and remove pipes and accessories.
- Install and remove ventilation columns and accessories.
- Test for flammable gas by means of an approved hand-held electronic instrument.
- Test for toxic gasses by means of an approved hand-held electronic instrument.
- Determine environmental thermal conditions by means of a whirling hygrometer and take appropriate action.
- Determine velocity and volume flow rate of air in a working place by means of the tape method and take appropriate action.
- Control airflow by means of ventilation curtains.
- Install a ventilation brattice.
- Demonstrate knowledge and understanding of the properties and characteristics of the most common gases.
- Describe the basic principles of ventilating a workplace to ensure a safe and healthy environment (check if includes development).

International comparability.

This qualification and the component unit standards have been compared with similar qualifications from the following countries:

- Australia - MNM Metalliferous Mining
- New Zealand - Introductory Skills underground metalliferous

In general this qualification and its component unit standards compare well with their international counterparts. The only major differences are in formatting and scope of coverage or focus.

Integrated Assessment

For award of the qualification, a candidate must achieve each unit standard.

In addition, candidates must demonstrate the ability to engage in the operations selected in an integrative way, dealing with divergent and "random" demands related to these work operations, effectively. Evidence is required that the candidate is able to achieve the purpose of the qualification as a whole at the time of the award of the qualification.

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

The qualification can act as a springboard from which people may progress to other qualifications in mining, mining-related sub-fields and mining supervision.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. The bulk of the unit standards are vocationally based and adequate facilities must be provided for the learner to practise and gain experience in a protected environment prior to assessment.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The assessor must have contextual competence in the form of a certificate, qualification or experience related to the unit standards in which assessments intend being conducted.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.
- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.

- *Systematic*: Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open*: Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent*: The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
 - All Core unit standards are compulsory (107 Credits)
 - A selection of Elective unit standards (minimum of 10 Credits)
- These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

ANNEXURE A

FUNDAMENTAL UNIT STANDARDS

A candidate must achieve the following unit standards:

Number	UNIT STANDARD TITLE	Level	Credits
	Language, Literacy and Communication		
Com301	Engage in a range of speaking and listening interactions	ABET 3	6
Com302	Read and respond to a range of text types	ABET 3	8
Com303	Write for a variety of different purposes and context	ABET 3	7
		SUB TOTAL	21
	Numeracy		
NUM301	Demonstrate and apply understanding of the number system	ABET3	1
NUM302	Solve realistic and abstract problems involving whole numbers, fractions, decimals and percentages	ABET3	1
NUM303	Describe, analyze, interpret and represent the environment geometrically in terms of location, shape and motion	ABET3	1
NUM304	Extract and use information from simple tables and graphs and represent numeric information onto tables and graphs	ABET3	1
NUM305	Select and use standard measures for time, length, mass, volume and capacity in real situations and solve measurement problems	ABET3	1
NUM306	Work with number patterns and relationships involving multiples, factors, even numbers, odd numbers and prime numbers	ABET3	1
NUM307	Demonstrate knowledge of different ways of expressing fractions and work with fractions, percentages and decimals to describe situations and calculate change situations	ABET3	2
NUM308	Demonstrate understanding of appropriate measures and the relationships between different units of measure, and solve problems involving measurement, perimeter, area, volume and time	ABET3	2
NUM309	Construct use tables and graphs to organise and interpret information	ABET3	3
NUM310	Describe, draw, analyse and construct planar shapes and patterns and spatial objects and describe, interpret and represent the environment geometrically	ABET3	2
NUM311	Apply concepts of lines of sight, views and perspectives in drawings, pictures, photographs and the environment to make sense of and decisions relative to the world around us	ABET3	1
		SUB TOTAL	16
	Science (matter and materials)		
Nat Sci 001	Demonstrate an understanding of concept of science	ABET3	3
Nat Sci 002	Use an investigation to explain phenomena and solve a problem relating to natural science	ABET3	4
		SUB TOTAL	7

		TOTAL	44
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ANNEXURE B**CORE UNIT STANDARDS**

The following unit standards are generic to Work/Life
A candidate must achieve the following unit standards:

Number	Unit Standard Title	Level	Credit
	Demonstrate basic knowledge of AIDS	2	1
	Work with diverse groups in the workplace	2	2
	Demonstrate knowledge and understanding of the consequences of substance abuse	2	1
	Demonstrate knowledge and understanding of personal finance (budgeting, banking, savings, insurance, hire purchase)	2	1
	Demonstrate knowledge and understanding of business principles e.g. 6M	2	2
		Total	7

The following unit standards are generic to the Manufacturing, Engineering and Technology (MET), the Mining and Minerals (M&M) and Mining Operations.

A candidate must achieve the following unit standards:

Number	Unit Standard Title	Level	Credit
	Demonstrate an understanding of the procedures related to accidents and incidents	2	1
	Demonstrate an understanding of workplace hazard identification and the treatment thereof.	2	1
	Demonstrate an understanding and apply principles in respect of planning, organising, leading and controlling in a workplace	2	3
	Demonstrate knowledge and understanding of principles and practices of working in teams	2	1
	Demonstrate knowledge of problem solving and apply a problem solving technique to a problem	2	1
	Demonstrate knowledge and application of measurement systems within a workplace to achieve production targets	2	2
	Demonstrate knowledge and understanding of emergency preparedness and response	2	2
	Demonstrate a knowledge and understanding of work ethic, disciplinary and grievance procedures and apply in the workplace.	2	1
OcM-G002	Carry out basic first aid treatment in the workplace.	3	3
	Extinguish a fire by means of a portable fire extinguisher	1	1
		Total	16

CORE UNIT STANDARDS

The following unit standards are specific to Mining Operations for Underground Hard Rock Tabular

A candidate must achieve the following unit standards:

Number	Unit Standard Title	Level	Credit
	Perform making safe and support installation activities (ELO)		
MnH-G038	Make safe a workplace by means of barring	2	2
MnH-G013	Support an underground workplace by means of stick support.	2	2
RoC-G005	Identify, demarcate and support geological discontinuities.	3	3
MnH-G016	Install and remove mechanical props.	2	3
MnH-G014	Support an underground workplace by means of timber pack support	2	4
MnH-G020	Install grout rods manually in an underground workplace	2	4
RoC	Knowledge and understanding of basic strata control principles	2	2
		Sub total	20
	Conduct drilling operations (ELO)		
MnH-G022	Prepare a face for hole marking	2	2
MnH-G025	Drill holes by means of a hand held rock drill.	2	4
MnH-G023	Mark service holes underground	2	5
		Sub total	11
	Carry out blasting activities (ELO)		
MnH-G037	Treat misfires.	2	2
MnH-G027	Charge shot holes with cartridge explosives	2	2
MnH-G051	Charge shot holes with ammonium nitrate based explosives	2	2
		Sub total	6
	Conduct cleaning operations (ELO)		
MnH-G002	Join steel ropes by means of splicing.	2	2
MnH-G003	Equip scraper winch drums with scraper ropes.	2	2
MnH-G004	Rig scraper rope for scraping operations in an underground workplace.	2	2
MnH-G005	Install a winch signaling arrangement in an underground workplace.	1	1
MnH-G006	Remove broken rock by means of a scraper winch.	2	4
MnH-G008	Extend tracks by means of jump-sets and sliding rails.	1	2

MnH-G054	Remove an accumulation of water in an orepass.	2	1
MnH-G009	Remove broken rock by means of a track-bound loader.	2	5
		Sub total	19

Number	Unit Standard Title	Level	Credit
	Provide ancillary services		
MnH-G001	Follow basic Health and Safety practices underground	2	2
DiP	Read and interpret basic features on an underground plan	2	2
MnH-G056	Install a dust allaying device	1	1
MnH-G055	Install and remove pipes and accessories	2	3
MnH-G058	Install and remove ventilation columns and accessories	2	2
OcH-004	Test for flammable gas by means of an approved hand-held electronic instrument	3	3
OcH-006	Test for toxic gasses by means of an approved hand-held electronic instrument	3	3
OcH-G001	Determine environmental thermal conditions by means of a whirling hygrometer and take appropriate action	2	2
OcH-G002	Determine velocity and volume flow rate of air in a working place by means of the tape method and take appropriate action	2	2
OcH-G048	Control airflow by means of ventilation curtains	2	2
OcH-G044	Install a ventilation brattice	2	2
OcH	Demonstrate knowledge and understanding of the properties and characteristics of the most common gases	2	3
OcH-G085	Describe the basic principles of ventilating a workplace to ensure a safe and healthy environment (check if includes development)	2	5
		Sub total	32
		Total	86

ANNEXURE C

ELECTIVE UNIT STANDARDS

The following unit standards are elective to individuals. The candidate must choose a total of at least 10 credits.

Number	Unit Standard Title	Level	Credit
MnH-G015	Install and remove hydraulic props.	2	3
MnH-G059	Install pre-stressed elongate support	2	2
MnH-G050	Support an underground workplace by means of mechanical anchors	2	4
MnH-G019	Support an underground workplace by means of back filling.	2	4
MnH-G021	Support an underground workplace by means of concrete spray.	2	4
MnH-G060	Install tendon support by means of a roofbolter	2	4
MnH-G061	Support an underground workplace by means of grout packs	2	2
MnH-G017	Support an underground workplace by means of sets.	2	4
MnH-G018	Support an underground workplace by means of meshing and lacing.	2	4
MnH-G026	Drill holes by means of a stope drill rig.	2	4
MnH-G112	Drill holes by means of a developing drill rig	3	4
MnH-G053	Charge shot holes with pumpable emulsion explosives	2	2
MnH-G007	Remove broken rock by means of a high-pressure water jet unit	2	3
MnH-G012	Remove broken rock by means of a suction unit.	2	6
MnH-G100	Transfer broken rock by means of an electrical powered load haul dumper (LHD) in an underground mine.	2	4
MnH-G101	Transfer broken rock by means of a diesel powered load haul dumper (LHD) in an underground mine.	2	4
MnH-G045	Transport material by means of a mono rope system	2	3
MnH-G047	Install a set of rails	2	2
MnH-G048	Install a rail turn-out in an underground workplace	2	2
MnH-G063	Install a swing barricade	1	1
MnH-G046	Operate a monorail system.	2	4
MnH-G064	Install a blasting barricade	1	1
MnH-G065	Install a stope box front, chute and platform	2	4
EnM-	Replace an electric motor	3	5

G023			
EnE-G001	Install an electrical cable	2	3
EnE-G018	Install a cable support system	2	2
MnH-G062	Install a stope grizzly.	2	2
MnH-G066	Construct and equip an underground ladder way	2	2
MnH-G067	Construct a winch bed.	1	1
EnM-G008	Replace an inline ventilation fan in an underground environment	2	2
EnM-G	Replace conveyor belt idlers.	1	1
EnM-G022	Join a conveyor belt by means of mechanical clips.	2	2
MnH-G068	Install a mono rope system	2	3
MnH-G069	Construct and install a platform	1	1
EnM-G	Train a conveyor belt.	1	1

Number	Unit Standard Title	Level	Credit
OcH-G043	Install a regulator to control airflow underground	2	2
OcH-G049	Control airflow by means of an aerated stopping	3	2
MnH-G039	Load a battery onto and remove it from a locomotive	1	1
MnH-G071	Transport material by means of rolling stock	1	1
MnH-G044	Transport persons by means of a carriage	1	1
MnH-G073	Transport broken rock by means of rolling stock	2	2
EnM-G007	Lift and move a load by means of manual lifting equipment.	3	7
EnM-G012	Cut steel by means of oxy-acetylene apparatus.	2	3
EnM-G046	Assemble oxy-acetylene equipment	2	1
MnH-G041	Operate a battery locomotive	2	2
MnH-G042	Operate an diesel locomotive	2	3
MnH-G043	Operate an electrical locomotive	2	2
MnH-G040	Re-rail a trackbound unit	2	2
OcH-G	Use a self contained self rescuer	1	1

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 343

22 March 2002

National Certificate In Winding Engine Driving**Field:** NSB 06: Manufacturing, Engineering and Technology**Sub-field:** Fabrication and Extraction**Level:** 3**Credit:** 161 credits**Issue date:****Review date:****Rationale of the qualification**

The Mining Industry requires the transportation of men, material and rock to and from the underground workings of a mine. This qualification makes it possible for individuals to carry out such transport activities using winding engines.

Purpose:

Recipients of this qualification are able to perform winding engine driving operations in the mining industry.

Access to the Qualification

The achievement of this qualification may be via a recognised, accepted and registered:

- Skills programme
- Cluster of unit standards

Learning assumed to be in place

It is assumed that candidates embarking on learning towards this qualification are in possession of a relevant GETC or equivalent, which includes the required fundamental component applicable for winding operations

Exit Level Outcomes

Candidates for a National Certificate in winding engine driving operations (Mining Industry) – Level 3 must achieve the credits as per the following summary. The relevant unit standards are attached to this qualification description as annexures.

Fundamental

A minimum of 36 credits as listed under Annexure A must be achieved in order to get the full qualification.

Core

- All candidates must achieve the generic unit standards under Annexure B, which apply to all types of operations.
- Candidates requiring the skills for Direct Current winders must achieve the unit standards under Annexure B1.
- Candidates requiring the skills for Alternating Current winders must achieve the unit standards under Annexure B2.

Elective

Candidates must choose any combination of unit standards under Annexure C to obtain a minimum of 20 credits.

LEVEL	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
1				
2				
3				
TOTAL	36	105	20	161

Exit Level Outcomes

Exit Level 1: Communicate in a variety of ways.

Associated Assessment Criteria

- Accommodate context needs in oral communication.
- Interpret and use information from texts.
- Interpret a variety of literary texts.
- Use language and communication in occupational learning programmes.

Exit Level 2: Use mathematics in practical applications

Associated Assessment Criteria

- Demonstrate understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations
- Use mathematics to investigate and monitor the financial aspects of personal and business issues.
- Investigate life-related problems using data and probabilities

Exit Level 3: Health and safety in the workplace.**Associated Assessment Criteria**

- Understand Quality Management principles and processes
- Demonstrate basic understanding of AIDS
- Carry out basic first aid treatment in the workplace.
- Protect health and safety in the workplace
- Extinguish a fire by means of a fire extinguisher
- Understand emergency preparedness and response
- Understand the identification of hazards and risks and relevant response
- Understanding of legislation and compliance in terms of the Mining and Minerals Sector

Exit Level 4: Onsetter Exit Level Outcomes**Associated Assessment Criteria**

- Load and unload persons into and from a shaft conveyance.
- Load long material into a shaft conveyance.
- Remove long material from a shaft conveyance
- Load and remove rolling stock into and from a shaft conveyance
- Prepare a conveyance for shaft examination and repairs
- Demonstrate an understanding of the functions and operation of signalling arrangements and safety devices in a shaft.
- Follow basic health and safety practices pertaining to shaft operations

Exit Level 5: Winding Engine Exit level outcome**Associated Assessment Criteria**

- Demonstrate an understanding of the functions of electrical and mechanical components of a winder
- Start and take control of a winder.
- Follow basic health and safety practices pertaining to winding operations
- Position conveyances in a shaft by means of clutching
- Switch a high voltage inline switch on and off
- Shut down a winding plant

International comparability.

The qualification is comparable to the winding engine driving in the following countries:

- Australia
- Canada
- South Africa
- Zimbabwe

The major differences are in the law applicable to each of these countries.

Integrated Assessment

For award of the qualification, a candidate must achieve each unit standard.

In addition, candidates must demonstrate the ability to engage in the operations selected in an integrative way, dealing with divergent and "random" demands related to these work operations, effectively. Evidence is required that the candidate is able to achieve the purpose of the qualification as a whole at the time of the award of the qualification.

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

The skills programme for onsetting serves as base for further development in this field, however the Winding Engine Driving Certificate does not serve as a basis for any further development.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.
- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.

- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.
- *Systematic:* Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open:* Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent:* The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
- All Core unit standards are compulsory (107 Credits)
- A selection of Elective unit standards (minimum of 10 Credits)

These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

ANNEXURE A

FUNDAMENTAL UNIT STANDARDS

All candidates must achieve at least 36 credits from any of these unit standards: 20 credits on communication and 16 credits for mathematics.

Communication

Candidates are required to achieve all the following standards:

<i>Number</i>	<i>Title</i>	<i>Level</i>	<i>Credit</i>
Exit level outcome: Communicate in a variety of ways			
FET-C/04	Accommodate context needs in oral communication	3	5
FET-C/05	Interpret and use information from texts	3	5
FET-S/13	Interpret a variety of literary texts	3	5
FET-S/17	Use language and communication in occupational learning programmes	3	5
	TOTAL		20

Mathematics/Numeracy

Candidates are required to achieve all the following standards:

<i>Number</i>	<i>Title</i>	<i>Level</i>	<i>Credit</i>
Exit level outcome: Use mathematics in practical applications			
9010/MathLit3001	Demonstrate understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	3	2
9011/MathLit3002	Use mathematics to investigate and monitor the financial aspects of personal and business issues	3	5
9012	Investigate life-related problems using data and probabilities	3	5
9013	Measure, estimate and calculate physical quantities and explore, describe and represent, interpret and justify geometrical relationships in two and three dimensional space relevant to the life or workplace of the community	3	4
	TOTAL		16

ANNEXURE B

CORE UNIT STANDARDS

The following unit standards are generic to the workplace or society in general and are core to the learning process in terms of the exit level outcome: Sustain health and safety in the workplace.

Candidates must achieve the following unit standards.

Number	Unit Standard Title	Level	Credit
	Health & Safety Exit Level Outcome		
	Understand Quality Management principles and processes	3	2
	Demonstrate basic understanding of AIDS	2	2
OcM-G002	Carry out basic first aid treatment in the workplace.	3	3
	Protect health and safety in the workplace	2	2
	Extinguish a fire by means of a fire extinguisher	2	2
	Understand emergency preparedness and response	1	2
		3	2
	Understand the identification of hazards and risks and relevant response	2	2
	Understanding of legislation and compliance in terms of the Mining and Minerals Sector	2	2
	Total		17

The following unit standards are specific to the onsetting and winding engine driving:

Number	Unit Standard Title	Level	Credit
	Onsetter Exit Level Outcome		
MnH-G003(ons)	Load and unload persons into and from a shaft conveyance	2	4
MnH-G004(ons)	Load long material into a shaft conveyance	2	3
MnH-G005(ons)	Remove long material from a shaft conveyance	2	3
MnH-G006(ons)	Load and remove rolling stock into and from a shaft conveyance	2	8
MnH-G008(ons)	Prepare a conveyance for shaft examination and repairs	2	2
MnH-G010(ons)	Demonstrate an understanding of the functions and operation of signalling arrangements and safety devices in a shaft.	3	3
MnH-G009(ons)	Follow basic health and safety practices pertaining to shaft operations	2	2
	Total		25
	Winding Engine Exit Level Outcome		
MnH-G065WED	Demonstrate an understanding of the functions of electrical and mechanical components of a winder	3	9
MnH-G064WED	Start and take control of a winder.	3	19
MnH-G067WED	Follow basic health and safety practices pertaining to winding operations	3	5
MnH-	Position conveyances in a shaft by means of clutching	3	11

G063WED			
EnE-G022	Switch a high voltage inline switch on and off	2	2
MnH-G071WED	Shut down a winding plant	3	2
Total			48

ANNEXURE B.1: UNIT STANDARDS CORE TO DIRECT CURRENT WINDER

The following unit standards are required for the operation of Direct Current Winders:

Number	Unit Standard Title	Level	Credit
MnH-G068WED	Operate a Direct Current winder.	3	15
	Total		15

ANNEXURE B.2: UNIT STANDARDS CORE TO ALTERNATING CURRENT WINDER

The following unit standards are required for the operation of Alternating Current Winders:

Number	Unit Standard Title	Level	Credit
MnH-G069WED	Operate an Alternating Current winder.	3	15
	Total		15

ANNEXURE C: ELECTIVE UNIT STANDARDS

The following unit standards are electives to individuals. The candidate must choose a total of at least 20 credits from the following:

Number	Unit Standard Title	Level	Credit
MnH-G001(ons)	Sling material into a shaft.	2	4
MnH-G002(ons)	Remove slung material from a shaft.	2	4
MnH-G007(ons)	Change a conveyance in a shaft	2	2
MnH-G070WED	Operate a friction driven winder.	3	15
	Total		25

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 344

22 March 2002

National Certificate in Engineering Maintenance and Repairing for Underground Coal**Mining****Field:** Manufacturing Engineering and Technology**Sub-field:** Fabrication and Extraction**Level:** 2

Credit:	Specialisation area 1 – Conventional Mining	:	173
	Specialisation area 2 – Continuous Mining	:	134
	Specialisation area 3 – Wall Mining	:	138
	Specialisation area 4 – Breaking Services	:	145

Issue date:**Review date:****Rationale of the qualification**

This qualification is primarily intended for application in the underground coal mining environment, and has a primary operational application in the engineering field

Recipients of one of the variations of this qualification are able to conduct the essential operations associated with efficient and safe engineering maintenance and repairs, in any one of the following specialisation areas in underground coal mines:

- Underground coal – Conventional Mining.
- Underground coal – Continuous Mining.
- Underground coal – Wall Mining.
- Underground coal – Breaking Services.

The qualification is designed to be flexible and accessible so that people are able to demonstrate the competencies required to work safely in mines in general, and effectively and safely in one of the conventional, continuous, wall and breaking services specialisation areas.

People credited with this qualification are able to:

- Replace mining related equipment and components
- Repair mining related equipment and components

Purpose:

This qualification is aimed at people who work or intend to work within a mineral extraction context, and who seek recognition for essential skills in mining operations.

Recipients of this qualification know about and are able to conduct the essential operations associated with safe and efficient mining processes related to underground hard rock excavation in tabular ore bodies.

The qualification is designed to be flexible and accessible so that people are able to demonstrate the competencies required to work in a safe, healthy and effective manner in an underground environment.

Access to the Qualification

It is recommended that candidates have addressed the areas reflected under "Learning assumed to be in place" before embarking on learning towards this qualification.

Learning assumed to be in place

It is assumed that candidates embarking on learning towards this qualification are in possession of a relevant GETC, or equivalent, which includes the required fundamental component in an engineering field.

It is also assumed that the candidate is competent to operate relevant mining machines and work on explosion-protected equipment.

Exit Level Outcomes

This qualification has the following exit level outcomes, the details of which are indicated in the Annexures:

Fundamental exit level outcomes

- Communicate in a variety of ways
- Use mathematics in real life situations

See **Annexure A** for the list of unit standards that relates to these exit level outcomes

Core exit level outcomes

- Sustain health and safety in the workplace
- Replace mining related equipment and components
- Repair mining related equipment and components

See **Annexure B** for the list of unit standards that relates to these exit level outcomes. There are further generic unit standards that are required and are listed in **Annexure B**

Elective exit level outcomes

- Replace mining related equipment and components
- Repair mining related equipment and components

See **Annexure C** for the list of unit standards that relates to these exit level outcomes. Candidates may also select individual unit standards from the list in **Annexure C**

Credits and rules of combination

Candidates for a National Certificate in Engineering Maintenance for Underground Coal Mining ~ Level 2 must achieve the credits as per the following summary, attached to this qualification description as Annexures:

Fundamental (see Annexure A for details)

- 20 Communications credits as per Annexure A.
- 16 Mathematical credits as per Annexure A.

Core

- All credits, from the list of unit standards identified in Annexure B, generic to the workplace or society in general
- All – credits, from the list of unit standards identified in Annexure B, core to the Engineering Maintenance for Underground Coal Mining specialisation areas:
 - Conventional mining
 - Continuous mining
 - Wall mining
 - Breaking services

Elective

- All credits, from the list of unit standards identified in **Annexure C**, relevant to **one of** the following specialisation areas in Engineering Maintenance for Underground Coal Mining:
 - Conventional mining
 - Continuous mining
 - Wall mining
 - Breaking services
- At least 6 credits, from the list of unit standards (Elective relevant to individuals) identified in **Annexure C**.

Summary of credit composition

Specialisation area 1: Conventional Mining.

(These figures do not include those for "generic to the workplace or society in general").

LEVEL	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
1	0	5		
2	36	48	6	
3	0	18		
4	0	0		0
TOTAL	36	71+	66	173

Specialisation area 2: Continuous Mining.

(These figures do not include those for "generic to the workplace or society in general").

LEVEL	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
1	0	5		
2	36	48		
3	0	18		
4	0	0		
TOTAL	36	71+	27	134

Specialisation area 3: Wall Mining

(These figures do not include those for "generic to the workplace or society in general").

LEVEL	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
1	0	5		
2	36	48		
3	0	18		
4	0	0		
TOTAL	36	71+	31	138

Specialisation area 4: Breaking Services

(These figures do not include those for "generic to the workplace or society in general").

LEVEL	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
1	0	5		
2	36	48		
3	0	18		
4	0	0		
TOTAL	36	71+	38	145

Exit Level Outcomes

Exit Level Outcome 1: Communicate in a variety of ways.

Associated Assessment Criteria

- Maintain and adapt oral communication
- Access and use information from text
- Write for a defined context
- Read and respond to library texts
- Respond to selected library texts
- Use language and communication in occupational learning programmes

Exit Level Outcome 2: Use mathematics in real life situations.

Associated Assessment Criteria

- Demonstrate understanding of rational and irrational numbers, and number systems, with the context of relevant calculations

- Use mathematics to investigate and monitor the financial aspects of personal and community life
- Work with a range of patterns and functions to solve problems
- Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in 2 dimensions in different life or workplace contexts
- Apply basic knowledge of statistics and probability in order to investigate life-related problems

Exit Level Outcome 3: Health and safety in the workplace

Associated Assessment Criteria

- Understand Quality Management principles and processes
- Demonstrate basic understanding of AIDS
- Carry out basic first aid treatment in the workplace.
- Protect health and safety in the workplace
- Extinguish a fire by means of a fire extinguisher
- Understand emergency preparedness and response
- Understand the identification of hazards and risks and relevant response
- Understanding of legislation and compliance in terms of the Mining and Minerals Sector

Exit Level Outcome 4: Replace mining related equipment and components

Associated Assessment Criteria

- Install an electrical cable
- Install a lighting system
- Install earthing and bonding on electrical installations
- Install a cable support system
- Install or replace an earth leakage unit in a low voltage circuit
- Install a low voltage supply in underground workings
- Replace an electrical cable
- Replace an electric motor
- Replace a flange mounted valve
- Replace a flanged pipe section
- Replace a tyre type drive coupling
- Replace a direct mount bearing
- Install a conveyor pull wire system
- Replace a taper sleeve bearing

Exit Level Outcome 5: Repairing mining equipment and components

Associated Assessment Criteria

- Terminate and connect low voltage cable ends.
- Restore power by joining a cable
- Isolate and restore power to an electrical system
- Repair a lighting system
- Use and care for hand held electrical test instruments
- Connect and commission a 3 phase direct on line starter to a motor
- Carry out a detailed inspection on an electrical enclosure.
- Disconnect and reconnect a low voltage power supply
- Test a three phase low voltage induction motor
- Lift and move a load
- Inspect and clean an electrical enclosure

- Inspect and clean a 3-phase transformer
- Carry out a detailed inspection on an (AC?) electrical motor
- Replace components on an onboard dust suppression unit
- Repair an onboard gas monitoring system

Exit Level Outcome 6: Perform making safe and support installation activities (ELO).

Associated Assessment Criteria

- Make safe a workplace by means of barring.
- Support an underground workplace by means of stick support.
- Identify, demarcate and support geological discontinuities.
- Install and remove mechanical props.
- Support an underground workplace by means of timber pack support.
- Install grout rods manually in an underground workplace.
- Knowledge and understanding of basic strata control principles.

Exit Level Outcome 7: Conduct drilling operations (ELO).

Associated Assessment Criteria

- Prepare a face for hole marking.
- Drill holes by means of a hand held rock drill.
- Mark service holes underground.

Exit Level Outcome 8: Carry out blasting activities (ELO).

Associated Assessment Criteria

- Treat misfires.
- Charge shot holes with cartridge explosives.
- Charge shot holes with ammonium nitrate based explosives.

Exit Level Outcome 9: Conduct cleaning operations (ELO).

Associated Assessment Criteria

- Join steel ropes by means of splicing.
- Equip scraper winch drums with scraper ropes.
- Rig scraper rope for scraping operations in an underground workplace.
- Install a winch signaling arrangement in an underground workplace.
- Remove broken rock by means of a scraper winch.
- Extend tracks by means of jump-sets and sliding rails.
- Remove an accumulation of water in an orepass.
- Remove broken rock by means of a track-bound loader.

Exit Level Outcome 10: Provide ancillary services.

Associated Assessment Criteria

- Follow basic Health and Safety practices underground.
- Read and interpret basic features on an underground plan.
- Install a dust allaying device.
- Install and remove pipes and accessories.
- Install and remove ventilation columns and accessories.
- Test for flammable gas by means of an approved hand-held electronic instrument.
- Test for toxic gasses by means of an approved hand-held electronic instrument.

- Determine environmental thermal conditions by means of a whirling hygrometer and take appropriate action.
- Determine velocity and volume flow rate of air in a working place by means of the tape method and take appropriate action.
- Control airflow by means of ventilation curtains.
- Install a ventilation brattice.
- Demonstrate knowledge and understanding of the properties and characteristics of the most common gases.
- Describe the basic principles of ventilating a workplace to ensure a safe and healthy environment (check if includes development).

International comparability.

No qualifications and unit standards, that are comparable to this qualification and the component unit standards, have been identified.

Integrated Assessment

For awarding of the qualification, a candidate must achieve each unit standard for one of the specialisation areas, stoping and developing, horizontal transport or horizontal transport services.

The assessment criteria in the unit standards are performance-based (applied competence as opposed to required knowledge only). This means that workplace experience may be recognised when awarding credits towards this qualification.

The candidate must demonstrate the ability to effectively engage in operations selected in an integrative way, dealing with divergent and "random" demands related to the work operations

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

The qualification can act as a springboard from which people may progress to other qualifications in mining, mining-related sub-fields and mining supervision.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. The bulk of the unit standards are vocationally based and adequate facilities must be provided for the learner to practise and gain experience in a protected environment prior to assessment.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.

- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The assessor must have contextual competence in the form of a certificate, qualification or experience related to the unit standards in which assessments intend being conducted.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.
- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.
- *Systematic:* Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open:* Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent:* The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
- All Core unit standards are compulsory (107 Credits)
- A selection of Elective unit standards (minimum of 10 Credits)

These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

ANNEXURE A

FUNDAMENTAL UNIT STANDARDS

The following unit standards are fundamental to the learning process in terms of the exit level outcome: Communicate in a variety of ways.

Candidates must achieve the following unit standards.

Number	UNIT STANDARD TITLE	Level	Credits
	Language & Communications		
FET-C/01	Maintain and adapt oral communication	2	5
FET-C/02	Access and use information from text	2	5
FET-C/03	Write for a defined context	2	5
FET-C/10	Read and respond to library texts	2	5
FET-C/11	Respond to selected library texts	2	5
FET-C/16	Use language and communication in occupational learning programmes	2	5
	Total		30

The following unit standards are fundamental to the learning process in terms of the exit level outcome: Use mathematics in real life situations.

Candidates must achieve the following unit standards.

Number	UNIT STANDARD TITLE	Level	Credits
	Mathematical, Physical, Computer and Life Science (MathLit)		
8982	Demonstrate understanding of rational and irrational numbers, and number systems, with the context of relevant calculations	2	3
8983/MathLit2002	Use mathematics to investigate and monitor the financial aspects of personal and community life	2	2
8983/MathLit2005	Work with a range of patterns and functions to solve problems	2	5
9008	Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in 2 dimensions in different life or workplace contexts	2	3
9009/20037	Apply basic knowledge of statistics and probability in order to investigate life-related problems	2	3
	Total		16

ANNEXURE B**CORE UNIT STANDARDS****Generic to the workplace and society in general**

The following unit standards are generic to the workplace or society in general and are core to the learning process in terms of the exit level outcome:

Sustain health and safety in the workplace.

Candidates must achieve the following unit standards.

Number	Unit Standard Title	Level	Credit
	Understand Quality Management principles and processes		
	Demonstrate basic understanding of AIDS		
OcM-G002	Carry out basic first aid treatment in the workplace.	3	3
	Protect health and safety in the workplace		
	Extinguish a fire by means of a fire extinguisher		
	Understand emergency preparedness and response		
	Understand the identification of hazards and risks and relevant response		
	Understanding of legislation and compliance in terms of the Mining and Minerals Sector		
Total			

All specialization areas

The following unit standards are core to the learning process for all specialization areas, in terms of the exit level outcome: **Replace mining related equipment and components**

Candidates must achieve the following unit standards.

Number	Unit Standard Title	Level	Credit
EnE-G001	Install an electrical cable	2	3
EnE-G014	Install a lighting system	2	4
EnE-G016	Install earthing and bonding on electrical installations	2	2
EnE-G018	Install a cable support system	2	2
EnE-G020	Install or replace an earth leakage unit in a low voltage circuit	2	3
EnE-G021	Install a low voltage supply in underground workings	3	5
EnE-G030	Replace an electrical cable	1	3
EnM-G023	Replace an electric motor	2	5
EnM-G054	Replace a flange mounted valve	1	2
EnM-G055	Replace a flanged pipe section	2	2
EnM-G119	Replace a tyre type drive coupling	2	2
EnM-G126	Replace a direct mount bearing	2	3
EnE-G062	Install a conveyor pull wire system	2	3
EnM-G002	Replace a taper sleeve bearing	2	2
Total			41

The following unit standards are core to the learning process for all specialization areas, in terms of the exit level outcome:

Repairing mining equipment and components

Candidates must achieve the following unit standards.

Number	Unit Standard Title	Level	Credit
EnE-G009	Terminate and connect low voltage cable ends	2	3
EnE-G002	Restore power by joining a cable	2	4
EnE-G010	Isolate and restore power to an electrical system	2	2
EnE-G015	Repair a lighting system	2	2
EnE-G019	Use and care for hand held electrical test instruments	2	3
EnE-G048	Connect and commission a 3 phase direct on line starter to a motor	3	6
EnE-G060	Carry out a detailed inspection on an electrical enclosure.	2	3
EnE-G064	Disconnect and reconnect a low voltage power supply	2	3
EnE-G069	Test a three phase low voltage induction motor	2	2
EnM-G007	Lift and move a load	3	7
EnE-G060	Inspect and clean an electrical enclosure	2	2
EnE-G005	Inspect and clean a 3-phase transformer	1	1
EnE-G055	Carry out a detailed inspection on an (AC?) electrical motor	2	3
EnM-G149	Replace components on an onboard dust suppression unit	2	3
EnE-G079	Repair an onboard gas monitoring system	3	3
		Total	47

ANNEXURE C

ELECTIVE UNIT STANDARDS

Candidates are required to achieve all the credits for any one of the following specialisation areas.

Specialisation area 1: Conventional mining

The following unit standards are elective to the learning process for conventional mining, in terms of the exit level outcome:

Replace mining related equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G029	Install a gate end box	2	2
EnE-G023	Advance or retreat electrical reticulation in an underground coal section	3	6
EnM-G017	Replace a hydraulic cylinder	2	2
EnM-G034	Replace a gathering arm gear case	2	4
EnM-G091	Replace a hydraulic pump/motor	2	3
EnM-G150	Replace the cutter clutch assembly of a coal cutter	2	4
EnM-G129	Replace hydraulic pipes and fittings	2	3
EnM-G052	Replace the wheel end final drive assembly of a self propelled mobile machine	2	4
EnM-G151	Replace a flight chain assembly	2	3
EnM-G	Replace a hydraulic valve bank	0	0
EnM-G083	Install a chain drive	2	4
EnM-G	Replace cat tracks on self propelled mobile machines	0	0
EnM-G120	Replace a pin and bush type drive coupling	2	2
EnM-G0	Replace a wheel on a mobile machine	0	0
EnM-G	Replace a universal joint on a coal cutter	0	0
EnM-G	Replace the cutting bar on a coal cutter	0	0
EnM-G	Replace a clutch assembly on a gathering arm gear case	0	0
Total			

The following unit standards are elective to the learning process for conventional mining, in terms of the exit level outcome:

Repairing mining equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G0	Disconnect and connect a Direct Current motor	0	0
EnE-G0	Disconnect and connect a pole changing motor	0	0
EnM-G	Repair a brake system	0	0
EnE-G032	Carry out a detailed inspection on a Direct Current motor	2	3
Total			3

Specialisation area 2: Continuous mining

The following unit standards are elective to the learning process for continuous mining, in terms of the exit level outcome:

Replace mining equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G029	Install a gate end box	2	2
EnE-G023	Advance or retreat electrical reticulation in an underground coal section	3	6
EnM-G017	Replace a hydraulic cylinder	2	2
EnM-G034	Replace a gathering arm gear case	2	4
EnM-G091	Replace a hydraulic pump/motor	2	3
EnM-G110	Replace the cutter clutch assembly of a continuous miner	2	2
EnM-G129	Replace hydraulic pipes and fittings	2	3
EnM-G	Replace a wheel unit on a shuttle car	0	0
EnM-G	Replace a flight chain gearbox on a shuttle car	0	0
EnM-G	Replace a flight chain	0	0
EnM-G	Replace a hydraulic valve bank	0	0
EnM-G083	Install a chain drive	2	4
EnM-G	Replace cat tracks on self propelled mobile machines	0	0
EnM-G120	Replace a pin and bush type drive coupling	2	2
EnM-G0	Replace a wheel on a mobile machine	0	0
EnM-G	Replace a clutch assembly on a gathering arm gear case	0	0
Total			28

The following unit standards are elective to the learning process for continuous mining, in terms of the exit level outcome:

Repair mining equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G0	Disconnect and connect a Direct Current motor	0	0
EnE-G032	Carry out a detailed inspection on a Direct Current motor	2	3
EnE-G0	Disconnect and connect a pole changing motor	0	0
EnM-G	Repair a brake system	0	0
Total			3

Specialisation area 3: Wall Mining

The following unit standards are elective to the learning process for wall mining, in terms of the exit level outcome:

Replace mining equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G029	Install a gate end box	2	2
EnE-G023	Advance or retreat electrical reticulation in an underground coal section	3	6
EnM-G017	Replace a hydraulic cylinder	2	2
EnM-G091	Replace a hydraulic pump/motor	2	3
EnM-G129	Replace hydraulic pipes and fittings	2	3
EnM-G	Replace a flight chain	0	0
EnM-G	Replace a hydraulic valve bank	0	0
EnM-G120	Replace a pin and bush type drive coupling	2	2
EnM-G	Replace a hydraulic high pressure power pack	0	0
Total			18+

Specialisation area 4: Breaking services

The following unit standards are elective to the learning process for breaking services, in terms of the exit level outcome:

Replace mining equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G057	Replace faulty components in a distribution board	2	3
EnE-G058	Install a flitting panel	2	3
EnM-G004	Replace a single stage centrifugal pump	2	2
EnM-G003	Replace a reduction gearbox	2	3
EnM-G135	Replace liners on a transfer chute	2	2
EnM-G136	Install a transfer chute	2	4
EnM-G146	Replace components on a conveyor belt installation	2	3
EnM-G	Replace conveyor belt pulleys and drums	0	0
EnM-G	Replace a conveyor drive power pack	0	0
EnM-G	Replace a tail end assembly	0	0
EnM-G	Install a conveyor belt drive	0	0
Total			20

The following unit standards are elective to the learning process for breaking services, in terms of the exit level outcome:

Repair mining equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G032	Carry out a detailed inspection on a DC motor	2	3
EnE-G005	Inspect and clean a 3-phase transformer	1	1
EnE-G003	Inspect and clean a distribution board	2	2
EnE-G075	Repair a water level control system	3	3
EnM-G	Carry out a detailed inspection on a conveyor belt (Electrical)	0	0
EnM-G022	Join a conveyor belt by means of mechanical clips	2	2
EnM-G137	Repair a transfer chute	2	4

EnM-G	Train a conveyor belt	0	0
EnM-G	Carry out a detailed inspection on a conveyor belt (Mechanical)	0	0
Total			15

The following unit standards are elective to individuals.

The candidate must choose a total of at least six credits.

Number	Unit Standard Title	Level	Credit
	Demonstrate knowledge of problem solving and apply a problem solving technique to a problem		
	Produce a plan for own future directions		
MnH-G001	Follow basic health and safety practices underground	2	2
MnH-G038	Make safe a workplace by means of barring	2	2
OcS-G008	Deal with hazardous substances in a workplace	3	5
OcH-G006	Test for harmful gases by means of an approved hand held electronic instrument and take appropriate action.	4	5
RoC-G032	Acquire an appreciation for the role of rock engineering in the mining process.	1	3
OcM-G002	Carry out basic first aid treatment in the workplace.	3	3

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**No. 345****22 March 2002****National Certificate in Engineering Maintenance for Underground Hard Rock (Metalliferous)**

Field:	Manufacturing Engineering and Technology		
Sub-field:	Fabrication and Extraction		
Level:	2		
Credit:	Specialisation area 1 – Stoping and Developing	:160	
	Specialisation area 2 – Horizontal Transport	:149	
	Specialisation area 3 – Horizontal Transport Services	:179	

Issue date:**Review date:****Rationale of the qualification**

Traditionally, artisans were utilised for the purpose of low-level maintenance and repairs. Due to artisans being over-skilled for this environment, deep minerals mining has a need for focused and functional employment in the area of maintenance of basic equipment utilised in the core process of mining.

There is also a critical need in the industry to identify people who are able to conduct the essential operations associated with efficient and safe engineering maintenance and/or repairs, in at least one of the following specialisation areas:

- Underground hard rock stoping and developing
- Underground hard rock horizontal transport
- Underground hard rock horizontal transport services

Purpose:

This qualification is primarily intended for application in the underground metalliferous breaking environment, and has a primary operational application in the engineering field

Recipients of one of the variations of this qualification are able to conduct the essential operations associated with efficient and safe engineering maintenance and repairs, in any one of the following specialisation areas in metalliferous mines:

- Underground hard rock – Stoping and developing.
- Underground hard rock – Horizontal transport or
- Underground hard rock – Horizontal transport services.

The qualification is designed to be flexible and accessible so that people are able to demonstrate the competencies required to work safely in mines in general, and effectively and

safely in one of the stoping and developing, horizontal transport or horizontal transport services specialisation areas.

People credited with this qualification are able to:

- Replace mining related equipment and components
- Repair mining related equipment and components

Access to the Qualification

It is recommended that candidates have addressed the areas reflected under "Learning assumed to be in place " before embarking on learning towards this qualification.

Learning assumed to be in place

It is assumed that candidates embarking on learning towards this qualification are in possession of a relevant GETC, or equivalent, which includes the required fundamental component in an engineering field.

Exit Level Outcomes

This qualification has the following exit level outcomes, the details of which are indicated in the Annexures:

Fundamental exit level outcomes

- Communicate in a variety of ways
- Use mathematics in real life situations

See **Annexure A** for the list of unit standards that relates to these exit level outcomes

Core exit level outcomes

- Sustain health and safety in the workplace
- Replace mining related equipment and components
- Repair mining related equipment and components

See **Annexure B** for the list of unit standards that relates to these exit level outcomes. There are further generic unit standards that are required and are listed in **Annexure B**

Elective exit level outcomes

- Replace mining related equipment and components
- Repair mining related equipment and components

See **Annexure C** for the list of unit standards that relates to these exit level outcomes. Candidates may also select individual unit standards from the list in **Annexure C**

Credits and rules of combination

Candidates for a **National Certificate in Engineering Maintenance for Underground Hard Rock (Metalliferous) ~ Level 2** must achieve the credits as per the following summary, attached to this qualification description as Annexures:

Fundamental (see Annexure A for details)

- 20 Communications credits as per **Annexure A**.
- 16 Mathematical credits as per **Annexure A**.

Core

- All credits, from the list of unit standards identified in **Annexure B**, generic to the workplace or society in general
- All 71 credits, from the list of unit standards identified in **Annexure B**, core to the Engineering Maintenance for Underground Hard Rock specialisation areas:
 - Stoping and Developing
 - Horizontal Transport
 - Horizontal Transport Services.

Elective

- All credits, from the list of unit standards identified in Annexure C, relevant to one of the following specialisation areas in Engineering Maintenance for Underground Hard Rock:
 - Stoping and developing,
 - Horizontal transport
 - Horizontal transport services
- At least 6 credits, from the list of unit standards (Elective relevant to individuals) identified in Annexure C.

Summary of credit composition

Specialisation area 1: Stoping and Developing.

(These figures do not include those for "generic to the workplace or society in general").

LEVEL	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
1	0	5	2	7
2	36	48	51	135
3	0	18	0	18
4	0	0	0	0
TOTAL	36	71+	53	160+

Specialisation area 2: Horizontal Transport

(These figures do not include those for "generic to the workplace or society in general").

LEVEL	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
1	0	5	1	6
2	36	48	38	122

3	0	18	3	21
4	0	0	0	0
TOTAL	36	71+	42	149+

Specialisation area 3: Horizontal Transport Services

(These figures do not include those for "generic to the workplace or society in general").

LEVEL	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
1	0	5	0	5
2	36	48	55	139
3	0	18	17	35
4	0	0	0	0
TOTAL	36	71+	72	179+

Exit Level Outcomes

All Candidates

Exit Level Outcome 1: Communicate in a variety of ways

Associated Assessment Criteria

- Maintain and adapt oral communication
- Access and use information from text
- Write for a defined context
- Read and respond to library texts

Exit Level Outcome 2: Use mathematics in real life situations

Associated Assessment Criteria

- Demonstrate understanding of rational and irrational numbers, and number systems, with the context of relevant calculations
- Use mathematics to investigate and monitor the financial aspects of personal and community life
- Work with a range of patterns and functions to solve problems
- Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in 2 dimensions in different life or workplace contexts
- Apply basic knowledge of statistics and probability in order to investigate life-related problems

Exit Level Outcome 3: Health and safety.

Associated Assessment Criteria

- Understand Quality Management principles and processes
- Demonstrate basic understanding of AIDS
- Carry out basic first aid treatment in the workplace.
- Protect health and safety in the workplace
- Extinguish a fire by means of a fire extinguisher
- Understand emergency preparedness and response
- Understand the identification of hazards and risks and relevant response
- Understanding of legislation and compliance in terms of the Mining and Minerals Sector

Exit Level Outcome 4: Replace mining related equipment and components**Associated Assessment Criteria**

- Install an electrical cable
- Install a lighting system
- Install earthing and bonding on electrical installations
- Install a cable support system
- Install or replace an earth leakage unit in a low voltage circuit
- Install a low voltage supply in underground workings
- Replace an electric motor
- Replace a flange mounted valve
- Replace a flanged pipe section
- Replace a tyre type drive coupling
- Replace a direct mount bearing
- Lift and move a load
- Replace an electrical cable

Exit Level Outcome 5: Repairing mining equipment and components**Associated Assessment Criteria**

- Demonstrate basic knowledge of AIDS.
- Work with diverse groups in the workplace.
- Demonstrate knowledge and understanding of the consequences of substance abuse.
- Demonstrate knowledge and understanding of personal finance (budgeting, banking, savings, insurance, hire purchase).
- Demonstrate knowledge and understanding of business principles e.g. 6M.

All Specialization Areas**Stoping and Developing****Exit Level Outcome 6: Replace mining related equipment and components.****Associated Assessment Criteria**

- Install an electrical blasting box
- Install a gully box
- Install an electrical signalling device for scraper winches
- Repair a lighting system
- Replace an inline ventilation fan in an underground environment
- Replace a double drum scraper winch
- Replace components on an air driven track bound mechanical loader
- Replace a mono rope winch

Exit Level Outcome 7: Repairing mining equipment and components.**Associated Assessment Criteria**

- Carry out a detailed inspection on an electrical blasting box
- Inspect and clean a gully box
- Repair a double drum scraper winch
- Cut mild steel by means of Oxy-acetylene cutting torch
- Join metal by means of arc welding
- Assemble Oxy-acetylene equipment
- Repair the control and pipes on an air driven track bound mechanical loader

- Repair a mono rope winch

Horizontal Transport

Exit Level Outcome 8: Replace mining related equipment and components.

Associated Assessment Criteria

- Connect an industrial plug with a rating exceeding 16 amp
- Install an industrial socket outlet (Exceeding/higher/larger than 16amps)
- Install a gully box
- Install an overhead trolley line in a underground haulage
- Replace a taper sleeve bearing
- Replace an inline ventilation fan in an underground environment
- Replace a vertical spindle pump
- Replace a pin and bush type drive coupling

Exit Level Outcome 9: Repairing mining equipment and components.

Associated Assessment Criteria

- Inspect and clean a 3-phase transformer
- Carry out a detailed inspection on an electrical motor
- Carry out a detailed inspection on an overhead trolley line
- Carry out a detailed inspection on a cam operated motor controller
- Repair a water level control system

Horizontal Transport Services

Exit Level Outcome 10: Replace mining related equipment and components.

Associated Assessment Criteria

- Install an Intercom system
- Replace a taper sleeve bearing
- Replace a single stage centrifugal pump
- Replace the axle assembly on an air driven track bound mechanical loader
- Replace a final drive (gearbox) assembly of an underground locomotive
- Replace an axle assembly of an underground locomotive

Exit Level Outcome 11: Repairing mining equipment and components.

Associated Assessment Criteria

- Carry out a detailed inspection on a DC motor
- Repair an electronic controller for a battery operated machine
- Repair a battery charger
- Repair a lead acid battery comprising of independent cells
- Carry out a detailed inspection on an electrical motor
- Repair a single stage centrifugal pump
- Repair the mechanical brake system of an underground locomotive
- Repair the upper gearbox on an air driven track bound mechanical loader
- Repair the lower gearbox on an air driven track bound mechanical loader
- Repair a vertical spindle pump
- Trace and correct faults on a diesel engine of an underground locomotive

International comparability.

No qualifications and unit standards, that are comparable to this qualification and the component unit standards, have been identified.

Integrated Assessment

For awarding of the qualification, a candidate must achieve each unit standard for one of the specialisation areas, stoping and developing, horizontal transport or horizontal transport services.

The assessment criteria in the unit standards are performance-based (applied competence as opposed to required knowledge only). This means that workplace experience may be recognised when awarding credits towards this qualification.

The candidate must demonstrate the ability to effectively engage in operations selected in an integrative way, dealing with divergent and "random" demands related to the work operations

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

The qualification can act as a springboard from which people may progress to other qualifications in mining, mining-related sub-fields and mining supervision.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. The bulk of the unit standards are vocationally based and adequate facilities must be provided for the learner to practise and gain experience in a protected environment prior to assessment.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The assessor must have contextual competence in the form of a certificate, qualification or experience related to the unit standards in which assessments intend being conducted.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

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- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

ANNEXURE A

FUNDAMENTAL UNIT STANDARDS

The following unit standards are fundamental to the learning process in terms of the exit level outcome: Communicate in a variety of ways.

Candidates must achieve the following unit standards.

Number	UNIT STANDARD TITLE	Level	Credits
	Language & Communications		
FET-C/01	Maintain and adapt oral communication	2	5
FET-C/02	Access and use information from text	2	5
FET-C/03	Write for a defined context	2	5
FET-C/10	Read and respond to library texts	2	5
	Total		20

The following unit standards are fundamental to the learning process in terms of the exit level outcome:

Use mathematics in real life situations.

Candidates must achieve the following unit standards.

Number	UNIT STANDARD TITLE	Level	Credits
	Mathematical, Physical, Computer and Life Science (MathLit)		
8982	Demonstrate understanding of rational and irrational numbers, and number systems, with the context of relevant calculations	2	3
8983/MathLit2002	Use mathematics to investigate and monitor the financial aspects of personal and community life	2	2
8983/MathLit2005	Work with a range of patterns and functions to solve problems	2	5
9008	Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in 2 dimensions in different life or workplace contexts	2	3
9009/20037	Apply basic knowledge of statistics and probability in order to investigate life-related problems	2	3
	Total		16

ANNEXURE B**CORE UNIT STANDARDS****Generic to the workplace and society in general**

The following unit standards are generic to the workplace or society in general and are core to the learning process in terms of the exit level outcome:

Sustain health and safety in the workplace.

Candidates must achieve the following unit standards.

Number	Unit Standard Title	Level	Credit
	Understand Quality Management principles and processes	2	2
	Demonstrate basic understanding of AIDS	2	2
OcM-G002	Carry out basic first aid treatment in the workplace.	3	3
	Protect health and safety in the workplace	1	2
	Extinguish a fire by means of a fire extinguisher	1	2
	Understand emergency preparedness and response	2	2
	Understand the identification of hazards and risks and relevant response	2	3
	Understanding of legislation and compliance in terms of the Mining and Minerals Sector	2	2
	Total		16

All specialization areas

The following unit standards are core to the learning process for all specialization areas, in terms of the exit level outcome:

Replace mining related equipment and components

Candidates must achieve the following unit standards.

Number	Unit Standard Title	Level	Credit
EnE-G001	Install an electrical cable	2	3
EnE-G014	Install a lighting system	2	4
EnE-G016	Install earthing and bonding on electrical installations	2	2
EnE-G018	Install a cable support system	2	2
EnE-G020	Install or replace an earth leakage unit in a low voltage circuit	2	3
EnE-G021	Install a low voltage supply in underground workings	3	5
EnM-G023	Replace an electric motor	2	5
EnM-G054	Replace a flange mounted valve	1	2
EnM-G055	Replace a flanged pipe section	2	2
EnM-G119	Replace a tyre type drive coupling	2	2
EnM-G126	Replace a direct mount bearing	2	3
EnM-G007	Lift and move a load	3	7
EnE-G030	Replace an electrical cable	1	3
		Total	43

The following unit standards are core to the learning process for all specialization areas, in terms of the exit level outcome:

Repairing mining equipment and components

Candidates must achieve the following unit standards.

Number	Unit Standard Title	Level	Credit
EnE-G009	Terminate and connect low voltage cable ends	2	3
EnE-G002	Restore power by joining a cable	2	4
EnE-G010	Isolate and restore power to an electrical system	2	2
EnE-G015	Repair a lighting system	2	2
EnE-G048	Connect and commission a 3 phase direct on line starter to a motor	3	6
EnE-G064	Disconnect and reconnect an electrical motor	2	3
EnE-G019	Use and care for hand held electrical test instruments	2	3
EnE-G069	Test a three phase low voltage induction motor	2	2
EnE-G060	Carry out a detailed inspection on an electrical enclosure.	2	3
		Total	28

ANNEXURE C

ELECTIVE UNIT STANDARDS

Candidates are required to achieve all the credits for any one of the following specialisation areas.

Specialisation area 1: Stoping and Developing

The following unit standards are elective to the learning process for stoping and developing, in terms of the exit level outcome:

Replace mining related equipment and components

Number	Unit Standard Title	Level	Credit
ENE-G025	Install an electrical blasting box	1	1
ENE-G027	Install a gully box	2	2
ENE-G065	Install an electrical signalling device for scraper winches	2	3
EnM-G008	Replace an inline ventilation fan in an underground environment	2	2
EnM-G032	Replace a double drum scraper winch	2	3
EnM-G113	Replace components on an air driven track bound mechanical loader	2	5
EnM-G128	Replace a mono rope winch	2	2
Total			18

The following unit standards are elective to the learning process for stoping and developing, in terms of the exit level outcome:

Repairing mining equipment and components

Number	Unit Standard Title	Level	Credit
ENE-G026	Carry out a detailed inspection on an electrical blasting box	1	1
ENE-G028	Inspect and clean a gully box	2	2
EnM-G006	Repair a double drum scraper winch	2	4
EnM-G012	Cut mild steel by means of Oxy-acetylene cutting torch	2	3
EnM-G024	Join metal by means of arc welding	2	11
EnM-G046	Assemble Oxy-acetylene equipment	2	1
EnM-G118	Repair the control and pipes on an air driven track bound mechanical loader	2	4
EnM-G127	Repair a mono rope winch	2	3
Total			29

Specialisation area 2: Horizontal Transport

The following unit standards are elective to the learning process for horizontal transport, in terms of the exit level outcome:

Replace mining equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G006	Connect an industrial plug with a rating exceeding 16 amp	2	2
EnE-G007	Install an industrial socket outlet (Exceeding/higher/larger than 16amps)	2	2
EnE-G027	Install a gully box	2	2
EnE-G051	Install an overhead trolley line in a underground haulage	2	6
EnM-G002	Replace a taper sleeve bearing	2	2
EnM-G008	Replace an inline ventilation fan in an underground environment	2	2
EnM-G010	Replace a vertical spindle pump	2	2
EnM-G120	Replace a pin and bush type drive coupling	2	2
Total			20

The following unit standards are elective to the learning process for horizontal transport, in terms of the exit level outcome:

Repair mining equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G005	Inspect and clean a 3-phase transformer	1	1
EnE-G055	Carry out a detailed inspection on an electrical motor	2	3
EnE-G050	Carry out a detailed inspection on an overhead trolley line	2	4
EnE-G053	Carry out a detailed inspection on a cam operated motor controller	2	5
EnE-G075	Repair a water level control system	3	3
Total			16

Specialisation area 3: Horizontal Transport Services

The following unit standards are elective to the learning process for horizontal transport, in terms of the exit level outcome:

Replace mining equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G078	Install an Intercom system	2	2
EnM-G002	Replace a taper sleeve bearing	2	2
EnM-G004	Replace a single stage centrifugal pump	2	2
EnM-G117	Replace the axle assembly on an air driven track bound mechanical loader	2	3
EnM-G143	Replace a final drive (gearbox) assembly of an underground locomotive	2	5
EnM-G144	Replace an axle assembly of an underground locomotive	2	4
Total			18

The following unit standards are elective to the learning process for horizontal transport, in terms of the exit level outcome:

Repair mining equipment and components

Number	Unit Standard Title	Level	Credit
EnE-G032	Carry out a detailed inspection on a DC motor	2	3
EnE-G052	Repair an electronic controller for a battery operated machine	2	5
EnE-G076	Repair a battery charger	3	3
EnE-G077	Repair a lead acid battery comprising of independent cells	2	3
EnE-G055	Carry out a detailed inspection on an electrical motor	2	3
EnM-G013	Repair a single stage centrifugal pump	3	7
EnM-G021	Repair the mechanical brake system of an underground locomotive	2	5
EnM-G114	Repair the upper gearbox on an air driven track bound mechanical loader	2	4
EnM-G115	Repair the lower gearbox on an air driven track bound mechanical loader	2	4
EnM-G142	Repair a vertical spindle pump	2	4
EnM-G147	Trace and correct faults on a diesel engine of an underground locomotive	3	7
Total			48

The following unit standards are elective to individuals.

The candidate must choose a total of at least six credits.

Number	Unit Standard Title	Level	Credit
	Demonstrate knowledge of problem solving and apply a problem solving technique to a problem		
	Produce a plan for own future directions		
MnH-G 001	Follow basic health and safety practices underground	2	2
MnH-G 038	Make safe a workplace by means of barring	2	2
OcS-G008	Deal with hazardous substances in a workplace	3	5
OcH-G006	Test for harmful gases by means of an approved hand held electronic instrument and take appropriate action.	4	5
RoC-G032	Acquire an appreciation for the role of rock engineering in the mining process.	1	3

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**No. 346****22 March 2002****National Certificate in Diamond Processing****Field:** Manufacturing, Engineering and Technology**Sub-field:** Fabrication and Extraction**Level:** 2**Credit:** Bottom Operator stream - 145
Top Operator stream - 129**Issue date:****Review date:****Rationale of the qualification**

The majority of the candidates for this qualification are likely to be working in the diamond polishing industry. The qualification will give them the opportunity to have their skills recognised as the previous practice only accorded recognition at tradesman level. This qualification would provide a launching pad for development into diamond polisher qualifications at higher levels.

There is a critical need in the industry to convert experienced operators into qualified diamond polishers and this qualification would provide experienced, but unrecognised people in the industry an opportunity to establish their skills for further development.

Purpose:

This qualification is aimed at people who work or intend to work within the diamond processing industry and who seek recognition for essential skills in processing diamond gemstones. The qualification will give them the opportunity to have their skills recognised as the previous practice only accorded recognition at tradesman level. Recognition at this level enables candidates to prepare for further development in the industry.

Recipients of this qualification know about and are able to conduct the basic operations associated with effective polishing of rough diamond gemstones under supervision into cut and polished diamond gemstones for sale into local and international markets. The ability of the industry to develop its potential in the beneficiation of raw materials is dependent upon the development of operator skills to provide the platform for expansion and to have a base of skilled workers to feed the more skilled occupations of crossworker and brillianteer.

The qualification is designed to be flexible and accessible so that people are able to consistently demonstrate the competencies required to work safely and effectively in polishing diamond gemstones under supervision.

The candidate can select "bottom" or "top" as a stream, and then has a further choice of either "sawn" or "makeable" diamonds.

- National Certificate in Diamond Processing: Bottom Operator
- National Certificate in Diamond Processing: Top Operator

People credited with this qualification are able to:

- Communicate in a variety of ways
- Use mathematics in practical applications
- Work effectively in a diamond processing workplace
- Interact effectively with others at work
- Prepare tables on diamond gemstones
- Perform bottom blocking on diamond gemstones
- Perform bottom lapping on diamond gemstones
- Polish bottom halves on diamond gemstones
- Perform top blocking on diamond gemstones
- Perform top lapping on diamond gemstones
- Polish top halves on diamond gemstones
- Make stars on diamond gemstones

Opportunities for specialisation are:

- Performing polishing functions on sawn diamond gemstones
- Performing polishing functions on makeable diamond gemstones

Access to the Qualification

This qualification is open to anyone with access to learning opportunities and work experience in the areas reflected in the exit level outcomes and unit standards. It is advisable that candidates should already have addressed the areas reflected under "learning assumptions" before embarking on learning towards this qualification, although the exact starting point depends on the available resources for learning.

Learning assumed to be in place

It is assumed that candidates embarking on learning towards this qualification are already competent in the areas of communication, mathematics, natural science and arts and culture in the General Education and Training Band.

Exit Level Outcomes

Fundamental exit level outcomes:

- Communicate in a variety of ways
- Use mathematics in practical applications

See Annexure A for the list of unit standards that relate to these exit level outcomes.

Core exit level outcomes

Candidates who are declared competent in the core unit standards are able to exit the qualification with recognition of their ability to work effectively in a diamond processing workplace. This recognition could apply to other areas of operation of diamond processing other than polishing. The clusters are: -

- Work effectively in a diamond processing workplace
- Interact effectively with others at work

See Annexure B for the list of unit standards that relate to these exit level outcomes.

Elective exit level outcomes

Each of the Unit standards set out in the Bottom Operator and Top Operator Streams in Annexure C represent discrete elements of the processes of operator polishing. A candidate who is declared competent in any one of these unit standards, coupled with the workplace standards referred to above, would be able to exit the qualification and be recognised as competent as an operator in that specific activity. The possible categories are: -

- Prepare tables on diamond gemstones
- Perform bottom blocking on diamond gemstones
- Perform bottom lapping on diamond gemstones
- Polish bottom halves on diamond gemstones
- Perform top blocking on diamond gemstones
- Perform top lapping on diamond gemstones
- Polish top halves on diamond gemstones
- Make stars on diamond gemstones

Candidates may also select from individual unit standards from the list of generic elective standards in Annexure C.

Credits and rules of combination

Fundamental (See Annexure A for the detail):

- 20 Communications credits from the list specified
- 16 Mathematics credits from the list specified

Core (See Annexure B for the detail):

- All 38 credits from the list of standards generic to working in a diamond processing workplace
- All 24 credits from the list of standards generic to interaction in a diamond processing workplace

Elective (See Annexure C for the detail):

- A minimum of 41 from the 82 credits of the candidate's choice from the list of credits if the candidate elects the Bottom Operator stream. The candidate must select all the unit standards relating to "sawn" or all the unit standards relating to "makeable" diamond gemstones.
- A minimum of 25 from the 58 credits of the candidate's choice from the list of credits if the candidate elects the Top Operator stream. The candidate must select all the unit standards relating to "sawn" or all the unit standards relating to "makeable" diamond gemstones.
- A minimum of 6 of the 9 credits of the candidate's choice from the generic list of credits

Summary of credit composition – Bottom Operator

	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
LEVEL 1		26		26
LEVEL 2	36	36	47	119
LEVEL 3				
LEVEL 4				
TOTAL	36	62	47	145

Summary of credit composition – Top Operator

	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
LEVEL 1		26		26
LEVEL 2	36	36	31	103
LEVEL 3				
LEVEL 4				
TOTAL	36	62	31	129

Exit Level Outcomes

Exit Level Outcome 1: Communicate in a variety of ways

Associated Assessment Criteria

- Maintain and adapt oral communication
- Access and use information from texts
- Write for a defined context
- Use language and communication in occupational learning programmes

Exit Level Outcome 2: Mathematics Standards

Associated Assessment Criteria

- Demonstrate understanding of rational and irrational numbers, and number systems, with the context of relevant calculations
- Use mathematics to investigate and monitor the financial aspects of personal and community life
- Work with a range of patterns and functions to solve problems
- Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in 2 dimensions in different life or workplace contexts
- Apply basic knowledge of statistics and probability in order to investigate life-related problems

Exit Level Outcome 3: Workplace Standards

Associated Assessment Criteria

- Use a loupe to examine diamond gemstones
- Describe the structure of the diamond processing industry
- Describe the characteristics of diamond gemstones
- Explain the requirements for security of diamonds
- Prepare a scaiffe
- Level tangs for polishing diamond gemstones
- Explain how HIV/AIDS is transmitted
- Explain how to address HIV/AIDS in the workplace
- Demonstrate basic rules of safety in the workplace
- Explain the roles of employees relating to first aid in the workplace

Exit Level Outcome 4: Workplace Interaction

Associated Assessment Criteria

- Demonstrate care and timeliness as an employee
- Demonstrate problem solving and apply a technique to solve a problem
- Communicate a problem so that the other party collaborates in resolving it

- Explain basic rights of employees
- Explain the obligations of an employee
- Answer workplace related queries
- Demonstrate knowledge of anger and options for dealing with anger
- Maintain personal presentation for the workplace
- Work with diverse groups in the workplace
- Describe the employment relationship and the application of employment law in that relationship
- Recognise harassment in the workplace and describe ways of dealing with it

Integrated Assessment

For award of the qualification, a candidate must achieve each unit standard as above. Candidates must demonstrate the ability to engage in the operations selected in an integrative way, dealing with divergent and "random" demands related to these work operations, effectively.

Fundamental exit level outcomes require that the candidate must demonstrate the ability to communicate and use mathematics effectively in a variety of ways.

Core exit level outcomes must be assessed in the context of the workplace and candidates must be able to demonstrate competencies in the normal course of workplace activities. These often require that the competencies be applied simultaneously and in different combinations.

The structure of operations in the industry are such that each unit standard reflected in the respective cluster of elective standards for both bottom and top operator streams represents an exit level outcome at which assessment may be conducted.

Evidence is required that the candidate is able to achieve the purpose of the qualification as a whole at the time of the award of the qualification; that is to say to effectively carry out the full cluster of elective standards at either bottom operator level or top operator level.

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors.

Articulation possibilities

This qualification can form the foundation for a candidate who wishes to develop into a diamond polisher. This qualification also contains common competencies with other disciplines within the diamond processing industry. The detail of these other qualifications is still to be finalised. There is no existing comparable qualification.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. The bulk of the unit standards are vocationally based and adequate facilities must be provided for the learner to practise and gain experience in a protected environment prior to assessment.

- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The assessor must have contextual competence in the form of a certificate, qualification or experience related to the unit standards in which assessments intend being conducted.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.
- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.
- *Systematic:* Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open:* Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent:* The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
- All Core unit standards are compulsory (107 Credits)
- A selection of Elective unit standards (minimum of 10 Credits)

These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

Annexure A Fundamental

Communication

Candidates are required to achieve all the following standards:

Number	Title	Level	Credit
Exit level outcome: Communicate in a variety of ways			
FET-C/01	Maintain and adapt oral communication	2	5
FET-C/02	Access and use information from texts	2	5
FET-C/03	Write for a defined context	2	5
FET-S/16	Use language and communication in occupational learning programmes	2	5
TOTAL			20

Mathematics/Numeracy

Candidates are required to achieve all the following standards:

Number	Title	Level	Credit
Exit level outcome: Use mathematics in practical applications			
8982	Demonstrate understanding of rational and irrational numbers, and number systems, with the context of relevant calculations	2	3
8983/MathLit2002	Use mathematics to investigate and monitor the financial aspects of personal and community life	2	2
9007/MathLit 2005	Work with a range of patterns and functions to solve problems	2	5
9008	Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in 2 dimensions in different life or workplace contexts	2	3
9009/2003	Apply basic knowledge of statistics and probability in order to investigate life-related problems	2	3
TOTAL			16

**Annexure B
Core**

Workplace Standards. The following unit standards are core to working in a diamond processing workplace. Candidates are required to achieve all the following credits:

Number	UNIT STANDARD TITLE	Level	Credits
DiP_G00 0	Use a loupe to examine diamond gemstones	1	8
DiP_G00 1	Describe the structure of the diamond processing industry	1	3
Dip_G00 3	Describe the characteristics of diamond gemstones	2	10
DiP_G00 5	Explain the requirements for security of diamonds	1	1
DiP_G30 2	Prepare a scaiffe	2	2
DiP_G30 3	Level tangs for polishing diamond gemstones	1	2
	Explain how HIV/AIDS is transmitted	1	2
	Explain how to address HIV/AIDS in the workplace	1	4
	Demonstrate basic rules of safety in the workplace	1	4
	Explain the roles of employees relating to first aid in the workplace	1	2
	TOTAL		38

Workplace Interaction. The following unit standards are core to interaction in a diamond processing workplace. Candidates are required to achieve all credits:

Number	UNIT STANDARD TITLE	Level	Credits
	Demonstrate care and timeliness as an employee	2	3
	Demonstrate problem solving and apply a technique to solve a problem	2	2
	Communicate a problem so that the other party collaborates in resolving it	2	2
	Explain basic rights of employees	2	2
	Explain the obligations of an employee	2	2
	Answer workplace related queries	2	2
	Demonstrate knowledge of anger and options for dealing with anger	2	2
	Maintain personal presentation for the workplace	2	2
	Work with diverse groups in the workplace	2	2
	Describe the employment relationship and the application of employment law in that relationship	2	3
	Recognise harassment in the workplace and describe ways of dealing with it	2	2
	TOTAL		24

Annexure C
Electives

A candidate must select either of the streams: Bottom Operator or Top Operator.

Bottom Operator Stream

EITHER all the credits for "Sawn" standards

Number	UNIT STANDARD TITLE	Level	Credit
Dip_G34 0	Make complete bottoms on sawn diamond gemstones	2	18
Dip_G34 1	Prepare a table on sawn diamond gemstones	2	5
DiP_G34 2	Bottom block sawn diamond gemstones	2	8
DiP_G34 3	Bottom lap sawn diamond gemstones	2	6
DiP_G34 4	Polish bottom halves for sawn diamond gemstones	2	4
	TOTAL		41

OR all the credits for "Makeable" standards

Number	UNIT STANDARD TITLE	Level	Credit
Dip_G34 5	Make complete bottoms on makeable diamond gemstones	2	18
DiP_G34 6	Prepare a table on makeable diamond gemstones	2	5
DiP_G34 7	Bottom block makeable diamond gemstones	2	8
DiP_G34 8	Bottom lap makeable diamond gemstones	2	6
DiP_G34 9	Polish bottom halves for makeable diamond gemstones	2	4
	TOTAL		41

Top Operator Stream

EITHER all the credits for "Sawn" standards

Number	UNIT STANDARD TITLE	Level	Credits
Dip_G35 0	Make complete tops on sawn diamond gemstones	2	13
Dip_G35 1	Top block sawn diamond gemstones	2	7
DiP_G35 2	Top lap sawn diamond gemstones	2	5
DiP_G35 3	Polish top halves for sawn diamond gemstones	2	4
DiP_G35 4	Polish stars on sawn diamond gemstones	2	4
	TOTAL		33

OR all the credits for "Makeable" standards

Number	UNIT STANDARD TITLE	Level	Credits
Dip_G35 5	Make complete tops on makeable diamond gemstones	2	9
DIP_G35 6	Top block makeable diamond gemstones	2	7
DIP_G35 7	Top lap makeable diamond gemstones	2	3
DIP_G35 8	Polish top halves for makeable diamond gemstones	2	4
DIP_G35 9	Polish stars on makeable diamond gemstones	2	2
	TOTAL		25

Generic Elective Standards

A minimum of 6 credits must be selected from the following unit standards:

Number	UNIT STANDARD TITLE	Level	Credits
	Criticising solutions so that the other party collaborates in seeking a better solution	2	2
	Demonstrate personal discipline in the workplace	2	2
	Explain how to improve employment relationships	2	2
	Demonstrate how to improve behaviour in the workplace	2	1
	Explain the role and responsibility of a Health & Safety representative in the workplace	2	2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 347

22 March 2002

National Certificate in Diamond Processing: Polisher - Brillianteer**Field:** Manufacturing, Engineering and Technology**Sub-field:** Fabrication and Extraction**Level:** 3**Credit:** 323**Issue date:****Review date:****Rationale of the qualification**

The majority of the candidates for this qualification are likely to be working in the diamond polishing industry. The qualification will give recognition to people who are able to conceptualise and convert any diamond gemstones into marketable commodities. People with these skills form the backbone of maintaining standards in the industry, being able to deal with complications and to advise others in the performance of their polishing tasks.

This qualification has been identified as one of the most critical needs to enable the diamond cutting industry to prosper in South Africa and the global market. It is the level to which many operators, who have not been previously given recognition for their skills, aspire to create the skills pool for future generations.

Purpose:

This qualification is aimed at people who work or intend to work within the diamond processing industry and who seek recognition for essential skills in processing diamond gemstones. The qualification will give them the opportunity to have their skills recognised as the previous practice only accorded recognition at tradesman level through apprenticeships or trade tests. This qualification seeks to provide the learner with a broad understanding of the requirements to work effectively with others as well to recognise the competencies specific to the trade. Recognition at this level enables candidates to perpetuate the inherent skills of the industry and this is essential for further development of the industry.

Recipients of this qualification know about and are, through self directed assessment of the gemstone, able to conduct the holistic requirements to polish rough diamond gemstones under minimal supervision into cut and polished diamond gemstones for sale into local and international markets. The ability of the industry to develop its potential in the beneficiation of raw materials is dependent upon the development of the skills of crossworker and brillianteer. Without these special skills the future of the industry will falter along with expansion of job opportunities for workers at operator levels.

The qualification is designed to be flexible and accessible so that people are able to consistently demonstrate the competencies required to work safely and effectively in the polishing of a wide spectrum of diamond gemstones under minimal supervision.

The candidate is required to demonstrate the ability to brillianteer both sawn and makeable diamond gemstones.

People credited with this qualification are able to:

- Communicate in a variety of contexts
- Use mathematics in practical applications
- Work effectively in a diamond processing workplace
- Interact effectively with others in a diamond processing workplace
- Brillianteer sawn diamond gemstones
- Brillianteer makeable diamond gemstones
- Polish bottom halves on diamond gemstones
- Polish top halves on diamond gemstones
- Make stars on diamond gemstones

Opportunities for specialisation are:

- Performing polishing functions on sawn diamond gemstones
- Performing polishing functions on makeable diamond gemstones

Access to the Qualification

This qualification is open to anyone with access to learning opportunities and work experience in the areas reflected in the exit level outcomes and unit standards. It is advisable that candidates should already have addressed the areas reflected under "learning assumptions" before embarking on learning towards this qualification, although the exact starting point depends on the available resources for learning.

Candidates may commence their learning in the industry through an appropriate learnership to achieve this qualification. Access is also open to candidates who have already demonstrated competence in basic polishing skills and who have been credited with the national certificate in diamond polishing at operator level, or who have attained any of the exit level outcomes in that qualification.

Learning assumed to be in place

It is assumed that candidates embarking on learning towards this qualification are already competent in the areas of communication, mathematics, natural science and arts and culture in the General Education and Training Band.

Exit Level Outcomes

This qualification is designed to reflect the competency of candidates who are able to complete the whole process of polishing under minimal supervision. Whilst there are defined milestones in the learning processes which equate to exit level outcomes in the national certificate in diamond processing at operator level, these exit level outcomes are not applicable for this qualification. This is because the progression from the various stages of diamond polishing is continuous under this qualification. Nevertheless, where competence has been assessed at any of these exit level outcomes under this qualification, the candidate would be able to be recognised at that level under the national certificate.

Exit level outcomes:**Fundamental exit level outcomes:**

- Communicate in a variety of ways
- Use mathematics in practical applications

See Annexure A for the list of unit standards that relate to these exit level outcomes.

Core exit level outcomes

Candidates who are declared competent in the core unit standards are able to exit the qualification with recognition of their ability to work effectively in a diamond processing workplace. This recognition could apply to other areas of operation of diamond processing other than polishing. The cluster of unit standards is described in Annexure B as: -

- Work effectively in a diamond processing workplace
Candidates who are declared competent in the core unit standards reflected under the heading "Generic Diamond Processing Standards" are able to exit the qualification with recognition of their ability to understand the characteristics of diamond gemstones and the processing systems in the industry. Such a candidate would have a platform of competence to develop into other streams of diamond processing, such as Marking, Parting, Bruting and Grading. The cluster of unit standards is described in Annexure B as: -
- Interact effectively with others in a diamond processing workplace

A candidate who is declared competent in brilliantteering on only sawn or makeable gemstones could exit the qualification with recognition of this limitation, however, it is the stated intention of the industry that qualification should apply to candidates who are competent in brilliantteering both kinds of gemstones.

- Brilliantteer sawn diamond gemstones
- Brilliantteer makeable diamond gemstones

See Annexure B for the list of unit standards that relate to these exit level outcomes.

Elective exit level outcomes

Each of the Unit standards set out in the Diamond Polishing Standards in Annexure C represent discrete elements of the processes of operator polishing. A candidate who is declared competent in any one of these unit standards, coupled with the workplace standards referred to above, would be able to exit the qualification and be recognised as competent as an operator in that specific activity. The possible categories are: -

- Polish bottom halves on diamond gemstones
- Polish top halves on diamond gemstones
- Make stars on diamond gemstones

Candidates may also select from individual unit standards from the list of generic elective standards in Annexure C.

Credits and rules of combination**Fundamental** (See Annexure A for the detail):

- 20 Communications credits from the list specified
- 16 Mathematics credits from the list specified

Core (See Annexure B for the detail):

- All 38 credits from the list of standards generic to working in a diamond processing workplace
- All 64 credits from the list of standards generic to interacting effectively with others in a diamond processing workplace
- All 131 credits from the list of diamond polishing standards. These relate to the competencies of the Brillianteer.

Elective (See Annexure C for the detail):

- A minimum of 10 from the 22 credits from the list of diamond polishing standards
- A minimum of 31 from the 61 credits of the candidate's choice from the list of diamond processing standards.
- A minimum of 13 of the 22 credits of the candidate's choice from the generic list of standards.

Summary of credit composition

	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
LEVEL 1		26		26
LEVEL 2		23	36	59
LEVEL 3	36	135	18	189
LEVEL 4		49		49
TOTAL	36	233	54	323

Exit Level Outcomes

Exit Level Outcome 1: Communication Standards

Associated Assessment Criteria

- Accommodate context needs in oral communication
- Interpret and use information from texts
- Interpret a variety of literary texts
- Use language and communication in occupational learning programmes

Exit Level Outcome 2: Mathematics Standards

Associated Assessment Criteria

- Demonstrate understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations
- Use mathematics to investigate and monitor the financial aspects of personal and business issues
- Investigate life-related problems using data and probabilities
- Measure, estimate and calculate physical quantities and explore, describe and represent, interpret and justify geometrical relationships in two and three dimensional space relevant to the life or workplace of the community

Exit Level Outcome 3: Diamond Processing Core Standards

Associated Assessment Criteria

- Use a loupe to examine diamond gemstones
- Describe the structure of the diamond processing industry
- Describe the characteristics of diamond gemstones
- Explain the requirements for security of diamonds

- Prepare a scaiffe
- Level tangs for polishing diamond gemstones
- Explain how HIV/AIDS is transmitted
- Explain how to address HIV/AIDS in the workplace
- Demonstrate basic rules of safety in the workplace
- Explain the roles of employees relating to first aid in the workplace

Exit Level Outcome 4: Generic Diamond Processing Standards

Associated Assessment Criteria

- Describe the characteristics of diamond gemstones
- Set up a bench & level a scaiffe
- Set diamond gemstones for polishing
- Describe the process of fabrication for polishing diamond gemstones.
- Identify basic employment rights and responsibilities and sources of information and assistance
- Explain the importance of ergonomics in planning a working area
- Identify, from an employee perspective, ways of dealing with personal grievances and disputes.
- Contribute to collective employment contract negotiation as an employee
- Exercise effective time management
- Exercise effective leadership in the workplace
- Use fractions, ratio and proportions to evaluate
- Recognise harassment in the workplace and describe ways of dealing with it
- Explain the role and responsibility of a Health & Safety representative in the workplace

Exit Level Outcome 5: Diamond Polishing Standards

Associated Assessment Criteria

- Brillianteer sawn diamond gemstones
- Brillianteer makeable diamond gemstones

International comparability.

This qualification and the component unit standards will be internationally accepted and can be favourably compared with practices and qualifications from other countries including Israel, Belgium and the United States of America.

International qualifications are more aligned to the journeyman qualification described above rather than the qualification prepared for the National Qualifications Framework.

Integrated Assessment

For award of the qualification, a candidate must achieve each unit standard as per item 13 above. Candidates must demonstrate the ability to engage in the operations selected in an integrative way, dealing with divergent and "random" demands related to these work operations, effectively.

Fundamental exit level outcomes require that the candidate must demonstrate the ability to communicate and use mathematics effectively in a variety of ways.

Core exit level outcomes must be assessed in the context of the workplace and candidates must be able to demonstrate competencies in the normal course of workplace activities. These often require that the competencies be applied simultaneously and in different combinations.

The requirement of this qualification is that the process of polishing a diamond gemstone under minimal supervision requires integrated assessment. Whilst the processing elements can be assessed separately, the key to the qualification is the ability to produce the gemstone at the required level of finish without close supervision.

Evidence is required that the candidate is able to achieve the purpose of the qualification as a whole at the time of the award of the qualification: that is to say to effectively carry out the full cluster of elective standards at the level of Brillianteer.

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

The qualification can act as a springboard from which people may progress to other qualifications in mining, mining-related sub-fields and mining supervision.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. The bulk of the unit standards are vocationally based and adequate facilities must be provided for the learner to practise and gain experience in a protected environment prior to assessment.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The assessor must have contextual competence in the form of a certificate, qualification or experience related to the unit standards in which assessments intend being conducted.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or

role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.

- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.
- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.
- *Systematic:* Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open:* Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent:* The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
 - All Core unit standards are compulsory (107 Credits)
 - A selection of Elective unit standards (minimum of 10 Credits)
- These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

Annexure A Fundamental

Communication

Candidates are required to achieve all the following standards:

Number	Title	Level	Credit
Exit level outcome: Communicate in a variety of ways			
FET-C/04	Accommodate context needs in oral communication	3	5
FET-C/05	Interpret and use information from texts	3	5
FET-S/13	Interpret a variety of literary texts	3	5
FET-S/17	Use language and communication in occupational learning programmes	3	5
TOTAL			20

Note These unit standards are taken from those currently registered on the NQF. When more standards are available this list may be modified.

Mathematics/Numeracy

Candidates are required to achieve all the following standards:

Number	Title	Level	Credit
Exit level outcome: Use mathematics in practical applications			
9010/MathLit3001	Demonstrate understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	3	2
9011/MathLit3002	Use mathematics to investigate and monitor the financial aspects of personal and business issues	3	5
9012	Investigate life-related problems using data and probabilities	3	5
9013	Measure, estimate and calculate physical quantities and explore, describe and represent, interpret and justify geometrical relationships in two and three dimensional space relevant to the life or workplace of the community	3	4
TOTAL			16

Note These unit standards are taken from those currently registered on the NQF. When more standards are available this list may be modified.

Annexure B Core

Diamond Processing Core Standards

Workplace Standards. The following unit standards are core to working in a diamond processing workplace. Candidates are required to achieve all the following credits:

Number	UNIT STANDARD TITLE	Level	Credits
DiP_G00 0	Use a loupe to examine diamond gemstones	1	8
DiP_G00 1	Describe the structure of the diamond processing industry	1	3
DiP_G00 3	Describe the characteristics of diamond gemstones	2	10
DiP_G00 5	Explain the requirements for security of diamonds	1	1
DiP_G30 2	Prepare a scaiffe	2	2
DiP_G30 3	Level tangs for polishing diamond gemstones	1	2
	Explain how HIV/AIDS is transmitted	1	2
	Explain how to address HIV/AIDS in the workplace	1	4
	Demonstrate basic rules of safety in the workplace	1	4
	Explain the roles of employees relating to first aid in the workplace	1	2
	TOTAL		38

Generic Diamond Processing Standards

Workplace Interaction. The following unit standards are core to interaction in a diamond processing workplace. Candidates are required to achieve all credits:

Number	UNIT STANDARD TITLE	Level	Credits
DiP_G00 4	Describe the characteristics of diamond gemstones	4	22
DiP_G30 1	Set up a bench & level a scaiffe	2	2
DiP_G30 5	Set diamond gemstones for polishing	2	3
DiP_G30 6	Describe the process of fabrication for polishing diamond gemstones	4	13
	Communicate a problem so that the other party collaborates in resolving it	2	2
	Identify basic employment rights and responsibilities and sources of information and assistance	4	2
	Explain the importance of ergonomics in planning a working area	4	2
	Identify, from an employee perspective, ways of dealing with personal grievances and disputes	3	2

Number	UNIT STANDARD TITLE	Level	Credits
	Contribute to collective employment contract negotiation as an employee	3	2
	Exercise effective time management	4	2
	Exercise effective leadership in the workplace	4	4
	Use fractions, ratio and proportions to evaluate	4	4
	Recognise harassment in the workplace and describe ways of dealing with it	2	2
	Explain the role and responsibility of a Health & Safety representative in the workplace	2	2
	TOTAL		64

Diamond Polishing Standards

The following unit standards are core to a Brillianteer. Candidates are required to achieve all the following credits:

Number	UNIT STANDARD TITLE	Level	Credit
Dip_G32 0	Brillianteer sawn diamond gemstones	3	61
Dip_G32 5	Brillianteer makeable diamond gemstones	3	70
	TOTAL		131

Note Unreferenced unit standards are listed pending the registration of similar standards on the NQF. When these standards are available this list may be modified.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**No. 348****22 March 2002****National Certificate in Diamond Processing: Polisher - Crossworker****Field:** Manufacturing, Engineering and Technology**Sub-field:** Fabrication and Extraction**Level:** 4**Credit:** 351 credits**Issue date:****Review date:****Rationale of the qualification**

The majority of the candidates for this qualification are likely to be working in the diamond polishing industry. The qualification will give recognition to people who are able to conceptualise and convert any diamond gemstones into marketable commodities. People with these skills form the backbone of maintaining standards in the industry, being able to deal with complications and to advise others in the performance of their polishing tasks.

This qualification has been identified as one of the most critical needs to enable the diamond cutting industry to prosper in South Africa and the global market. It is the level to which many operators, who have not been previously given recognition for their skills, aspire to create the skills pool for future generations.

Purpose:

This qualification is aimed at people who work or intend to work within the diamond processing industry and who seek recognition for essential skills in processing diamond gemstones. The qualification will give them the opportunity to have their skills recognised as the previous practice only accorded recognition at tradesman level through apprenticeships or trade tests. This qualification seeks to provide the learner with a broad understanding of the requirements to work effectively with others as well to recognise the competencies specific to the trade. Recognition at this level enables candidates to perpetuate the inherent skills of the industry and this is essential for further development of the industry.

Recipients of this qualification know about and are, through self directed assessment of the gemstone, able to conduct the holistic requirements to polish rough diamond gemstones under minimal supervision into cut and polished diamond gemstones for sale into local and international markets. The ability of the industry to develop its potential in the beneficiation of raw materials is dependent upon the development of the skills of crossworker and brillianteer. Without these special skills the future of the industry will falter along with expansion of job opportunities for workers at operator levels.

The qualification is designed to be flexible and accessible so that people are able to consistently demonstrate the competencies required to work safely and effectively in the polishing of a wide spectrum of diamond gemstones under minimal supervision.

The candidate is required to demonstrate the ability to crosswork both sawn and makeable diamond gemstones.

People credited with this qualification are able to:

- Communicate in a variety of contexts
- Use mathematics in practical applications
- Work effectively in a diamond processing workplace
- Interact effectively with others in a diamond processing workplace
- Crosswork sawn diamond gemstones
- Crosswork makeable diamond gemstones
- Prepare tables on diamond gemstones
- Perform bottom blocking on diamond gemstones
- Perform bottom lapping on diamond gemstones
- Perform top blocking on diamond gemstones
- Perform top lapping on diamond gemstones

Opportunities for specialisation are:

- Performing polishing functions on sawn diamond gemstones
- Performing polishing functions on makeable diamond gemstones

Access to the Qualification

This qualification is open to anyone with access to both learning opportunities and work experience in the areas reflected in the exit level outcomes and unit standards. It is advisable that candidates should already have addressed the areas reflected under "learning assumptions" before embarking on learning towards this qualification, although the exact starting point depends on the available resources for learning.

Learning assumed to be in place

The credit calculation is based on the assumption that learners are already competent in terms of the following outcomes or areas of learning when starting to learn towards this unit standard:

- Company induction
- Appropriate licence to operate in the work area
- Workplace health and safety standards
- Communication skills (Language at ABET Level 3)
- Basic knowledge of in-pit or strip-mining operations
- An understanding of basic principles of information technology

Exit Level Outcomes

This qualification is designed to reflect the competency of candidates who are able to complete the whole process of polishing under minimal supervision. Whilst there are defined milestones in the learning processes which equate to exit level outcomes in the national certificate in diamond processing at operator level, these exit level outcomes are not applicable for this qualification. This is because the progression from the various stages of diamond polishing is continuous under this qualification. Nevertheless, where competence has been assessed at any of these exit level outcomes under this qualification, the candidate would be able to be recognised at that level under the national certificate.

Exit Level Outcomes:

Fundamental exit level outcomes:

- Communicate in a variety of ways
- Use mathematics in practical applications

See Annexure A for the list of unit standards that relate to these exit level outcomes.

Core exit level outcomes

Candidates who are declared competent in the core unit standards are able to exit the qualification with recognition of their ability to work effectively in a diamond processing workplace. This recognition could apply to other areas of operation of diamond processing other than polishing. The cluster of unit standards is described in Annexure B as: -

- Work effectively in a diamond processing workplace

Candidates who are declared competent in the core unit standards reflected under the heading "Generic Diamond Processing Standards" are able to exit the qualification with recognition of their ability to understand the characteristics of diamond gemstones and the processing systems in the industry. Such a candidate would have a platform of competence to develop into other streams of diamond processing, such as Marking, Parting, Bruting and Grading. The cluster of unit standards is described in Annexure B as: -

- Interact effectively with others in a diamond processing workplace

A candidate who is declared competent in crossworking on only sawn or makeable gemstones could exit the qualification with recognition of this limitation, however, it is the stated intention of the industry that qualification should apply to candidates who are competent in crossworking both kinds of gemstones.

- Crosswork sawn diamond gemstones
- Crosswork makeable diamond gemstones

See Annexure B for the list of unit standards that relate to these exit level outcomes.

Elective exit level outcomes

Each of the Unit standards set out in the Diamond Polishing Standards in Annexure C represent discrete elements of the processes of operator polishing. A candidate who is declared competent in any one of these unit standards, coupled with the workplace standards referred to above, would be able to exit the qualification and be recognised as competent as an operator in that specific activity. The possible categories are: -

- Prepare tables on diamond gemstones
- Perform bottom blocking on diamond gemstones
- Perform bottom lapping on diamond gemstones
- Perform top blocking on diamond gemstones
- Perform top lapping on diamond gemstones

Candidates may also select from individual unit standards from the list of generic elective standards in Annexure C.

Credits and rules of combination

Fundamental (See Annexure A for the detail):

- 20 Communications credits from the list specified
- 16 Mathematics credits from the list specified

Core (See Annexure B for the detail):

- All 38 credits from the list of standards generic to working in a diamond processing workplace
- All 64 credits from the list of standards generic to interacting effectively with others in a diamond processing workplace
- All 138 credits from the list of diamond polishing standards. These relate to the competencies of the Crossworker.

Elective (See Annexure C for the detail):

- A minimum of 31 from the 60 credits from the list of diamond polishing standards
- A minimum of 31 from the 61 credits of the candidate's choice from the list of diamond processing standards.
- A minimum of 13 of the 22 credits of the candidate's choice from the generic list of standards.

Summary of credit composition

	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
LEVEL 1		26		26
LEVEL 2		23	57	80
LEVEL 3		4	18	22
LEVEL 4	36	187		223
TOTAL	36	240	75	351

Exit Level Outcomes

Exit Level Outcome 1: Communication Standards

Associated Assessment Criteria

- Engage in sustained oral communications and evaluate spoken texts
- Read, analyse and respond to a variety of texts
- Evaluate literary texts
- Use language and communication in occupational learning programmes

Exit Level Outcome 2: Mathematics Standards

Associated Assessment Criteria

- Use mathematics to investigate and monitor the financial aspects of personal, business and national issues
- Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings in life-related problems
- Measure, estimate and calculate physical quantities and explore, critique and prove geometrical relationships in two and three dimensional space in the life or workplace of the adult with increasing responsibilities

Exit Level Outcome 3: Diamond Processing Core Standards**Associated Assessment Criteria**

- Use a loupe to examine diamond gemstones
- Describe the structure of the diamond processing industry
- Describe the characteristics of diamond gemstones
- Explain the requirements for security of diamonds
- Prepare a scaiffe
- Level tangs for polishing diamond gemstones
- Explain how HIV/AIDS is transmitted
- Explain how to address HIV/AIDS in the workplace
- Demonstrate basic rules of safety in the workplace
- Explain the roles of employees relating to first aid in the workplace

Exit Level Outcome 4: Generic Diamond Processing Standards**Associated Assessment Criteria**

- Describe the characteristics of diamond gemstones
- Set up a bench & level a scaiffe
- Set diamond gemstones for polishing
- Describe the process of fabrication for polishing diamond gemstones.
- Identify basic employment rights and responsibilities and sources of information and assistance
- Explain the importance of ergonomics in planning a working area
- Identify, from an employee perspective, ways of dealing with personal grievances and disputes.
- Contribute to collective employment contract negotiation as an employee
- Exercise effective time management
- Exercise effective leadership in the workplace
- Use fractions, ratio and proportions to evaluate
- Recognise harassment in the workplace and describe ways of dealing with it
- Explain the role and responsibility of a Health & Safety representative in the workplace

Exit Level Outcome 5: Diamond Polishing Standards**Associated Assessment Criteria**

- Crosswork sawn diamond gemstones
- Crosswork makeable diamond gemstones

International comparability.

This qualification and the component unit standards will be internationally accepted and can be favourably compared with practices and qualifications from other countries including Israel, Belgium and the United States of America.

International qualifications are more aligned to the journeyman qualification described above rather than the qualification prepared for the National Qualifications Framework.

Integrated Assessment

For award of the qualification, a candidate must achieve each unit standard as per item 13 above. Candidates must demonstrate the ability to engage in the operations selected in an integrative way, dealing with divergent and "random" demands related to these work operations, effectively.

Fundamental exit level outcomes require that the candidate must demonstrate the ability to communicate and use mathematics effectively in a variety of ways.

Core exit level outcomes must be assessed in the context of the workplace and candidates must be able to demonstrate competencies in the normal course of workplace activities. These often require that the competencies be applied simultaneously and in different combinations.

The requirement of this qualification is that the process of polishing a diamond gemstone under minimal supervision requires integrated assessment. Whilst the processing elements can be assessed separately, the key to the qualification is the ability to produce the gemstone at the required level of finish without close supervision.

Evidence is required that the candidate is able to achieve the purpose of the qualification as a whole at the time of the award of the qualification: that is to say to effectively carry out the full cluster of elective standards at the level of Crossworker.

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

The qualification can act as a springboard from which people may progress to other qualifications in mining, mining-related sub-fields and mining supervision.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. The bulk of the unit standards are vocationally based and adequate facilities must be provided for the learner to practise and gain experience in a protected environment prior to assessment.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The assessor must have contextual competence in the form of a certificate, qualification or experience related to the unit standards in which assessments intend being conducted.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.
- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.
- *Systematic:* Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open:* Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent:* The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
 - All Core unit standards are compulsory (107 Credits)
 - A selection of Elective unit standards (minimum of 10 Credits)
- These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.

- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

Annexure A Fundamental

Communication

Candidates are required to achieve all the following standards:

Number	Title	Level	Credit
Exit level outcome: Communicate in a variety of ways			
FET-C/07	Engage in sustained oral communications and evaluate spoken texts	4	5
FET-C/08	Read, analyse and respond to a variety of texts	4	5
FET-S/14	Evaluate literary texts	4	5
FET-S/18	Use language and communication in occupational learning programmes	4	5
TOTAL			20

Note These unit standards are taken from those currently registered on the NQF. When more standards are available this list may be modified.

Mathematics/Numeracy

Candidates are required to achieve all the following standards:

Number	Title	Level	Credit
Exit level outcome: Use mathematics in practical applications			
9014/MathLit4002	Use mathematics to investigate and monitor the financial aspects of personal, business and national issues	4	6
9015	Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings in life-related problems	4	6
9016	Measure, estimate and calculate physical quantities and explore, critique and prove geometrical relationships in two and three dimensional space in the life or workplace of the adult with increasing responsibilities	4	4
TOTAL			16

Note These unit standards are taken from those currently registered on the NQF. When more standards are available this list may be modified.

Annexure B Core

Diamond Processing Core Standards

Workplace Standards. The following unit standards are core to working in a diamond processing workplace. Candidates are required to achieve all the following credits:

Number	UNIT STANDARD TITLE	Level	Credits
DiP_G00 0	Use a loupe to examine diamond gemstones	1	8
DiP_G00 1	Describe the structure of the diamond processing industry	1	3
DiP_G00 3	Describe the characteristics of diamond gemstones	2	10
DiP_G00 5	Explain the requirements for security of diamonds	1	1
DiP_G30 2	Prepare a scaiffe	2	2
DiP_G30 3	Level tangs for polishing diamond gemstones	1	2
	Explain how HIV/AIDS is transmitted	1	2
	Explain how to address HIV/AIDS in the workplace	1	4
	Demonstrate basic rules of safety in the workplace	1	4
	Explain the roles of employees relating to first aid in the workplace	1	2
	TOTAL		38

Generic Diamond Processing Standards

Workplace Interaction. The following unit standards are core to interaction in a diamond processing workplace. Candidates are required to achieve all credits:

Number	UNIT STANDARD TITLE	Level	Credits
DiP_G00 4	Describe the characteristics of diamond gemstones	4	22
DiP_G30 1	Set up a bench & level a scaiffe	2	2
DiP_G30 5	Set diamond gemstones for polishing	2	3
DiP_G30 6	Describe the process of fabrication for polishing diamond gemstones	4	13
	Communicate a problem so that the other party collaborates in resolving it	2	2
	Identify basic employment rights and responsibilities and sources of information and assistance	4	2
	Explain the importance of ergonomics in planning a working area	4	2
	Identify, from an employee perspective, ways of dealing with personal grievances and disputes	3	2
	Contribute to collective employment contract negotiation as an employee	3	2

Number	UNIT STANDARD TITLE	Level	Credits
	Exercise effective time management	4	2
	Exercise effective leadership in the workplace	4	4
	Use fractions, ratio and proportions to evaluate	4	4
	Recognise harassment in the workplace and describe ways of dealing with it	2	2
	Explain the role and responsibility of a Health & Safety representative in the workplace	2	2
	TOTAL		64

Diamond Polishing Standards

The following unit standards are core to a Crossworker. Candidates are required to achieve all the following credits:

Number	UNIT STANDARD TITLE	Level	Credit
Dip_G31 0	Crosswork sawn diamond gemstones	4	62
Dip_G31 5	Crosswork makeable diamond gemstones	4	76
	TOTAL		138

Annexure C Electives

Diamond Polishing Standards

A minimum of 31 credits must be selected from the following unit standards:

Number	UNIT STANDARD TITLE	Level	Credit
Dip_G34 1	Prepare a table on sawn diamond gemstones	2	5
DiP_G34 2	Bottom block sawn diamond gemstones	2	8
DiP_G34 3	Bottom lap sawn diamond gemstones	2	6
DiP_G34 6	Prepare a table on makeable diamond gemstones	2	5
DiP_G34 7	Bottom block makeable diamond gemstones	2	8
DiP_G34 8	Bottom lap makeable diamond gemstones	2	6
Dip_G35 1	Top block sawn diamond gemstones	2	7
DiP_G35 2	Top lap sawn diamond gemstones	2	5
DiP_G35 6	Top block makeable diamond gemstones	2	7
DiP_G35 7	Top lap makeable diamond gemstones	2	3
	TOTAL		60

Diamond Processing Standards

A minimum of 31 credits must be selected from the following unit standards:

Number	UNIT STANDARD TITLE	Level	Credits
DiP_G06 5	Use a computer to design, mark and check diamond gemstones for marking	2	2
DiP_G12 0	Part diamond gemstones by means of laser cutting	2	16
DiP_G23 0	Facet the girdle by hand	3	11
DiP_G24 0	Facet the girdle by machine	3	7
DiP_G30 0	Prepare and set up a bench	2	6
DiP_G30 7	Screen diamond gemstones for polishing using the press pot system	2	4
DiP_G33 0	Block & polish a diamond gemstone semi-automatically	3	15
	TOTAL		61

Generic Elective Standards

A minimum of 13 credits must be selected from the following unit standards:

Number	UNIT STANDARD TITLE	Level	Credits
	Make good decisions using a structured methodology	4	2
	Demonstrate personal discipline in the workplace	2	2
	Explain how labour legislation impacts on employment relationships	4	3
	Explain the processes for addressing misconduct, poor performance and incapacity in the workplace	3	2
	Compile a plan to structure the work of others	3	2
	Manage personal stress effectively	3	2
	Demonstrate knowledge of computers to construct spreadsheets	3	4
	Conduct health & safety representative activities at the workplace	3	5
	TOTAL		22

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 349

22 March 2002

National Certificate in Jewellery Manufacture in a Mass Production Environment**Field:** Manufacturing, Engineering and Technology**Sub-field:** Fabrication and Extraction**Level:** 3**Credit:** 159**Issue date:****Review date:****Rationale of the qualification**

Traditionally recognition of skills in the jewellery manufacturing industry was given in a fragmented way and the skills were not combined. This qualification will give a holistic foundation to the jewellery manufacturing process.

The majority of the candidates for this qualification are likely to be working in the jewellery manufacturing industry. The qualification will give them the opportunity to have their skills recognised as the previous practice only accorded recognition at tradesman level. This qualification would provide a launching pad for development into other jewellery-related qualifications.

There is a critical need in the industry to convert experienced operators into qualified jewellery manufacturers and this qualification would provide experienced, but unrecognised people in the industry an opportunity to establish their skills for further development.

Purpose:

This qualification is primarily intended for application in the jewellery manufacturing environment. The qualification will give them the opportunity to have their skills recognised as the previous practice only accorded recognition at tradesman level. People credited with this qualification are able to manufacture jewellery using hand-held tools in a mass production environment.

Recipients of this qualification know about and are able to conduct the basic operations associated with mass production of jewellery. It will include basics of working with metals in jewellery manufacture, stone setting, polishing and assembly. The ability of the industry to develop its potential in the beneficiation of raw materials is dependent upon the development of mass production skills to provide the platform for expansion and to have a base of skilled workers for further development.

The qualification is designed to be flexible and accessible so that people are able to consistently demonstrate the competencies required to work safely and effectively in jewellery workshops in general.

The qualification is the foundation for development into other areas of jewellery manufacturing, such as design, goldsmithing and setting.

People credited with this qualification are able to:

- Communicate in a variety of ways
- Use mathematics in practical applications
- Utilise the tools and equipment in the jewellery workshop
- Manufacture non-ferrous and precious metal sheet and bar from granules
- Manufacture non-ferrous and precious metal jewellery using hand tools and equipment
- Manufacture jewellery by soldering prepared components
- Hand-polish a piece of jewellery
- Assemble prepared components without applying heat
- Reproduce a piece of jewellery using the lost wax casting technique
- Demonstrate appropriate product knowledge to enable working in a jewellery environment

Access to the Qualification

This qualification is open to anyone with access to learning opportunities and work experience in the areas reflected in the exit level outcomes and unit standards. It is advisable that candidates should already have addressed the areas reflected under "learning assumptions" before embarking on learning towards this qualification, although the exact starting point depends on the available resources for learning.

Learning assumed to be in place

It is assumed that candidates embarking on learning towards this qualification are already competent in the areas of communication, mathematics, natural science and arts and culture in the General Education and Training Band.

Exit Level Outcomes

Fundamental exit level outcomes:

- Communicate in a variety of ways
- Use mathematics in practical applications

See Annexure A for the list of unit standards that relate to these exit level outcomes.

Core exit level outcomes

Candidates who are declared competent in the core unit standards are able to exit the qualification with recognition of their ability to work effectively in a jewellery manufacturing workplace. This recognition could apply to other streams of operation in jewellery manufacturing that are still being developed. This cluster of unit standards is seen as the platform from which other streams such as design, goldsmithing and setting would follow. The outcomes are: -

- Utilise the tools and equipment in the jewellery workshop
- Manufacture non-ferrous and precious metal sheet and bar from granules
- Manufacture non-ferrous and precious metal jewellery using hand tools and equipment
- Manufacture jewellery by soldering prepared components
- Hand-polish a piece of jewellery
- Assemble prepared components without applying heat
- Reproduce a piece of jewellery using the lost wax casting technique

- Demonstrate appropriate product knowledge to enable working in a jewellery environment

See Annexure B for the list of unit standards that relate to these exit level outcomes.

Elective exit level outcomes

Each of the Unit standards set out in Annexure C represent discrete elements of the jewellery manufacturing process. A candidate who is declared competent in any one of these elective unit standards would be able to exit the qualification and be recognised as competent in that specific activity.

The possible categories are: -

- Make and use repousse and chasing punches
- Forge metal to manufacture jewellery
- Set faceted stones in multiple claw or wire settings
- Set faceted stones in channel settings
- Tension-set a single faceted stone
- Flush set faceted stones
- Pave and star set faceted stones
- Draw and design jewellery
- Manufacture jewellery for single faceted stone setting

Candidates may select from individual unit standards from the list of generic elective standards in Annexure C.

Credits and rules of combination

Fundamental (See Annexure A for the detail):

- 20 Communications credits from the list specified
- 16 Mathematics credits from the list specified

Core (See Annexure B for the detail):

- All 93 credits from the list of standards that are generic to jewellery manufacturing. All of these standards are considered to be compulsory to establish the platform of competency to enable candidates to develop streams in areas of jewellery manufacturing.

Elective (See Annexure C for the detail):

- At least 30 credits from the list of Elective Standards. These standards are to be selected relevant to the individual.

Summary of credit composition

	FUNDAMENTAL	CORE	ELECTIVE	TOTAL
LEVEL 1				
LEVEL 2		43		43
LEVEL 3	36	50	30	116
LEVEL 4				
TOTAL	36	93	30	159

Exit Level Outcomes**Exit Level Outcome 1: Communication Standards****Associated Assessment Criteria**

- Accommodate context needs in oral communication
- Interpret and use information from texts
- Interpret a variety of literary texts
- Use language and communication in occupational learning programmes

Exit Level Outcome 2: Mathematics Standards**Associated Assessment Criteria**

- Demonstrate understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations
- Use mathematics to investigate and monitor the financial aspects of personal and business issues
- Investigate life-related problems using data and probabilities
- Measure, estimate and calculate physical quantities and explore, describe and represent, interpret and justify geometrical relationships in two and three dimensional space relevant to the life or workplace of the community

Exit Level Outcome 3: CORE to Jewellery Manufacturing**Associated Assessment Criteria**

- Utilise the tools and equipment in the jewellery workshop
- Manufacture non-ferrous and precious metal sheet and bar from granules
- Manufacture non-ferrous and precious metal jewellery using hand tools and equipment
- Manufacture jewellery by soldering prepared components
- Set single stones
- Hand-polish a piece of jewellery
- Assemble prepared jewellery components without applying heat
- Reproduce a piece of jewellery using the lost wax casting technique
- Demonstrate appropriate product knowledge to enable working in a jewellery environment

Integrated Assessment

For award of the qualification, a candidate must achieve each unit standard as per item 13 above. Candidates must demonstrate the ability to engage in the operations selected in an integrative way, dealing with divergent and "random" demands related to these work operations, effectively.

Fundamental exit level outcomes require that the candidate must demonstrate the ability to communicate and use mathematics effectively in a variety of ways.

The structure of operations in the industry is such that unit standards reflected in the elective standards prepare candidates for further qualifications in the fields of design, goldsmithing or setting. It is critical, however, that candidates have a grounding in all disciplines in order to access further qualifications. For this reason, it is important that assessment is carried out as an integrated process between core and elective standards. The candidate must be able to demonstrate the ability to apply the competencies of the unit standards in a practical way, depending on the requirements of the workplace.

The assessment criteria in the unit standards are performance-based (applied competence as opposed to required knowledge only). This means that workplace experience may be recognised when awarding credits towards this qualification.

Evidence is required that the candidate is able to achieve the purpose of the qualification as a whole at the time of the award of the qualification.

Recognition of prior learning

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

All such evidence should be judged according to the general principles of assessment described in the note to assessors in item 20 below.

Articulation possibilities

This qualification can form the foundation for a candidate who wishes to develop into a jewellery manufacturer. This qualification also contains common competencies with other disciplines within the jewellery manufacturing industry. The detail of these other qualifications is still to be finalised.

Moderation Options

- Providers offering learning towards achievement of any of the unit standards that make up this qualification must be accredited through the relevant ETQA by SAQA. The bulk of the unit standards are vocationally based and adequate facilities must be provided for the learner to practise and gain experience in a protected environment prior to assessment.
- Internal moderation of assessment must take place at the point of assessment with external moderation provided by the relevant ETQA according to the moderation guidelines and the agreed ETQA procedures.
- Assessors registered with the relevant ETQA must carry out the assessment of candidates for any of the unit standards that make up this qualification. The assessor must have contextual competence in the form of a certificate, qualification or experience related to the unit standards in which assessments intend being conducted.

Notes for assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments:

- Focus the initial assessment activities on gathering evidence in terms of the main outcomes expressed in the titles of the unit standards to ensure assessment is integrated rather than fragmented. The aim is to declare the person competent in terms of the qualification purpose. Where assessment at across titles or at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes. Take special note of the need for integrated assessment.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.

- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent as defined below:

Principles of assessment:

- *Appropriate:* The method of assessment is suited to the performance being assessed.
- *Fair:* The method of assessment does not present any barriers to achievements, which are not related to the evidence.
- *Manageable:* The methods used make for easily arranged, cost-effective assessments that do not unduly interfere with learning.
- *Integration into work or learning:* Evidence collection is integrated into the work or learning process where this is appropriate and feasible.
- *Valid:* The assessment focuses on the requirements laid down in the Standard; i.e. the assessment is fit for purpose.
- *Direct:* The activities in the assessment mirror the conditions of actual performance as closely as possible
- *Authentic:* The assessor is satisfied that the work being assessed is attributable to the person being assessed.
- *Sufficient:* The evidence collected establishes that all criteria have been met and that performance to the required Standard can be repeated consistently.
- *Systematic:* Planning and recording is sufficiently rigorous to ensure that assessment is fair.
- *Open:* Learners can contribute to the planning and accumulation of evidence. Assessment candidates understand the assessment process and the criteria that apply.
- *Consistent:* The same assessor would make the same judgement again in similar circumstances. The judgement made is similar to the judgement that would be made by other assessors.

Rules of combination

- All Fundamental unit standards are compulsory (44 Credits)
 - All Core unit standards are compulsory (107 Credits)
 - A selection of Elective unit standards (minimum of 10 Credits)
- These unit standards are laid out in Annexure A, B & C.

The level assigned to this qualification is appropriate as it is done according to SAQA's level descriptors. The following is illustrated about the qualification:

- The process requires familiarity with the main areas of a discipline/subject.
- A basic understanding of the discipline's key terms.
- Familiarity with basic procedures and operations.
- An ability to use the above to select appropriate procedures to solve familiar routine problems within given frameworks.
- An ability to summarise, interpret and take a position on available information.
- Well-developed literacy and numeracy skills in the required medium of instruction.

This qualification will enable the qualifying learner to articulate to other Mining operation specialisation domains at NQF level 3.

Annexure A Fundamental

Communication

Candidates are required to achieve all the following standards:

Number	Title	Level	Credit
Exit level outcome: Communicate in a variety of ways			
FET-C/04	Accommodate context needs in oral communication	3	5
FET-C/05	Interpret and use information from texts	3	5
FET-S/13	Interpret a variety of literary texts	3	5
FET-S/17	Use language and communication in occupational learning programmes	3	5
TOTAL			20

Note These unit standards are taken from those currently registered on the NQF. When more standards are available this list may be modified.

Mathematics/Numeracy

Candidates are required to achieve all the following standards:

Number	Title	Level	Credit
Exit level outcome: Use mathematics in practical applications			
9010/MathLit3001	Demonstrate understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	3	2
9011/MathLit3002	Use mathematics to investigate and monitor the financial aspects of personal and business issues	3	5
9012	Investigate life-related problems using data and probabilities	3	5
9013	Measure, estimate and calculate physical quantities and explore, describe and represent, interpret and justify geometrical relationships in two and three dimensional space relevant to the life or workplace of the community	3	4
TOTAL			16

Note These unit standards are taken from those currently registered on the NQF. When more standards are available this list may be modified.

**Annexure B
Core**

CORE to Jewellery Manufacturing

Candidates are required to achieve all the following unit standards

Number	Unit Standard Title	Level	Credit
Jwl-G 001	Utilise the tools and equipment in the jewellery workshop	2	25
Jwl-G 002	Manufacture non-ferrous and precious metal sheet and bar from granules	3	4
Jwl-G 003	Manufacture non-ferrous and precious metal jewellery using hand tools and equipment	2	8
Jwl-G 004	Manufacture jewellery by soldering prepared components	3	9
Jwl-G 005	Set single stones	3	21
Jwl-G 008	Hand-polish a piece of jewellery	2	4
Jwl-G 009	Assemble prepared jewellery components without applying heat	3	5
Jwl-G 012	Reproduce a piece of jewellery using the lost wax casting technique	2	6
Jwl-G 030	Demonstrate appropriate product knowledge to enable working in a jewellery environment	3	11
	TOTAL		93

Annexure C**Electives**

The following unit standards are elective to individuals. A minimum of 30 credits must be achieved by the candidate:

Number	Unit Standard Title	Level	Credit
Jwl -G 010	Make and use repousse and chasing punches	3	20
Jwl-G 011	Forge metal to manufacture jewellery	4	21
Jwl-G 017	Set faceted stones in multiple claw or wire settings	4	15
Jwl-G 018	Set faceted stones in multiple tube settings	4	15
Jwl-G 019	Set faceted stones in channel settings	4	18
Jwl-G 020	Tension-set a single faceted stone	4	2
Jwl-G 021	Flush set faceted stones	4	15
Jwl-G 022	Pave and star set faceted stones	4	15
Jwl-G 023	Draw and design jewellery	3	15
Jwl-G 026	Manufacture jewellery for single faceted stone setting	3	21
	TOTAL		157

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**No. 350****22 March 2002****Mining-specific Mechanical Engineering (137)****1. EnM-G001 Replace a fluid drive coupling (L3/Cr3)**

- SO. 1 Explain the factors critical to replacing fluid drive couplings
- SO. 2 Prepare to replace a fluid drive coupling
- SO. 3 Replace a fluid drive coupling
- SO. 4 Test a fluid drive coupling and prepare for operation and/or production

2. EnM-G002 Replace a taper sleeve bearing. (L2/ Cr2)

- SO. 1 Explain the factors critical to replacing taper sleeve bearings
- SO. 2 Prepare to replace the taper sleeve bearing
- SO. 3 Replace the taper sleeve bearing
- SO. 4 Test the taper sleeve bearings and prepare for operation and/or production

3. EnM-G003 Replace a reduction gearbox. (L2/ Cr3)

- SO. 1 Explain the factors critical to replacing a reduction gearbox
- SO. 2 Prepare to replace a reduction gearbox
- SO. 3 Replace a reduction gearbox
- SO. 4 Test the reduction gearbox and prepare for operation and/or production

4. EnM-G004 Replace a single-stage centrifugal pump. (L2/ Cr2)

- SO. 1 Explain the factors critical to replacing a single-stage centrifugal pump
- SO. 2 Prepare to replace a single-stage centrifugal pump
- SO. 3 Replace the single-stage centrifugal pump
- SO. 4 Test the single-stage centrifugal pump and prepare for operation and/or production

5. EnM-G005 Overhaul a single-stage centrifugal pump. (L3/ Cr6)

- SO. 1 Explain the factors critical to overhauling a single-stage centrifugal pump
- SO. 2 Prepare to overhaul a single-stage centrifugal pump
- SO. 3 Overhaul a single-stage centrifugal pump
- SO. 4 Test a single-stage centrifugal pump and prepare for operation and/or production

6. EnM-G006 Repair a double drum scraper winch. (L2/ Cr4)

- SO. 1 Explain the factors critical to repairing a double-drum scraper winch
- SO. 2 Prepare to repair a double-drum scraper winch
- SO. 3 Repair a double-drum scraper winch
- SO. 4 Test the double-drum scraper winch and prepare for operation and/or production

7. EnM-G007 Lift and move a load. (L3/ Cr7)

- SO. 1 Explain the factors critical to lifting and moving loads
- SO. 2 Prepare to lift and move a load
- SO. 3 Lift and move a load
- SO. 4 Make the load available for production purposes

8. EnM-G008 Replace an in-line ventilation fan in an underground environment. (L2/ Cr2)

- SO. 1 Explain the factors critical to replacing in-line ventilation fans
- SO. 2 Prepare to replace the in-line ventilation fan
- SO. 3 Replace the in-line ventilation fan
- SO. 4 Test the in-line ventilation fan and prepare for operation and/or production

9. EnM-G009 Replace the transmission of a self-propelled mobile machine. (L3/ Cr10)

- SO. 1 Explain the factors critical to replacing the transmission of a self-propelled mobile machine
- SO. 2 Prepare to replace the transmission of a self-propelled mobile machine
- SO. 3 Replace the transmission of a self-propelled mobile machine
- SO. 4 Test the transmission of a self-propelled mobile machine and prepare for operation and/or production

10. EnM-G010 Replace a vertical spindle pump unit. (L2/ Cr2)

- SO. 1 Explain the factors critical to replacing a vertical spindle pump unit
- SO. 2 Prepare to replace the vertical spindle pump unit
- SO. 3 Replace the vertical spindle pump unit
- SO. 4 Test the vertical spindle pump unit and prepare for operation and/or production

11. EnM-G011 Overhaul a portable pneumatic submersible centrifugal pump. (L2/ Cr2)

- SO. 1 Explain the factors critical to overhauling a portable pneumatic submersible centrifugal pump
- SO. 2 Prepare to overhaul a portable pneumatic submersible centrifugal pump
- SO. 3 Overhaul the portable pneumatic submersible centrifugal pump
- SO. 4 Test the portable pneumatic submersible centrifugal pump and prepare for operation and/or production

12. EnM-G012 Cut mild steel by means of an Oxy-acetylene cutting torch. (L2/ Cr3)

- SO. 1 Explain the factors critical to cutting mild steel by means of an Oxy-acetylene cutting torch
- SO. 2 Prepare to cut mild steel by means of an Oxy-acetylene cutting torch
- SO. 3 Cut mild steel by means of an Oxy-acetylene cutting torch
- SO. 4 Complete the mild steel cutting process and prepare for operation and/or production

13. EnM-G013 Repair a single-stage centrifugal pump. (L3/ Cr7)

- SO. 1 Explain the factors critical to repairing a single-stage centrifugal pump
- SO. 2 Prepare to repair a single-stage centrifugal pump
- SO. 3 Repair the single-stage centrifugal pump
- SO. 4 Test the single-stage centrifugal pump and prepare for operation and/or production

14. EnM-G014 Maintain the hydraulic system of a load haul dump machine. (L1/ Cr2)

- SO. 1 Explain the factors critical to maintaining the hydraulic system of a load haul dump machine
- SO. 2 Prepare to maintain the hydraulic system of a load haul dump machine
- SO. 3 Maintain the hydraulic system of the load haul dump machine
- SO. 4 Test the load haul dump machine and prepare for operation and/or production

15. EnM-G015 Replace the bucket assembly of a load haul dump machine. (L2/ Cr2)

- SO. 1 Explain the factors critical to replacing the bucket assembly of a load haul dump machine
- SO. 2 Prepare to replace the bucket assembly of a load haul dump machine
- SO. 3 Replace the bucket assembly of a load haul dump machine
- SO. 4 Test the bucket assembly and prepare for operation and/or production

16. EnM-G016 Repair the bucket assembly of a load haul dump machine. (L2/ Cr3)

- SO. 1 Explain the factors critical to repairing the bucket assembly of a load haul dump machine
- SO. 2 Prepare to repair the bucket assembly of a load haul dump machine
- SO. 3 Repair the bucket assembly of a load haul dump machine
- SO. 4 Test the bucket assembly of the load haul dump machine and prepare for operation and/or production

17. EnM-G018 Overhaul a reduction gearbox. (L2/ Cr5)

- SO. 1 Explain the factors critical to overhauling reduction gearboxes
- SO. 2 Prepare to overhaul a reduction gearbox
- SO. 3 Overhaul the reduction gearbox
- SO. 4 Test the reduction gearbox and prepare for operation and/or production

18. EnM-G019 Overhaul a hydraulic cylinder. (L2/ Cr5)

- SO. 1 Explain the factors critical to overhauling hydraulic cylinders
- SO. 2 Prepare to overhaul a hydraulic cylinder
- SO. 3 Overhaul the hydraulic cylinder
- SO. 4 Test the hydraulic cylinder and prepare for operation and/or production

19. EnM-G020 Replace the centre bearing assembly of an articulated vehicle. (L3/ Cr5)

- SO. 1 Explain the factors critical to replacing the centre bearing assembly of an articulated vehicle
- SO. 2 Prepare to replace the centre bearing assembly of an articulated vehicle
- SO. 3 Replace the centre bearing assembly of an articulated vehicle
- SO. 4 Test the centre bearing assembly of an articulated vehicle and prepare for operation and/or production

20. EnM-G021 Repair the mechanical brake system of an underground locomotive. (L2/ Cr5)

- SO. 1 Explain the factors critical to repairing the mechanical brake system of an underground locomotive
- SO. 2 Prepare to repair the mechanical brake system of the underground locomotive
- SO. 3 Repair the mechanical brake system of an underground locomotive
- SO. 4 Test the mechanical brake system of the underground locomotive and prepare for operation and/or production

21. EnM-G022 Join a conveyor belt by means of mechanical clips. (L2/ Cr2)

- SO. 1 Explain the factors critical to joining a conveyor belt
- SO. 2 Prepare to join a conveyor belt
- SO. 3 Join the conveyor belt
- SO. 4 Test the conveyor belt and prepare for operation and/or production

22. EnM-G023 Replace an electric motor. (L3/ Cr5)

- SO. 1 Explain the factors critical to the replacement of electric motors
- SO. 2 Prepare to replace an electric motor
- SO. 3 Replace the electric motor
- SO. 4 Test the motor and prepare for operation and/or production

23. EnM-G024 Join mild steel by means of arc welding. (L2/ Cr11)

- SO. 1 Explain the factors critical to joining mild steel by means of arc welding
- SO. 2 Prepare to join mild steel by means of arc welding
- SO. 3 Join mild steel by means of arc welding
- SO. 4 Complete the mild steel welding process and prepare for operation and/or production

- 24. EnM-G025 Test and adjust the mechanical safety devices on a winding plant. (L3/ Cr6)**
- SO. 1 Explain the factors critical to testing and adjusting mechanical safety devices on a winding plant
- SO. 2 Prepare to test and adjust the mechanical safety devices
- SO. 3 Test and adjust the mechanical safety devices
- SO. 4 Complete the testing and adjusting process of the mechanical safety devices and prepare for operation and/or production.
- 25. EnM-G026 Repair a drum reclaimer. (L2/ Cr5)**
- SO. 1 Explain the factors critical to the repair of drum reclaimers
- SO. 2 Prepare to repair the drum reclaimer
- SO. 3 Repair the drum reclaimer
- SO. 4 Test the drum reclaimer and prepare for operation and/or production
- 26. EnM-G027 Repair a drum stacker. (L2/ Cr5)**
- SO. 1 Explain the factor critical to repairing drum stackers
- SO. 2 Prepare to repair a drum stacker
- SO. 3 Repair the drum stacker
- SO. 4 Test the drum stacker and prepare for operation and/or production
- 27. EnM-G028 Replace the diesel engine of a self-propelled mobile machine. (L3/ Cr5)**
- SO. 1 Démonstrate knowledge pertaining to diesel engines
- SO. 2 Prepare to replace a diesel engine
- SO. 3 Replace the diesel engine
- SO. 4 Test the diesel engine and prepare for operation and/or production
- 28. EnM-G029 Replace the centre portion of the differential assembly of a self-propelled mobile machine. (L2/ Cr2)**
- SO. 1 Explain the factors critical when replacing the centre portion of the differential assembly of a self-propelled mobile machine
- SO. 2 Prepare to replace the centre portion of the differential assembly
- SO. 3 Replace the centre portion of the differential assembly
- SO. 4 Test the centre portion of the differential assembly and prepare for operation and/or production
- 29. EnM-G030 Cut material by means of lancing. (L2/ Cr3)**
- SO. 1 Explain the factors critical to cutting material by means of lancing
- SO. 2 Prepare to cut material by means of lancing
- SO. 3 Cut material by means of lancing
- SO. 4 Complete the cutting (lancing) process and prepare for operation and/or production

- 30. EnM-G031 Overhaul the propeller shaft of a self-propelled mobile machine. (L2/ Cr3)**
- SO. 1 Demonstrate knowledge pertaining to propeller shafts
 - SO. 2 Prepare to overhaul the propeller shaft of a self-propelled mobile machine
 - SO. 3 Overhaul the propeller shaft of a self-propelled mobile machine
 - SO. 4 Test the propeller shaft assembly and prepare for operation and/or production
- 31. EnM-G032 Replace a double drum scraper winch. (L2/ Cr3)**
- SO. 1 Explain the factors that are critical to replacing a double drum scraper winch
 - SO. 2 Prepare to replace a double drum scraper winch
 - SO. 3 Replace a double drum scraper winch
 - SO. 4 Test the double drum scraper winch, and prepare for operation and/or production
- 32. EnM-G033 Replace the cutter-boom gearbox of a continuous miner. (L2/ Cr4)**
- SO. 1 Explain the factors critical to replacing the cutter-boom gearbox of a continuous miner
 - SO. 2 Prepare to replace the cutter-boom gearbox
 - SO. 3 Replace the cutter-boom gearbox
 - SO. 4 Test the cutter-boom gearbox and prepare for operation and/or production
- 33. EnM-G034 Replace the gathering-head gearbox on a continuous miner. (L2/ Cr3)**
- SO. 1 Explain the factors critical to replacing the gathering-head gearbox of a continuous miner
 - SO. 2 Prepare to replace the gathering-head gearbox
 - SO. 3 Replace the gathering-head gearbox
 - SO. 4 Test the gathering-head gearbox and prepare for operation and/or production
- 34. EnM-G035 Repair the hydraulic braking system of a self-propelled machine. (L3/ Cr7)**
- SO. 1 Explain the factors critical to repairing the hydraulic braking system of a self-propelled machine
 - SO. 2 Prepare to repair the hydraulic braking system of a self-propelled machine
 - SO. 3 Repair the hydraulic braking system of a self-propelled machine
 - SO. 4 Test the hydraulic braking system of a self-propelled machine and prepare for operation and/or production
- 35. EnM-G036 Replace the cutter head assembly of a continuous miner (L2/ Cr4)**
- SO. 1 Explain the factors critical to replacing the cutter head assembly of a continuous miner
 - SO. 2 Prepare to replace the cutter head assembly of a continuous miner
 - SO. 3 Replace the cutter head assembly
 - SO. 4 Test the cutter head assembly and prepare for operation and/or production

- 36. EnM-G037 Overhaul a gear type hydraulic motor. (L3/ Cr5)**
- SO. 1 Explain the factors critical to overhauling gear-type hydraulic motors
 - SO. 2 Prepare to overhaul a gear-type hydraulic motor
 - SO. 3 Overhaul the gear-type hydraulic motor
 - SO. 4 Test the gear-type hydraulic motor and prepare for operation and/or production
- 37. EnM-G038 Overhaul a gear-type hydraulic pump. (L3/ Cr5)**
- SO. 1 Explain the factors critical to overhauling gear-type hydraulic pumps
 - SO. 2 Prepare to overhaul a gear-type hydraulic pump
 - SO. 3 Overhaul the gear-type hydraulic pump
 - SO. 4 Test the gear-type hydraulic pump and prepare for operation and/or production
- 38. EnM-G039 Replace a multi-stage centrifugal pump. (L2/ Cr2)**
- SO. 1 Explain the factors critical to replacing a multi-stage centrifugal pump
 - SO. 2 Prepare to replace a multi-stage centrifugal pump
 - SO. 3 Replace the multi-stage centrifugal pump
 - SO. 4 Test the multi-stage centrifugal pump and prepare for operation and/or production
- 39. EnM-G040 Repair a multi-stage centrifugal pump. (L3/ Cr7)**
- SO. 1 Explain the factors critical to repairing a multi-stage centrifugal pump
 - SO. 2 Prepare to repair the multi-stage centrifugal pump
 - SO. 3 Repair a multi-stage centrifugal pump
 - SO. 4 Test the multi-stage centrifugal pump and prepare for operation and/or production
- 40. EnM-G041 Overhaul of a multi-stage centrifugal pump. (L3/ Cr6)**
- SO. 1 Explain the factors critical to overhauling multi-stage centrifugal pumps
 - SO. 2 Prepare to overhaul a multi-stage centrifugal pump
 - SO. 3 Overhaul the multi-stage centrifugal pump
 - SO. 4 Complete the process of overhauling the multi-stage centrifugal pump and prepare for operation and/or production
- 41. EnM-G042 Cut mild steel by means of an Oxy-acetylene profile cutter. (L2/ Cr4)**
- SO. 1 Explain the factors critical to cutting mild steel by means of an Oxy-acetylene profile cutter
 - SO. 2 Prepare to cut mild steel by means of an Oxy-acetylene profile cutter
 - SO. 3 Cut mild steel by means of an Oxy-acetylene profile cutter
 - SO. 4 Complete the mild steel cutting process
- 42. EnM-G043 Cut mild steel by means of an Oxy-acetylene straight-line cutter. (L2/ Cr4)**
- SO. 1 Explain the factors critical to cutting mild steel by means of an Oxy-acetylene straight-line cutter
 - SO. 2 Prepare to cut mild steel by means of an Oxy-acetylene straight-line cutter
 - SO. 3 Complete the mild steel cutting process

- 43. EnM-G044 Join of aluminium by means of arc welding. (L3/ Cr5)**
- SO. 1 Explain the factors critical to joining aluminium by means of arc welding
 - SO. 2 Prepare to join aluminium by means of arc welding
 - SO. 3 Join aluminium by means of arc welding
 - SO. 4 Complete the aluminium arc welding process and prepare for operation and/or production
- 44. EnM-G045 Weld aluminium by means of Oxy-acetylene equipment.. (L3/ Cr4)**
- SO. 1 Explain the factors critical to welding aluminium by means of Oxy-acetylene equipment
 - SO. 2 Prepare to weld aluminium by means of Oxy-acetylene equipment
 - SO. 3 Weld aluminium by means of Oxy-acetylene equipment
 - SO. 4 Complete the Oxy-acetylene welding process and prepare for operation and/or production
- 45. EnM-G046 Assemble Oxy-acetylene equipment. (L2/ Cr1)**
- SO. 1 Explain the factors critical to assembling Oxy-acetylene equipment
 - SO. 2 Prepare to assemble the Oxy-acetylene equipment
 - SO. 3 Assemble the Oxy-acetylene equipment
 - SO. 4 Complete the Oxy-acetylene assembling process and prepare for operation and/or production
- 46. EnM-G047 Weld mild steel by means of Oxy-acetylene equipment. (L3/ Cr4)**
- SO. 1 Explain the factors critical to welding mild steel by means of Oxy-acetylene equipment
 - SO. 2 Prepare to weld mild steel by means of Oxy-acetylene equipment
 - SO. 3 Weld mild steel by means of Oxy-acetylene equipment
 - SO. 4 Complete the Oxy-acetylene welding process and prepare for operation and/or production
- 47. EnM-G048 Silver solder metals by means of Oxy-acetylene equipment.. (L3/ Cr3)**
- SO. 1 Explain the factors critical to silver soldering metals by means of Oxy-acetylene equipment
 - SO. 2 Prepare to silver solder metals by means of Oxy-acetylene equipment
 - SO. 3 Silver-solder metals by means of Oxy-acetylene equipment
 - SO. 4 Complete the silver soldering process and prepare for operation and/or production
- 48. EnM-G049 Troubleshoot the hydraulic system of a self-propelled mobile machine. (L3/ Cr6)**
- SO. 1 Explain the factors critical to troubleshooting the hydraulic system of a self-propelled mobile machine
 - SO. 2 Prepare to troubleshoot the hydraulic system
 - SO. 3 Troubleshoot the hydraulic system
 - SO. 4 Complete the troubleshooting process and prepare for operation and/or production

- 49. EnM-G050 Perform troubleshooting on the pneumatic system of a self-propelled mobile machine. (L3/ Cr6)**
- SO. 1 Explain the factors critical to troubleshooting the pneumatic system of a self-propelled mobile machine
- SO. 2 Prepare to troubleshoot the pneumatic system
- SO. 3 Troubleshoot the pneumatic system
- SO. 4 Complete the troubleshooting process and prepare for operation and/or production
- 50. EnM-G051 Overhaul the wheel-end final drive assembly of a self-propelled mobile machine. (L3/ Cr6)**
- SO. 1 Explain the factors critical to overhauling the wheel-end final drive assembly of a self-propelled mobile machine
- SO. 2 Prepare to overhaul the wheel-end final drive assembly
- SO. 3 Overhaul the wheel-end final drive assembly
- SO. 4 Test the wheel-end final drive assembly and prepare for operation and/or production
- 51. EnM-G052 Replace the wheel-end final drive assembly of a self-propelled mobile machine. (L2/ Cr4)**
- SO. 1 Explain the factors critical to replacing the wheel-end final drive assembly of a self-propelled mobile machine
- SO. 2 Prepare to replace the wheel-end final drive assembly
- SO. 3 Replace the wheel-end final drive assembly
- SO. 4 Test the wheel-end final drive assembly and prepare for operation and/or production
- 52. EnM-G053 Replace the final-drive axle assembly of a self-propelled mobile machine. (L2/ Cr4)**
- SO. 1 Explain the factors critical to replacing the final-drive axle assembly of a self-propelled mobile machine
- SO. 2 Prepare to replace the final-drive axle assembly
- SO. 3 Replace the final-drive axle assembly
- SO. 4 Test the final-drive axle assembly and prepare for operation and/or production
- 53. EnM-G054 Replace a flange-mounted valve. (L1/ Cr2)**
- SO. 1 Explain the factors critical to replacing a flange-mounted valve
- SO. 2 Prepare to replace a flange-mounted valve
- SO. 3 Replace the flange-mounted valve
- SO. 4 Test the flange-mounted valve and prepare for operation and/or production
- 54. EnM-G055 Replace a flanged pipe section. (L2/ Cr2)**
- SO. 1 Explain the factors critical to replacing flanged pipe sections
- SO. 2 Prepare to replace a flanged pipe section
- SO. 3 Replace the flanged pipe section
- SO. 4 Test the flanged pipe section and prepare for operation and/or production

- 55. EnM-G056 Braze metals by means of Oxy-acetylene equipment. (L3/ Cr4)**
- SO. 1 Explain the factors critical to brazing metals by means of Oxy-acetylene equipment
 - SO. 2 Prepare to braze metals by means of Oxy-acetylene equipment
 - SO. 3 Braze metals by means of Oxy-acetylene equipment
 - SO. 4 Complete the brazing process and prepare for operation and/or production
- 56. EnM-G057 Join metals by means of Tungsten Inert Gas (TIG) welding. (L3/ Cr6)**
- SO. 1 Explain the factors critical to joining metals by means of TIG welding
 - SO. 2 Prepare to join metals by means of TIG welding
 - SO. 3 Join metals by means of TIG welding
 - SO. 4 Complete the TIG welding process and prepare for operation and/or production
- 57. EnM-G060 Repair a single-speed reduction gearbox. (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing a single-speed reduction gearbox
 - SO. 2 Prepare to repair a single-speed reduction gearbox
 - SO. 3 Repair a single-speed reduction gearbox
 - SO. 4 Test the single-speed reduction gearbox and prepare for operation and/or production
- 58. EnM-G061 Gouge metals by means of an arc-welding machine. (L2/ Cr2)**
- SO. 1 Explain the factors critical to gouging metals by means of an arc-welding machine
 - SO. 2 Prepare to gouge metals by means of an arc-welding machine
 - SO. 3 Gouge metals by means of an arc-welding machine
 - SO. 4 Complete the metal gouging process and prepare for operation and/or production
- 59. EnM-G062 Maintain an air compressor. (L2/ Cr3)**
- SO. 1 Explain the factors critical to maintaining an air compressor
 - SO. 2 Prepare to maintain a air compressor
 - SO. 3 Maintain the air compressor
 - SO. 4 Test the air compressor and prepare for operation and/or production
- 60. EnM-G063 Overhaul a vane-type hydraulic motor. (L3/ Cr6)**
- SO. 1 Explain the factors critical to overhauling a vane-type hydraulic motor
 - SO. 2 Prepare to overhaul a vane-type hydraulic motor
 - SO. 3 Overhaul the vane-type hydraulic motor
 - SO. 4 Test the vane-type hydraulic motor and prepare for operation and/or production
- 61. EnM-G064 Overhaul a piston-type hydraulic motor. (L3/ Cr7)**
- SO. 1 Explain the factors critical to overhauling a piston-type hydraulic motor
 - SO. 2 Prepare to overhaul a piston-type hydraulic motor
 - SO. 3 Overhaul the piston-type hydraulic motor
 - SO. 4 Test the piston-type hydraulic motor and prepare for operation and/or production

- 62. EnM-G065 Overhaul a vane-type hydraulic pump. (L3/ Cr6)**
- SO. 1 Explain the factors critical to overhauling a vane-type hydraulic pump
 - SO. 2 Prepare to overhaul a vane-type hydraulic pump
 - SO. 3 Overhaul the vane-type hydraulic pump
 - SO. 4 Test the vane-type hydraulic pump and prepare for operation and/or production
- 63. EnM-G066 Overhaul a piston-type hydraulic pump. (L3/ Cr7)**
- SO. 1 Explain the factors critical to overhauling a piston-type hydraulic pump
 - SO. 2 Prepare to overhaul a piston-type hydraulic pump
 - SO. 3 Overhaul the piston-type hydraulic pump
 - SO. 4 Test the piston-type hydraulic pump and prepare for operation and/or production
- 64. EnM-G067 Repair a piston-type air compressor. (L3/ Cr7)**
- SO. 1 Explain the factors critical to repairing a piston-type air compressor
 - SO. 2 Prepare to repair a piston-type air compressor
 - SO. 3 Repair the piston-type air compressor
 - SO. 4 Test the piston-type air compressor and prepare for operation and/or production
- 65. EnM-G068 Repair a vane-type air compressor. (L3/ Cr7)**
- SO. 1 Explain the factors critical to repairing a vane-type air compressor
 - SO. 2 Prepare to repair a vane-type air compressor
 - SO. 3 Repair the vane-type air compressor
 - SO. 4 Test the vane-type air compressor and prepare for operation and/or production
- 66. EnM-G069 Repair a screw-type air compressor. (L3/ Cr7)**
- SO. 1 Explain the factors critical to repairing a screw-type air compressor
 - SO. 2 Prepare to repair a screw-type air compressor
 - SO. 3 Repair the screw-type air compressor
 - SO. 4 Test the screw-type air compressor and prepare for operation and/or production
- 67. EnM-G070 Overhaul a piston-type air compressor. (L3/ Cr7)**
- SO. 1 Explain the factors critical to overhauling a piston-type air compressor
 - SO. 2 Prepare to overhaul a piston-type air compressor
 - SO. 3 Overhaul the piston-type air compressor
 - SO. 4 Test the piston-type air compressor and prepare for operation and/or production
- 68. EnM-G071 Overhaul a vane-type air compressor. (L3/ Cr7)**
- SO. 1 Explain the factors critical to overhauling a vane-type air compressor
 - SO. 2 Prepare to overhaul a vane-type air compressor
 - SO. 3 Overhaul the vane-type air compressor
 - SO. 4 Test the vane-type air compressor and prepare for operation and/or production

- 69. EnM-G072 Overhaul a screw-type air compressor. (L3/ Cr7)**
- SO. 1 Explain the factors critical to overhauling a screw-type air compressor
 - SO. 2 Prepare to overhaul a screw-type air compressor
 - SO. 3 Overhaul the screw-type air compressor
 - SO. 4 Test the screw-type air compressor and prepare for operation and/or production
- 70. EnM-G074 Join cast iron by means of arc welding. (L2/ Cr3)**
- SO. 1 Explain the factors critical to joining cast iron by means of arc welding
 - SO. 2 Prepare to join cast iron by means of arc welding
 - SO. 3 Join cast iron by means of arc welding
 - SO. 4 Complete the arc welding process and prepare for operation and/or production
- 71. EnM-G075 Bend steel by means of a bending machine. (L2/ Cr3)**
- SO. 1 Explain the factors critical to bending steel by means of a bending machine
 - SO. 2 Prepare to bend steel by means of a bending machine
 - SO. 3 Bend steel by means of a bending machine
 - SO. 4 Complete the steel bending process and prepare for operation and/or production
- 72. EnM-G076 Cut material by means of a hydraulic or electric guillotine. (L2/ Cr2)**
- SO. 1 Explain the factors critical to cutting material by means of a hydraulic or electric guillotine
 - SO. 2 Prepare to cut material by means of a hydraulic or electric guillotine
 - SO. 3 Cut material by means of a hydraulic or electric guillotine
 - SO. 4 Complete the cutting process and prepare for operation and/or production
- 73. EnM-G077 Punch and shear material by means of a punching and shearing machine. (L2/ Cr3)**
- SO. 1 Explain the factors critical to punching and shearing material by means of a punching and shearing machine
 - SO. 2 Prepare to punch and shear material
 - SO. 3 Punch and shear the material
 - SO. 4 Complete the punching and shearing process and prepare for operation and/or production
- 74. EnM-G078 Roll material by means of a plate-rolling machine. (L2/ Cr5)**
- SO. 1 Explain the factors critical to rolling material by means of a plate-rolling machine
 - SO. 2 Prepare to roll the material
 - SO. 3 Roll the material
 - SO. 4 Complete the rolling process and prepare for operation and/or production

- 75. EnM-G079 Overhaul a double-drum scraper winch. (L2/ Cr6)**
- SO. 1 Explain the factors critical to overhauling a double-drum scraper winch
 - SO. 2 Prepare to overhaul a double-drum scraper winch
 - SO. 3 Overhaul the double-drum scraper winch
 - SO. 4 Test the double-drum scraper winch and prepare for operation and/or production
- 76. EnM-G080 Overhaul a positive displacement pump. (L3/ Cr6)**
- SO. 1 Explain the factors critical to overhauling a positive displacement pump
 - SO. 2 Prepare to overhaul a positive displacement pump
 - SO. 3 Overhaul the positive displacement pump
 - SO. 4 Complete the overhauling process and prepare for operation and/or production
- 77. EnM-G081 Repair a positive displacement pump. (L3/ Cr6)**
- SO. 1 Explain the factors critical to repairing a positive displacement pump
 - SO. 2 Prepare to repair a positive displacement pump
 - SO. 3 Repair the positive displacement pump
 - SO. 4 Test the positive displacement pump and prepare for operation and/or production
- 78. EnM-G085 Install a V-belt drive. (L2/ Cr4)**
- SO. 1 Explain the factors critical to installing a V-belt drive
 - SO. 2 Prepare to install a V-belt drive
 - SO. 3 Install the V-belt drive
 - SO. 4 Test the V-belt drive and prepare for operation and/or production
- 79. EnM-G086 Repair a V-belt drive. (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing a V-belt drive
 - SO. 2 Prepare to repair a V-belt drive
 - SO. 3 Repair the V-belt drive
 - SO. 4 Test the V-belt drive and prepare for operation and/or production
- 80. EnM-G087 Repair a hydraulic cylinder. (L2/ Cr2)**
- SO. 1 Explain the factors critical to repairing a hydraulic cylinder
 - SO. 2 Prepare to repair a hydraulic cylinder
 - SO. 3 Repair the hydraulic cylinder
 - SO. 4 Test the hydraulic cylinder and prepare for operation and/or production
- 81. EnM-G088 Repair a pneumatic cylinder. (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing a pneumatic cylinder
 - SO. 2 Prepare to repair a pneumatic cylinder
 - SO. 3 Repair the pneumatic cylinder
 - SO. 4 Test the pneumatic cylinder and prepare for operation and/or production

- 82. EnM-G089 Replace a pneumatic cylinder. (L2/ Cr2)**
- SO. 1 Explain the factors critical to replacing a pneumatic cylinder
 - SO. 2 Prepare to replace a pneumatic cylinder
 - SO. 3 Replace the pneumatic cylinder
 - SO. 4 Test the pneumatic cylinder and prepare for operation and/or production
- 83. EnM-G090 Overhaul a pneumatic cylinder. (L2/ Cr5)**
- SO. 1 Explain the factors critical to overhauling a pneumatic cylinder
 - SO. 2 Prepare to overhaul a pneumatic cylinder
 - SO. 3 Overhaul the pneumatic cylinder
 - SO. 4 Test the pneumatic cylinder and prepare for operation and/or production
- 84. EnM-G091 Replace a hydraulic pump/motor. (L2/ Cr3)**
- SO. 1 Explain the factors critical to replacing a hydraulic pump/motor
 - SO. 2 Prepare to replace a hydraulic pump/motor
 - SO. 3 Replace the hydraulic pump/motor
 - SO. 4 Test the hydraulic pump/motor and prepare for operation and/or production
- 85. EnM-G092 Replace the torque converter of a self-propelled mobile machine. (L2/ Cr3)**
- SO. 1 Explain the factors critical to replacing the torque converter of a self-propelled mobile machine
 - SO. 2 Prepare to replace the torque converter
 - SO. 3 Replace the torque converter
 - SO. 4 Test the torque converter and prepare for operation and/or production
- 86. EnM-G093 Replace a pneumatic motor. (L2/ Cr3)**
- SO. 1 Explain the factors critical to replacing a pneumatic motor
 - SO. 2 Prepare to replace a pneumatic motor
 - SO. 3 Replace the pneumatic motor
 - SO. 4 Test the pneumatic motor and prepare for operation and/or production
- 87. EnM-G094 Repair the torque converter of a self-propelled mobile machine. (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing the torque converter of a self-propelled mobile machine
 - SO. 2 Prepare to repair the torque converter
 - SO. 3 Repair the torque converter
 - SO. 4 Test the torque converter and prepare for operation and/or production

- 88. EnM-G095 Overhaul the torque converter of a self-propelled mobile machine. (L2/ Cr4)**
- SO. 1 Explain the factors critical to overhauling the torque converter of a self-propelled mobile machine
- SO. 2 Prepare to overhaul the torque converter
- SO. 3 Overhaul the torque converter
- SO. 4 Test the torque converter and prepare for operation and/or production
- 89. EnM-G096 Replace the cylinder head assembly of an internal combustion engine. (L3/ Cr5)**
- SO. 1 Explain the factors critical to replacing a cylinder head assembly
- SO. 2 Prepare to replace the cylinder head assembly
- SO. 3 Replace the cylinder head assembly
- SO. 4 Test the cylinder head assembly and prepare for operation and/or production
- 90. EnM-G097 Overhaul the cylinder head assembly of an internal combustion engine. (L3/ Cr5)**
- SO. 1 Explain the factors critical to overhauling a cylinder head assembly
- SO. 2 Prepare to overhaul a cylinder head assembly
- SO. 3 Overhaul the cylinder head assembly
- SO. 4 Test the cylinder head assembly and prepare for operation and/or production
- 91. EnM-G098 Adjust the valve clearances of an internal combustion engine. (L3/ Cr5)**
- SO. 1 Explain the factors critical to adjusting the valve clearances of an internal combustion engine
- SO. 2 Prepare to adjust the valve clearances
- SO. 3 Adjust the valve clearances
- SO. 4 Test the internal combustion engine and prepare for operation and/or production
- 92. EnM-G099 Grind material by means of a pedestal-grinding machine. (L2/ Cr2)**
- SO. 1 Explain the factors critical to grinding material by means of a pedestal-grinding machine
- SO. 2 Prepare to grind material by means of a pedestal-grinding machine
- SO. 3 Grind material by means of a pedestal-grinding machine
- SO. 4 Complete the grinding process
- 93. EnM-G101 Cut screw threads by means of a thread-cutting machine. (L2/ Cr2)**
- SO. 1 Explain the factors critical to cutting screw threads by means of a thread cutting machine
- SO. 2 Prepare to cut screw threads by means of a thread cutting machine
- SO. 3 Cut screw threads by means of a thread cutting machine
- SO. 4 Complete the thread cutting process

- 94. EnM-G102 Repair the liquid cooling system of an internal combustion engine. (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing the liquid cooling system of an internal combustion engine
 - SO. 2 Prepare to repair the liquid cooling system of an internal combustion engine
 - SO. 3 Repair the liquid cooling system of the internal combustion engine
 - SO. 4 Test the liquid cooling system of the internal combustion engine and prepare for operation and/or production
- 95. EnM-G103 Repair the air-cooling system of an internal combustion engine. (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing the air cooling system of an internal combustion engine
 - SO. 2 Prepare to repair the air cooling system of an internal combustion engine
 - SO. 3 Repair the air cooling system of the internal combustion engine
 - SO. 4 Test the air-cooling system of the internal combustion engine and prepare for operation and/or production
- 96. EnM-G104 Repair the fuel system of a diesel engine. (L3/ Cr5)**
- SO. 1 Explain the factors critical to repairing the fuel system of a diesel engine
 - SO. 2 Prepare to repair the fuel system of a diesel engine
 - SO. 3 Repair the fuel system of a diesel engine
 - SO. 4 Test the fuel system and prepare for operation and/or production
- 97. EnM-G105 Replace the cutter drum assembly of a continuous miner (L2/ Cr3)**
- SO. 1 Explain the factors critical to replacing a cutter drum assembly of a continuous miner
 - SO. 2 Prepare to replace a cutter drum assembly of a continuous miner
 - SO. 3 Replace a cutter drum assembly of a continuous miner
 - SO. 4 Test the cutter drum assembly of a continuous miner and prepare for operation and/or production
- 98. EnM-G106 Repair the cutter drum assembly of a continuous miner. (L2/ Cr3)**
- SO. 1 Explain the factors critical to repairing the cutter drum assembly of a continuous miner
 - SO. 2 Prepare to repair the cutter drum assembly of a continuous miner
 - SO. 3 Repair the cutter drum assembly of a continuous miner
 - SO. 4 Test the cutter drum assembly of a continuous miner and prepare for operation and/or production

- 99. EnM-G107 Repair the cutter boom assembly of a continuous miner (L2/ Cr3)**
- SO. 1 Explain the factors critical to repairing the cutter boom assembly of a continuous miner
 - SO. 2 Prepare to repair the cutter boom assembly of a continuous miner
 - SO. 3 Repair the cutter boom assembly of a continuous miner
 - SO. 4 Test the cutter boom assembly of the continuous miner and prepare for operation and/or production
- 100. EnM-G108 Replace the cutter boom assembly of a continuous miner. (L2/ Cr3)**
- SO. 1 Explain the factors critical to replacing the cutter boom assembly of a continuous miner
 - SO. 2 Prepare to replace the cutter boom assembly of a continuous miner
 - SO. 3 Replace the cutter boom assembly of a continuous miner
 - SO. 4 Test the cutter boom assembly of the continuous miner and prepare for operation and/or production
- 101. EnM-G109 Overhaul the cutter gearbox of a continuous miner. (L2/ Cr4)**
- SO. 1 Explain the factors critical to overhauling the cutter gearbox of a continuous miner
 - SO. 2 Prepare to overhaul the cutter gearbox of a continuous miner
 - SO. 3 Overhaul the cutter gearbox of a continuous miner
 - SO. 4 Test the cutter gearbox of a continuous miner and prepare for operation and/or production
- 102. EnM-G110 Replace the cutter clutch assembly of a continuous miner. (L2/ Cr2)**
- SO. 1 Explain the factors critical to replacing the cutter clutch assembly of a continuous miner
 - SO. 2 Prepare to replace the cutter clutch assembly of a continuous miner
 - SO. 3 Replace the cutter clutch assembly of a continuous miner
 - SO. 4 Test the cutter clutch assembly of the continuous miner and prepare for operation and/or production
- 103. EnM-G111 Overhaul the cutter clutch assembly of a continuous miner (L2/ Cr3)**
- SO. 1 Explain the factors critical to overhauling the cutter clutch assembly of a continuous miner
 - SO. 2 Prepare to overhaul the cutter clutch assembly
 - SO. 3 Overhaul the cutter clutch assembly
 - SO. 4 Test the cutter clutch assembly and prepare for operation and/or production

- 104. EnM-G112 Overhaul the gathering head gearbox of a continuous miner (L2/ Cr3)**
- SO. 1 Explain the factors critical to overhauling the gathering head gearbox of a continuous miner
 - SO. 2 Prepare to overhaul the gathering head gearbox
 - SO. 3 Overhaul a gathering head gearbox
 - SO. 4 Test the gathering head gearbox and prepare for operation and/or production
- 105. EnM-G113 Replace the components of an air-driven track bound mechanical loader. (L2/ Cr7)**
- SO. 1 Explain the factors critical to replacing the components of an air-driven mechanical loader
 - SO. 2 Prepare to replace the components
 - SO. 3 Replace the components
 - SO. 4 Test the loader and prepare for operation and/or production
- 106. EnM-G114 Repair the upper gearbox of an air-driven track bound mechanical loader. (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing the upper gearbox of an air-driven mechanical loader
 - SO. 2 Prepare to repair the upper gearbox
 - SO. 3 Repair the upper gearbox
 - SO. 4 Test the loader and prepare for operation and/or production
- 107. EnM-G115 Repair the lower gearbox of an air-driven track bound mechanical loader. (L2/ Cr7)**
- SO. 1 Explain the factors critical to repairing the lower gearbox of an air-driven mechanical loader
 - SO. 2 Prepare to repair the lower gearbox
 - SO. 3 Repair the lower gearbox
 - SO. 4 Test the loader and prepare for operation and/or production
- 108. EnM-G116 Repair the motor of an air-driven mechanical loader. (L2/ Cr5)**
- SO. 1 Explain the factors critical to repairing the motor of an air-driven mechanical loader
 - SO. 2 Prepare to repair the motor
 - SO. 3 Repair the motor
 - SO. 4 Test the motor and prepare for operation and/or production
- 109. EnM-G117 Repair the axle assembly of an air-driven mechanical loader (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing the axle assembly of an air-driven mechanical loader
 - SO. 2 Prepare to repair the axle assembly
 - SO. 3 Repair the axle assembly
 - SO. 4 Test the loader and prepare for operation and/or production

- 110. EnM-G118 Repair the controls and pipes of an air-driven mechanical loader. (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing the controls and pipes of an air-driven mechanical loader
 - SO. 2 Prepare to repair the controls and pipes
 - SO. 3 Repair the controls and pipes
 - SO. 4 Test the air-driven mechanical loader and prepare for operation and/or production
- 111. EnM-G119 Replace a tyre-type drive coupling. (L2/ Cr2)**
- SO. 1 Explain the factors critical to replacing tyre-type drive couplings
 - SO. 2 Prepare to replace a tyre-type drive coupling
 - SO. 3 Replace a tyre-type drive coupling
 - SO. 4 Test a tyre-type drive coupling and prepare for operation and/or production
- 112. EnM-G120 Replace a pin and bush type drive coupling. (L2/ Cr2)**
- SO. 1 Explain the factors critical to replacing a pin and bush type drive coupling
 - SO. 2 Prepare to replace a pin and bush type drive coupling
 - SO. 3 Replace a pin and bush type drive coupling
 - SO. 4 Test a pin and bush type drive coupling and prepare for operation and/or production
- 113. EnM-G121 Bend a pipe by means of a hydraulic pipe bender. (L2/ Cr2)**
- SO. 1 Explain the factors critical to bending pipes by means of a hydraulic pipe bender
 - SO. 2 Prepare to bend pipes by means of a hydraulic pipe bender
 - SO. 3 Bend pipes by means of a hydraulic pipe bender
 - SO. 4 Complete the pipe bending process and prepare for operation and/or production
- 114. EnM-G122 Replace the transfer gearbox of a self-propelled mobile machine. (L2/ Cr2)**
- SO. 1 Explain the factors critical to replacing the transfer gearbox of a self-propelled mobile machine
 - SO. 2 Prepare to replace the transfer gearbox
 - SO. 3 Replace the transfer gearbox
 - SO. 4 Test the self-propelled mobile machine and prepare for operation and/or production
- 115. EnM-G123 Replace the manual transmission of a vehicle. (L2/ Cr3)**
- SO. 1 Explain the factors critical to replacing the manual transmission of a vehicle
 - SO. 2 Prepare to replace the manual transmission of a vehicle
 - SO. 3 Replace the manual transmission of a vehicle
 - SO. 4 Test the vehicle and prepare for operation and/or production

116. EnM-G124 Repair the transfer gearbox of a self-propelled mobile machine (L2/ Cr3)

- SO. 1 Explain the factors critical to finding the fault and repairing the transfer gearbox of a self-propelled mobile machine
- SO. 2 Prepare to repair the transfer gearbox
- SO. 3 Repair the transfer gearbox of a self-propelled mobile machine
- SO. 4 Test the self-propelled mobile machine and prepare for operation and/or production

117. EnM-G125 Overhaul a transfer gearbox of a self-propelled mobile machine. (L2/ Cr3)

- SO. 1 Explain the factors critical to overhauling the transfer gearbox of a self-propelled mobile machine
- SO. 2 Prepare to overhaul the transfer gearbox
- SO. 3 Overhaul the transfer gearbox
- SO. 4 Test the transfer gearbox and prepare for operation and/or production

118. EnM-G126 Replace a direct mount bearing. (L2/ Cr3)

- SO. 1 Explain the factors critical to replacing direct mount bearings
- SO. 2 Prepare to replace a direct mount bearing
- SO. 3 Replace a direct mount bearing
- SO. 4 Test the direct mount bearing and prepare for operation and/or production

119. EnM-127 Repair a monorope winch. (L2/ Cr3)

- SO. 1 Explain the factors critical to repairing a monorope winch
- SO. 2 Prepare to repair a monorope winch
- SO. 3 Repair a monorope winch
- SO. 4 Test the monorope winch and prepare for operation and/or production

120. EnM-G128 Replace a monorope winch. (L2/ Cr2)

- SO. 1 Explain the factors critical to replacing a monorope winch
- SO. 2 Prepare to replace a monorope winch
- SO. 3 Replace a monorope winch
- SO. 4 Test the monorope winch, and prepare for operation and/or production

121. EnM-G129 Replace hydraulic pipes and fittings. (L2/ Cr3)

- SO. 1 Explain the factors critical to replacing hydraulic pipes and fittings
- SO. 2 Prepare to replace hydraulic pipes and fittings
- SO. 3 Replace hydraulic pipes and fittings
- SO. 4 Test the hydraulic system and prepare for operation and/or production

122. EnM-G130 Repair the power shift transmission of a self-propelled mobile machine. (L2/ Cr5)

- SO. 1 Explain the factors critical to repairing the power shift transmission of a self propelled mobile machine
- SO. 2 Prepare to repair the power shift transmission of a self propelled mobile machine

- SO. 3 Repair the power shift transmission of a self propelled mobile machine
SO. 4 Test the power shift transmission and prepare for operation and/or production
- 123. EnM-G131 Repair the constant mesh transmission of a self-propelled mobile machine. (L2/ Cr5)**
- SO. 1 Explain the factors critical to repairing the constant mesh transmissions of a self-propelled mobile machine
SO. 2 Prepare to repair the constant mesh transmission of a self-propelled mobile machine
SO. 3 Repair the constant mesh transmission of a self-propelled mobile machine
SO. 4 Test the constant mesh transmission and prepare for operation and/or production
- 124. EnM-G132 Perform maintenance on a self-propelled mobile hydraulic drill rig. (L2/ Cr6)**
- SO. 1 Explain the factors critical to performing maintenance on a self-propelled mobile hydraulic drill rig
SO. 2 Prepare to perform maintenance on a self propelled mobile hydraulic drill rig
SO. 3 Perform maintenance on a self-propelled mobile hydraulic drill rig
SO. 4 Test the self propelled mobile hydraulic drill rig and prepare for operation and/or production
- 125. EnM-G133 Repair a hydraulic accumulator. (L2/ Cr3)**
- SO. 1 Explain the factors critical to repairing a hydraulic accumulator
SO. 2 Prepare to repair a hydraulic accumulator
SO. 3 Repair the hydraulic accumulator
SO. 4 Test the hydraulic accumulator and prepare for operation and/or production
- 126. EnM-G134 Replace the hydraulic wheel motor of a self-propelled mobile machine. (L2/ Cr4)**
- SO. 1 Explain the factors critical to replacing a hydraulic wheel motor
SO. 2 Prepare to replace the hydraulic wheel motor
SO. 3 Replace the hydraulic wheel motor
SO. 4 Test the hydraulic wheel motor and prepare for operation and/or production
- 127. EnM-G135 Replace liners in a transfer chute. (L2/ Cr2)**
- SO. 1 Explain the factors critical to replacing liners in a transfer chute
SO. 2 Prepare to replace liners in a transfer chute
SO. 3 Replace liners in a transfer chute
SO. 4 Complete the liner replacement and prepare for operation and/or production
- 128. EnM-G136 Install a transfer chute. (L2/ Cr4)**
- SO. 1 Explain the factors critical to installing a transfer chute
SO. 2 Prepare to install a transfer chute
SO. 3 Install the transfer chute
SO. 4 Test the transfer chute and prepare for operation and/or production

- 129. EnM-G137 Repair a transfer chute. (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing a transfer chute
 - SO. 2 Prepare to repair a transfer chute
 - SO. 3 Repair the transfer chute
 - SO. 4 Test the transfer chute and prepare for operation and/or production
- 130. EnM-G138 Replace a radial door on a transfer chute. (L2/ Cr2)**
- SO. 1 Explain the factors critical to replacing a radial doors on a transfer chute
 - SO. 2 Prepare to replace a radial door on a transfer chute
 - SO. 3 Replace the radial door on a transfer chute
 - SO. 4 Test the radial door and prepare for operation and/or production
- 131. EnM-G139 Develop a work piece by means of the parallel line development method. (L2/ Cr4)**
- SO. 1 Explain the factors critical to developing a work piece by means of the parallel line development method
 - SO. 2 Prepare to develop the work piece
 - SO. 3 Develop the work piece
 - SO. 4 Complete the development process
- 132. EnM-G142 Repair a vertical spindle pump. (L2/ Cr4)**
- SO. 1 Explain the factors critical to repairing a vertical spindle pump
 - SO. 2 Prepare to repair a vertical spindle pump
 - SO. 3 Repair the vertical spindle pump
 - SO. 4 Test the vertical spindle pump and prepare for operation and/or production
- 133. EnM-G143 Replace a final drive/gearbox assembly of an underground locomotive. (L2/ Cr5)**
- SO. 1 Explain the factors critical to replacing a final drive/gearbox assembly of an underground locomotive
 - SO. 2 Prepare to replace the final drive/gearbox assembly of an underground locomotive
 - SO. 3 Replace the final drive/gearbox assembly of an underground locomotive
 - SO. 4 Test the final drive/gearbox assembly of the underground locomotive and prepare for operation and/or production
- 134. EnM-G144 Replace an axle assembly of an underground locomotive (L2/ Cr4)**
- SO. 1 Explain the factors critical to replacing an axle assembly of an underground locomotive
 - SO. 2 Prepare to replace the axle assembly of an underground locomotive
 - SO. 3 Replace the axle assembly of an underground locomotive
 - SO. 4 Test the axle assembly of the underground locomotive and prepare for operation and/or production

135. EnM-G145 Replace components on a chairlift installation. (L2/ Cr4)

- SO. 1 Explain the factors critical to replacing components on a chairlift installation
- SO. 2 Prepare to replace components on a chairlift installation
- SO. 3 Replace components on a chairlift installation
- SO. 4 Test the chairlift installation and prepare for operation and/or production

136. EnM-G146 Replace components on a conveyor belt installation. (L2/ Cr3)

- SO. 1 Explain the factors critical to replacing components on a conveyor belt installation
- SO. 2 Prepare to replace components on a conveyor belt installation
- SO. 3 Replace components on a conveyor belt installation
- SO. 4 Test the conveyor belt installation and prepare for operation and/or production

137. EnM-G147 Trace and correct faults on a diesel engine. (L3/ Cr7)

- SO. 1 Explain the factors critical to tracing and correcting faults on a diesel engine
- SO. 2 Prepare to trace and correct faults on a diesel engine
- SO. 3 Trace and correct faults on a diesel engine
- SO. 4 Test the diesel engine and prepare for operation and/or production

138. EnM-G148 Maintain a diesel engine. (L2/ Cr4)

- SO. 1 Explain the factors critical to maintaining a diesel engine
- SO. 2 Prepare to maintain a diesel engine
- SO. 3 Maintain the diesel engine
- SO. 4 Test the diesel engine and prepare for operation and/or production

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 351

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Unit standards for Cement Manufacture (19)**1. CLA-G001 Demonstrate a basic understanding of cement manufacturing. (L2/ Cr2)**

- SO. 1 Describe the development of cement.
- SO. 2 Name and identify the raw materials.
- SO. 3 Describe the preparation and processing of materials in the cement manufacturing process.
- SO. 4 Describe the nature of the product and its various applications.
- SO. 5 Describe the nature of the business.
- SO. 6 Demonstrate understanding of statutory issues.

2. CLA-G002 Clear hot, dry material blockages in a mineral process. (L3 / Cr4)

- SO. 1 Identify and detect material blockages.
- SO. 2 Prepare to clear blockages.
- SO. 3 Clear blockages..
- SO. 4 Conduct post-clearing activities.
- SO. 5 Demonstrate knowledge of blockage clearing methods and the application of safe work procedures.

3. CLA-G003 Mill materials in a dry process mill utilising grinding materials. (L2 / Cr22)

- SO. 1 Demonstrate understanding of the milling process
- SO. 2 Prepare mill for production.
- SO. 3 Operate the mill
- SO. 4 Stop and inspect the mill

4. CLA-G004 Operate materials handling plant. (L3 / Cr8)

- SO. 1 Demonstrate understanding of materials handling plant
- SO. 2 Prepare materials handling plant for operation
- SO. 3 Operate materials handling plant
- SO. 4 Prepare plant for maintenance
- SO. 5 Comply with Safety, Health and Environmental Requirements.

5. CLA-G005 Manufacture calcined products in a rotary kiln. (L4 / Cr36)

- SO. 1 Demonstrate knowledge relating to the operation and operating principles of rotary kilns
- SO. 2 Prepare to start the kiln
- SO. 3 Start the kiln.
- SO. 4 Operate the kiln.
- SO. 5 Shut down the kiln

6. CLA-G006 Demonstrate an understanding of cement technology. (L4 / Cr22)

- SO. 1 Indicate the nature and sources of raw materials and their combinations to produce an economically viable cement clinker
- SO. 2 The preparation and chemical conversion of raw materials to cement clinker is explained in terms of the processes and mineralogy
- SO. 3 Describe the milling process whereby clinker is converted to cement
- SO. 4 Demonstrate knowledge of various kiln refractory materials and their purpose
- SO. 5 Explain the cementation process and the common field applications of cement

7. CLA-G007 Demonstrate an understanding of lime technology. (L4 / Cr16)

- SO. 1 Indicate the nature and sources of raw materials to produce an economically viable product
- SO. 2 Explain the chemical conversion of raw materials to burnt lime
- SO. 3 Describe the hydrating process
- SO. 4 Demonstrate knowledge of various kiln refractory materials and their purpose
- SO. 5 Describe the common field applications of lime

8. CLA-G008 Monitor Plant and Equipment. (L2 / Cr9)

- SO. 1 Demonstrate an understanding of the plant and process
- SO. 2 Monitor start and shut down operations
- SO. 3 Monitor plant and equipment
- SO. 4 Monitor raw and in-process materials

9. CLA-G010 Manufacture calcined products in a vertical kiln. (L4 / Cr33)

- SO. 1 Demonstrate knowledge relating to the operation and operating principles of vertical shaft kilns
- SO. 2 Prepare to start the kiln
- SO. 3 Start the kiln
- SO. 4 Operate the kiln
- SO. 5 Shut down the kiln

10. CLA-G015 Operate Programmable Logic Control (PLC) Systems. (L2 / Cr5)

- SO. 1 Navigate through the control panel system
- SO. 2 Monitor and control the manufacturing process
- SO. 3 Respond to signals, alarms and non-conformances
- SO. 4 Comply with safety, health and environmental requirements

11. CLA-G018 Demonstrate a basic understanding of lime manufacturing. (L2/ Cr2)

- SO. 1 Describe the development of lime
- SO. 2 Name and identify the raw materials used in lime manufacturing
- SO. 3 Describe the preparation and processing of materials in the lime manufacturing process.
- SO. 4 Describe the nature of the product and its various applications.
- SO. 5 Describe the nature of the business
- SO. 6 Demonstrate understanding of statutory issues

12. CLA-G022 Hydrate burnt lime by means of a lime hydration plant. (L4 / Cr23)

- SO. 1 Demonstrate knowledge relating to the operation and operating principles of burnt lime hydrators
- SO. 2 Prepare to start the hydrator
- SO. 3 Start the hydrator
- SO. 4 Operate the hydrator
- SO. 5 Shut down the hydrator

13. CLA-G027 Demonstrate Knowledge of Cement Quality. (L3 / Cr6)

- SO. 1 Demonstrate an understanding of cement quality
- SO. 2 Demonstrate understanding of sampling methods used in determining cement quality
- SO. 3 Demonstrate understanding of tests used in the manufacturing of cement
- SO. 4 Demonstrate knowledge of evaluating test results

14. CLA-G028 Demonstrate Knowledge of Lime Quality. (L3 / Cr6)

- SO. 1 Demonstrate an understanding of lime quality
- SO. 2 Demonstrate understanding of sampling methods used in determining lime products quality
- SO. 3 Demonstrate understanding of tests used in the manufacturing of lime products
- SO. 4 Demonstrate knowledge of evaluating test results

15. CLA-G030 Crush materials by means of primary crushing. (L2 / Cr8)

- SO. 1 Demonstrate knowledge of primary crushing process and material
- SO. 2 Prepare for production and start up
- SO. 3 Control operation of primary crushing plant.
- SO. 4 Shut down and inspect primary crushing plant
- SO. 5 Comply with Safety, Health and Environmental requirements.
- SO. 6 Perform operator maintenance

16. CLA-G032 Produce fine aggregates in a sand plant. (L2/ Cr15)

- SO. 1 Demonstrate knowledge of sands, classification and equipment
- SO. 2 Inspect and start up plant.
- SO. 3 Operate plant
- SO. 4 Comply with safety, health and environmental (S-H-E) requirements

17. CLA-G036 Demonstrate a basic understanding of the aggregates industry. (L2 / Cr2)

- SO. 1 Name and identify materials used for aggregates
- SO. 2 Describe the extraction and processing of aggregates
- SO.3 Describe the nature of products and applications
- SO.4 Describe the nature of the business
- SO. 5 Demonstrate understanding of the statutory issues impacting on the business

18. CLA-G039 Demonstrate Understanding of Aggregates Quality. (L3/ Cr6)

- SO. 1 Demonstrate an understanding of aggregates characteristics
- SO. 2 Demonstrate understanding of the sampling methods used in determining aggregates quality
- SO. 3 Demonstrate understanding of tests used in the manufacturing of aggregates
- SO. 4 Demonstrate knowledge of evaluating test results

19. CLA-G040 Carry out secondary breaking by mechanical means. (L2 / Cr8)

- SO. 1 Demonstrate knowledge of the material to be broken
- SO. 2 Demonstrate knowledge of equipment to be used
- SO. 3 Prepare for secondary breaking
- SO. 4 Start up the machine
- SO. 5 Operate the rock breaker
- SO. 6 Comply with Safety, health and environmental provisions

Diamond Processing (33)**20. DiP-G000 Use a loupe to examine diamond gemstones (L1 / Cr8)**

- SO. 1 Identify loupes to examine diamond gemstones and describe their application
- SO. 2 Prepare for and use loupes to examine diamond gemstones
- SO. 3 Protect and maintain loupes.

21. DiP-G001 Describe the structure of the diamond processing industry (L1/Cr3)

- SO. 1 Identify the role-players in the industry and describe their function and inter-relationships
- SO. 2 Demonstrate knowledge of terminology used in the industry
- SO. 3 Demonstrate knowledge of the economics of the diamond processing industry locally and internationally
- SO. 4 Describe the basic legal requirements to operate in the diamond processing industry

22. DiP-G003 Describe and identify the characteristics of diamond gemstones. (L2 / Cr10)

- SO. 1 Identify the crystalline morphology and forms of diamond gemstones and their grains, planes and axes.
- SO. 2 Describe the various properties of diamond gemstones in broad terms and explain these properties in relation to the processes of polishing diamond gemstones.
- SO. 3 Describe the colour and colour treatments of diamond gemstones.
- SO. 4 Describe and identify inclusions in diamond gemstones and explain the treatment of them.
- SO. 5 Distinguish synthetic diamonds and diamond imitations from diamond gemstones

23. DiP-G004 Describe the types of diamond gemstones. (L4 / Cr23)

- SO. 1 Identify and describe the main categories and groups of diamond gemstones.
- SO. 2 Identify the different diamond types and describe their differences.
- SO. 3 Describe the various properties of the different types of diamond gemstones and explain these properties in relation to the processes of polishing diamond gemstones.
- SO. 4 Explain the effects of nitrogen on diamond type and colour.
- SO. 5 Explain the colour obtained by treatment on the different diamond types

24. DiP-G005 Explain the requirements for the security of diamonds. (L1 / Cr1)

- SO. 1 Describe the general requirements for safeguarding diamonds in the workplace.
- SO. 2 Explain the implications of receiving and issuing of diamonds in the workplace.
- SO. 3 Describe the rights of an owner and employees in taking measures to safeguard diamonds.

25. DiP-G050 Rough sort diamond gemstones (L3 / Cr48)

- SO. 1 Identify the equipment and tools used to rough sort diamond gemstones and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for rough sorting.
- SO. 3 Sort rough diamond gemstones into categories for rough sorting.
- SO. 4 Conduct post-rough-sorting reconciliation, checking and security activities

26. DiP-G060 Design and mark diamond gemstones for parting. (L4 / Cr92)

- SO. 1 Identify the systems, equipment and tools used to mark diamond gemstones for parting and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for marking and parting.
- SO. 3 Examine rough diamond gemstones to determine their characteristics for parting.
- SO. 4 Predict the optimum shape of polished diamonds from rough diamond gemstones and determine where and how they should be parted for polishing.
- SO. 5 Conduct post-marking and parting reconciliation, checking and security activities

27. DIP-G065 Use a computer to design, mark and check diamond gemstones for parting. (L2 / Cr2)

- SO. 1 Identify the computer equipment and tools used to rough analyse diamond gemstones for parting and describe their application.
- SO. 2 Determine the optimum shape of polished diamonds from rough diamond gemstones and check the marking line for parting.
- SO. 3 Conduct post-rough-analysing reconciliation, checking and security activities

28. DIP-G070 Monitor the fabrication of polished diamond gemstones. (L4 / Cr64)

- SO. 1 Explain the requirements pertaining to the cleaning and the use of cleaning materials and equipment
- SO. 2 Prepare to inspect and clean the gully box
- SO. 3 Inspect and clean the gully box
- SO. 4 Prepare and test the gully box for operation

29. DIP-G100 Part diamond gemstones by means of sawing. (L3 / Cr72)

- SO. 1 Identify the equipment and tools used to part diamond gemstones by means of sawing and describe their application
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for parting them
- SO. 3 Prepare diamond gemstones for sawing
- SO. 4 Part diamond gemstones by means of sawing
- SO.5 Conduct post-sawing cleaning, checking and security activities

30. DIP-G120 Part diamond gemstones by means of laser cutting. (L2 / Cr16)

- SO. 1 Identify the equipment and tools used to part diamond gemstones by means of laser cutting and describe their application
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for parting them
- SO. 3 Prepare diamond gemstones for laser cutting
- SO. 4 Part or kerf diamond gemstones by means of laser cutting
- SO. 5 Conduct post-laser cutting cleaning, checking and security activities

31. DIP-G210 Brute diamond gemstones by hand. (L3 / Cr82)

- SO. 1 Identify the equipment and tools used to brute diamond gemstones by hand and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for brutting.
- SO. 3 Set and clamp diamond gemstones for brutting.
- SO. 4 Carry out rough brutting and rondisting on diamond gemstones.
- SO. 5 Conduct post-brutting cleaning, checking and security activities

32. DiP-G220 Brute diamond gemstones using semi-automatic equipment. (L3 / Cr62)

- SO. 1 Identify the equipment and tools used to brute diamond gemstones by using semi-automatic equipment and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for bruting.
- SO. 3 Set diamond gemstones for semi-automatic bruting.
- SO. 4 Carry out rough bruting and rondisting on diamond gemstones.
- SO. 5 Conduct post-bruting cleaning, checking and security activities.

33. DiP-G230 Facet the Girdle by hand. (L3 / Cr11)

- SO. 1 Identify the equipment and tools used to girdle facet diamond gemstones by hand and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for girdle faceting.
- SO. 3 Set and clamp diamond gemstones for girdle faceting.
- SO. 4 Polish girdle facets on diamond gemstones.
- SO. 5 Conduct post-girdle faceting cleaning, checking and security activities.

34. DiP-G240 Facet the Girdle by semi-automatic machine. (L3 / Cr7)

- SO. 1 Identify the equipment and tools used to girdle facet diamond gemstones using semi-automatic equipment and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for girdle faceting.
- SO. 3 Clamp diamond gemstones for semi-automatic girdle faceting.
- SO. 4 Polish girdle facets on diamond gemstones.
- SO. 5 Conduct post-girdle faceting cleaning, checking and security activities.

35. DiP-G250 Shape diamond gemstones by laser cutting (L3 / Cr24)

- SO. 1 Identify the equipment and tools used to shape diamond gemstones by means of laser cutting and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for laser shaping them.
- SO. 3 Prepare diamond gemstones for laser shaping.
- SO. 4 Laser shape diamond gemstones.
- SO. 5 Conduct post-laser shaping cleaning, checking and security activities.

36. DiP-G300 Prepare and set up a bench for polishing diamond gemstones. (L2 / Cr6)

- SO. 1 Identify the material, equipment and tools required to prepare and set up a bench and describe their application.

- SO. 2 Set up and align a bench and a scaiffe
- SO. 3 Prepare the surface of a scaiffe
- SO. 4 Level tangs with a bench and a scaiffe
- SO. 5 Conduct post set-up activities

37. DiP-G301 Set up a bench and level a scaiffe for polishing diamond gemstones. (L2 / Cr2)

- SO. 1 Identify the equipment and tools required to set up a bench and level a scaiffe for polishing diamond gemstones and describe their application
- SO. 2 Set up and align a bench and a scaiffe
- SO. 3 Conduct post set up activities

38. DiP-G302 Prepare a scaiffe for polishing diamond gemstones. (L2 / Cr2)

- SO. 1 Identify the material and tools required to prepare a scaiffe for polishing diamond gemstones and describe their application
- SO. 2 Prepare the surface of a scaiffe
- SO. 3 Conduct post scaiffe preparation activities

39. DiP-G303 Level tangs for polishing diamond gemstones. (L1 / Cr2)

- SO.1 Identify the equipment and tools required to level tangs for polishing diamond gemstones and describe their application.
- SO. 2 Level tangs with a bench and a scaiffe.
- SO. 3 Conduct post tang-leveilling activities

40. DiP-G305 Set diamond gemstones for polishing using the press pot system. (L2 / Cr3)

- SO. 1 Describe the use of the different sizes and depth of press pots for polishing.
- SO. 2 Explain the implications for setting of a diamond gemstone.
- SO. 3 Set diamond gemstones into appropriate pots.
- SO. 4 Conduct post-setting cleaning, checking and security activities

41. DiP-G306 Describe the process of fabrication for polishing diamond gemstones. (L4 / Cr13)

- SO. 1 Identify the equipment used in processing diamond gemstones and explain their use in different applications
- SO. 2 Describe the traditional and chain methods of polishing diamond gemstones
- SO. 3 Describe the critical checkpoints in fabrication of diamond gemstones and their importance for overall quality, weight and value of the finished article

42. DiP-G307 Screen diamond gemstones for polishing using the press pot system. (L3 / Cr7)

- SO. 1 Describe the importance of angles, table sizes and depth when setting press pots and rings for polishing.
- SO. 2 Explain the implications for programming dimensions when screening a diamond gemstone.
- SO. 3 Screen diamond gemstones in appropriate pots and rings.

SO. 4 Conduct post-screening cleaning, checking and security activities.

43. DiP-G310 Crosswork sawn diamond gemstones. (L4 / Cr62)

- SO. 1 Identify the equipment and tools used to perform crossworking on diamond gemstones and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for polishing.
- SO. 3 Set and clamp diamond gemstones for crossworking.
- SO. 4 Prepare and polish diamond gemstones for brilliantteering.
- SO. 5 Conduct post-crossworking cleaning, checking and security activities

44. DiP-G315 Crosswork makeable diamond gemstones.(L4 / Cr76)

- SO. 1 Identify the equipment and tools used to perform crossworking on diamond gemstones and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for polishing.
- SO. 3 Set and clamp and diamond gemstones for crossworking.
- SO. 4 Prepare and polish diamond gemstones for brilliantteering.
- SO. 5 Conduct post-crossworking cleaning, checking and security activities.

45. DiP-G317 Crosswork fancy shape diamond gemstones. (L4 / Cr87)

- SO. 1 Identify the equipment and tools used to perform fancy crossworking on diamond gemstones and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for polishing.
- SO. 3 Set and clamp diamond gemstones for fancy crossworking.
- SO. 4 Prepare and polish fancy diamond gemstones either for step cut or for brilliantteering.
- SO. 5 Conduct post-fancy-crossworking cleaning, checking and security activities

46. DiP-G320 Brillianteer sawn diamond gemstones. (L3 / Cr61)

- SO. 1 Describe the equipment and tools used to brillianteer diamond gemstones and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for polishing.
- SO. 3 Set and clamp diamond gemstones for brilliantteering.
- SO. 4 Brillianteer diamond gemstones.
- SO. 5 Conduct post-brilliantteering cleaning, checking and security activities.

47. DiP-G325 Brillianteer makeable diamond gemstones. (L3 / Cr70)

- SO. 1 Describe the equipment and tools used to brillianteer diamond gemstones and describe their application.
- SO. 2 Demonstrate knowledge of the structure of diamond gemstones and the implications for polishing.
- SO. 3 Set and clamp diamond gemstones for brilliantteering.
- SO. 4 Brillianteer diamond gemstones.
- SO. 5 Conduct post-brilliantteering cleaning, checking and security activities.

48. DiP-G330 Block and Polish diamond gemstones using automatic machinery. (L2/Cr9)

- SO1 diamond gemstones and describe their application.
- SO 2 Locate diamond gemstones into automatic machines after screening.
- SO 3 Perform automatic blocking and polishing on diamond gemstones.
- SO 4 Conduct post-automatic-blocking and polishing cleaning, checking and security activities

49. DiP-G500 Collect and return equipment for repair or refurbishment. (L2 / Cr2)

- SO. 1 Identify and label the equipment required to be repaired or refurbished
- SO. 2 Liaise with the user of the equipment to be repaired or refurbished
- SO. 3 Comply with the workplace security requirements
- SO. 4 Secure the equipment in transit
- SO. 5 Conduct post-repair-or-refurbish equipment activities

50. DiP-G510 Refurbish a scaiffe. (L3 / Cr36)

- SO. 1 Identify the material, equipment and tools required to refurbish a scaiffe
- SO. 2 Inspect a used scaiffe and identify its owner
- SO. 3 Clean the surface of a scaiffe for reuse
- SO. 4 Prepare the surface of a scaiffe for reuse
- SO. 5 Balance a cleaned and prepared scaiffe
- SO. 6 Conduct post refurbish-a-scaiffe activities

51. DiP-G520 Machine a scaiffe. (L3 / Cr12)

- SO. 1 Identify the material, equipment and tools required to machine a scaiffe
- SO. 2 Inspect a used scaiffe and identify its owner
- SO. 3 Machine the surface of a scaiffe for reuse
- SO. 4 Balance a machined scaiffe
- SO. 5 Conduct post machine-a-scaiffe activities

52. DiP-G530 Repair or refurbish equipment. (L3 / Cr35)

- SO. 1 Identify the equipment used in the diamond polishing industry and evaluate the extent of repair or refurbishment necessary
- SO. 2 Liaise with the user of the equipment to be repaired or refurbished
- SO. 3 Arrange for the repair or refurbishment of equipment
- SO. 4 Inspect the installation and application of equipment in the workplace
- SO. 5 Conduct post-repair-or-refurbish equipment activities

Metallurgy (13)**53. Met-G031 Separate material by means of a hydrosizer. (L2 / Cr4)**

- SO. 1 Demonstrate knowledge relating to separating material by means of a hydrosizer
- SO. 2 Prepare to separate material
- SO. 3 Separate material
- SO. 4 Complete the duties pertaining to the separation process

54. Met-G032 Leach metal bearing material in a pressure vessel. (L3 / Cr6)

- SO. 1 Demonstrate knowledge relating to leaching metal bearing material in a pressure vessel
- SO. 2 Prepare to leach material.
- SO. 3 Leach material.
- SO. 4 Complete the duties pertaining to the leaching process

55. Met-G034 Leach metal bearing material by means of heap leaching. (L3 / Cr5)

- SO. 1 Demonstrate knowledge relating to leaching metal bearing material by means of heap leaching.
- SO. 2 Prepare to leach material.
- SO. 3 Leach material.
- SO. 4 Complete the duties pertaining to the leaching process.

56. Met-G035 Adsorb dissolved gold onto activated carbon. (L3/ Cr5)

- SO. 1 Demonstrate knowledge relating to gold adsorption.
- SO. 2 Prepare to adsorb gold.
- SO. 3 Adsorb gold.
- SO. 4 Complete the duties pertaining to the adsorption process

57. Met-G085 Generate hot gas by means of a fluidized-bed process. (L2/ Cr4)

- SO. 1 Demonstrate knowledge relating to the generation of hot gas
- SO. 2 Prepare to generate hot gas
- SO. 3 Generate hot gas
- SO. 4 Complete the duties pertaining to the hot gas generation process

58. Met-G086 Remove impurities from molten metal by means of a converting process. (L3 / Cr10)

- SO. 1 Demonstrate knowledge relating to the removing of impurities from molten metal by means of a converting process
- SO. 2 Prepare to remove impurities
- SO. 3 Remove impurities
- SO. 4 Complete the duties to the converting process

59. Met-G087 Direct the operation of an overhead crane. (L2/ Cr3)

- SO. 1 Demonstrate knowledge relating to crane directing operations.
- SO. 2 Prepare to direct crane operations.
- SO. 3 Direct crane operations.

60. Met-G088 Generate sulphur trioxide gas by means of a catalytic converting process. (L3/ Cr8)

- SO. 1 Demonstrate knowledge relating to the generation of SO₃ gas
- SO. 2 Prepare to generate SO₃ gas
- SO. 3 Generate SO₃ gas
- SO. 4 Complete the duties pertaining to the SO₃ gas generation process

61. Met-G089 Produce sulphuric acid by means of absorption. (L2 / Cr5)

- SO. 1 Demonstrate knowledge relating to the absorption process
- SO. 2 Prepare to produce sulphuric acid
- SO. 3 Produce sulphuric acid
- SO. 4 Complete the duties pertaining to the absorption process.

62. Met-G090 Clean sulphur dioxide gas by means of a mist electrostatic precipitator. (L2 / Cr3)

- SO. 1 Demonstrate knowledge relating to the cleaning process
- SO. 2 Prepare to clean sulphur dioxide gas
- SO. 3 Clean sulphur dioxide gas
- SO. 4 Complete the duties pertaining to the gas cleaning process

63. Met-G213 Adsorb a dissolved precious metal onto resin. (L3 / Cr7)

- SO. 1 Demonstrate knowledge relating to precious metal adsorption
- SO. 2 Prepare to adsorb a precious metal
- SO. 3 Adsorb a precious metal
- SO. 4 Complete the duties pertaining to the adsorption process

63. Met-G214 Elute a precious metal from loaded resin. (L3 / Cr7)

- SO. 1 Demonstrate knowledge relating to precious metal elution
- SO. 2 Prepare to elute precious metal
- SO. 3 Elute precious metal
- SO. 4 Complete the duties pertaining to the elution process

64. Met-G215 Leach gold-bearing material by means of chlorine. (L3 / Cr9)

- SO. 1 Demonstrate knowledge relating to the leaching of gold-bearing material.
- SO. 2 Prepare to leach material.
- SO. 3 Leach material.
- SO. 4 Complete the duties pertaining to the leaching process.

Underground Hardrock Mining (6)**65. MnH-G026 Drill holes by means of a stope drill-rig. (L2 / Cr4)**

- SO. 1 Explain specified requirements regarding the drilling of holes with a stope drill-rig
- SO. 2 Prepare to drill holes with a stope drill-rig.
- SO. 3 Drill holes with a stope drill-rig

66. MnH-G053 Charge shot holes with bulk explosives. (L2 / Cr2)

- SO. 1 Explain specified requirements pertaining to the charging of shot holes with bulk explosives
- SO. 2 Prepare to charge shot holes with bulk explosives.
- SO. 3 Charge shot holes with bulk explosives

67. MnH-G058 Install and remove ventilation columns and accessories. (L2 / Cr2)

- SO. 1 Explain specified requirements regarding the installation and removal of ventilation columns and accessories
- SO. 2 Prepare to install and remove a ventilation column and accessories.
- SO. 3 Install and remove a ventilation column and accessories.

68. MnH-G059 Install pre-stressed elongated support. (L2 / Cr2)

- SO. 1 Explain specified requirements regarding the installation of pre-stressed elongated support
- SO. 2 Prepare to install pre-stressed elongated.
- SO. 3 Install pre-stressed elongated support.

69. MnH-G061 Support an underground workplace by means of grout packs. (L2 / Cr2)

- SO. 1 Explain the specified requirements pertaining to the installation of grout packs
- SO. 2 Prepare to install grout packs.
- SO. 3 Install grout packs.

70. MnH-G108 Install tendon support by means of a Roofbolter. (L2 / Cr4)

- SO. 1 Explain the specified requirements pertaining to the installation of tendon support with a roofbolter.
- SO. 2 Prepare to install tendon support with a roofbolter.
- SO. 3 Install tendon support with a roofbolter

Surface Mining (9)

- 71. MnS-G030 Haul and dump material using On Highway Articulated Dump Truck with mass not exceeding 25 000 Kg. (L2 / Cr10)**
- SO. 1 Prepare to haul and dump material;
SO. 2 Haul and dump material; and
SO. 3 Monitor hauling and dumping operation
- 72. MnS-G032 Haul and dump material using Off Highway Articulated Dump Truck (L2 / Cr10)**
- SO. 1 Prepare to haul and dump material;
SO. 2 Haul and dump material; and
SO. 3 Monitor hauling and dumping operation
- 73. MnS-G033 Haul and dump material using On Highway Rigid Body Rear Dumper with mass not exceeding 16000 Kg (L2 / Cr10)**
- SO. 1 Prepare to haul and dump material;
SO. 2 Haul and dump material; and
SO. 3 Monitor the hauling and dumping operation
- 74. MnS-G034 Haul and dump material using On Highway Rigid Body Rear Dumper With mass exceeding 16000 Kg (L2 / Cr10)**
- SO. 1 Prepare to haul and dump material;
SO. 2 Haul and dump material; and
SO. 3 Monitor the hauling and dumping operation
- 75. MnS-G035 Haul and dump material using Off Highway Rigid Body Rear Dumper with mass not exceeding 16000 Kg (L2 / Cr10)**
- SO. 1 Prepare to haul and dump material;
SO. 2 Haul and dump material; and
SO. 3 Monitor the hauling and dumping operation.
- 76. MnS-G036 Haul and dump material using Off Highway Rigid Body Rear Dumper with mass exceeding 16000 Kg (L2 / Cr10)**
- SO. 1 Prepare to haul and dump material;
SO. 2 Haul and dump material; and
SO. 3 Monitor the hauling and dumping operation
- 77. MnS-G037 Transport personnel, material and equipment using Light Delivery Vehicle (L1 / Cr4)**
- SO. 1 Prepare to transport personnel, material and equipment;
SO. 2 Transport personnel, material and equipment;
SO. 3 Monitor transporting operations.

78. MnS-G038 Operate a Crusher (L1 / Cr4)

- SO. 1 Prepare to operate a Crusher;
- SO.2 Operate a Crusher;
- SO.3 Monitor Crushing operations; and
- SO.4 Demonstrate teamwork

79. MnS-G039 Move Trailing Cable using Cable Reeler (L2 / Cr8)

- SO. 1 prepare to move trailing cables;
- SO.2 move trailing cables; and
- SO.3 monitor the moving trailing cable operations

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

No. 352

22 March 2002

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The South African Qualifications Authority in terms of the National Standards Bodies Regulations (Government Gazette No. 18787) published on 28 March 1998, hereby gives notice of additional names of the following Standard Generating Body:

NSB 09: HEALTH SCIENCES AND SOCIAL SERVICES**Additional Names for the SGB for Ancillary Health Care**

NOMINEE	WORKPLACE	NOMINATING BODY	QUALIFICATION / EXPERIENCE
Bakker, J J	South African Red Cross Society (National Society)	South African Red Cross Society (National Society)	Reg Nurse & Midwife; 22 years' clinical & field experience
Lepali, S	National Education, Health & Allied Workers Union (NEHAWU) Johannesburg Branch	Congress of South African Trade Unions (COSATU)	Labour Relation Management for the Public Service; 10 years' workplace experience
Strydom, M	North West Dept of Health (Southern Region)	North West Dept of Health	M A Nursing Science; 16 years clinical, 9 years' education
Trueman, K A	Healthcare Education & Training Unit	Afrox Healthcare Training Unit	Reg Nurse & Midwife; B Com; 15 years' clinical; 4 years' education & training

JOE SAMUELS

DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

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