

**SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

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

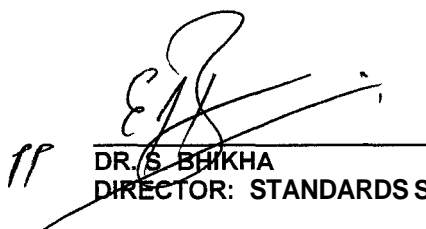
**Mining and Minerals**

Registered by Organising Field 06, Manufacturing, Engineering and Technology, publishes the following qualification and unit standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the qualification and unit standard. The qualification and unit standards can be accessed via the SAQA web-site at [www.saqqa.org.za](http://www.saqqa.org.za). Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, Hatfield Forum West, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the unit standards should reach SAQA at the address **below and no later than 5 November 2006**. All correspondence should be marked **Standards Setting – SGB for Mining and Minerals** and addressed to

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## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

### QUALIFICATION:

#### *Further Education and Training Certificate: Carbonate Materials Manufacturing Processes*

SAQA QUAL ID (QUALIFICATION TITLE)			
57692		Further Education and Training Certificate: Carbonate Materials Manufacturing	
SGB NAME	ORGANISING FIELD ID	PROVIDER NAME	
SGB Mining and Minerals	6		
QUAL TYPE	ORGANISING FIELD DESCRIPTION	SUBFIELD	
Further Ed and Training Cert	Manufacturing, Engineering and Technology	Fabrication and Extraction	
ABET BAND (MINIMUM CREDITS)	NQF LEVEL	QUALIFICATION CLASS	
Undefined	159	Level 4	Regular-Provider-Stds Base

#### **PURPOSE AND RATIONALE OF THE QUALIFICATION**

Purpose:

This qualification will enable qualifying learners with the necessary knowledge, understanding and competence to 'Burn' (manufacture) cement or lime in accordance with specified requirements. It provides an opportunity for learners to learn and apply skills in the workplace.

Cement and lime manufacturing are complex processes far beyond the mere reduction or separation of minerals, which impacts on the environment and the occupational safety of people. There are also potential dangers due to the extremely high temperatures of material in the kiln and explosions in electrostatic precipitators.

Process Controllers in modern cement or lime plants control the entire manufacturing process from centralised control rooms by means of state-of-the-art process technology. This involves production stages such as reclaiming of raw materials, materials transport (handling), raw milling, burning and finish milling. Their knowledge of, and application of cement technology spans a wide range of topics such as relevant chemistry, information technology, refractories and materials handling.

Learners acquiring this qualification will have an improved understanding of their role, acquire the applied competencies to consistently and effectively execute their duties by contributing to the manufacturing process and adhering to quality and occupational safety requirements.

This qualification will have a positive impact on society through the products produced (cement and lime). Furthermore, cement and lime plants and their associated quarries are often situated in rural areas, and have a direct and indirect impact on the economies of the towns and rural areas in the vicinity.

People credited with this qualification are able to:

- > Communicate and solve problems by applying mathematical practical applications in a variety of ways.
- > Adhere to occupational safety, health and environmental requirements.
- > Manufacture cement or lime in accordance with the relevant product and quality requirements, by means of applying relevant process technology.
- > Demonstrate knowledge and understanding of and compliance to quality management requirements in the cement or lime manufacturing process.
- > Coordinate work operations, lead teams and practise life skills within the cement or lime manufacturing context. □

Rationale:

The need for this qualification was identified by means of a number of processes and realities:

- > It was identified as one of the priority areas within the Mining and Minerals Sector by means of the Sector Skills Plan.
- > Employers within the Cement and Lime industry have consistently indicated that this is one of their greatest skills priorities and deem it as a critical need.
- > Rapid technological development has brought about the need for high-level operators capable of achieving world-class performance in a fully automated continuous process environment.
- > Quality standards for lime and particularly cement are stringent. As non-conforming products cannot be reworked; it is of vital importance to *maintain* standards rigidly, which requires competent process operators known as Burners.

This qualification will give recognition for the skills and competencies of process controllers, who up to now have been trained and developed on an informal basis only. The associated status of a nationally recognised qualification will serve as a motivation for high-level learners to enter the career of process controlling.

Current process operators, particularly, will benefit from the opportunities of assessment and subsequent recognition presented by RPL (Recognition of Prior Learning).

Learners entering this qualification will typically come from cement or lime manufacturing operations, working as Process Attendants, Operator Support or in support services such as Routine Testers in laboratories. In some cases learners can come from industries with similar materials handling processes and equipment (e.g. base metals). Learners from other industries would however have to become familiar with the cement or lime manufacturing materials, equipment and processes before they can proceed with this qualification.

Another potential source of Learners for the qualification is qualified artisans (e.g. Electricians, Fitters or Millwrights). There is a great deal of merit in multiskilling qualified artisans as process Operators.

This qualification prepares learners for possible appointment as Process Operators (Often called "Burners") in cement or lime manufacturing operations, controlling the entire manufacturing process by means of technologically advanced process control systems whereby minerals (limestone, silica, magnetite etc.) are processed (Manufactured) into final products (cement and lime respectively).

The process control function often called "Burning" is considered to be the "heart" of the cement/lime manufacturing industry due to the high level of investment in fixed plant, raw materials and processing costs involved. The contribution to the cement/lime manufacturing process and the associated potential losses due to non-conformance are enormous in terms of operating costs, occupational health and safety implications, impact on the environment, quality of product and potential waste due to non conforming product.

Cement and lime are both final products used in other industries for various purposes. Both these products play a vital role in the South African economy and even beyond our borders.

- > Lime is used in the gold refining, steel manufacturing, water purification and building and agricultural applications.
- > Cement *is* used in concrete, plaster, mortar, pipe manufacturing and various other applications in the building, construction, civil and other industries. Cement (as the main "ingredient" of concrete) is indispensable to the development of infrastructure such as roads, dams, bridges, hospitals and schools, all of which are vital in the various macro development initiatives.

#### **RECOGNIZE PREVIOUS LEARNING?**

Y

#### **LEARNING ASSUMED TO BE IN PLACE**

It is assumed that learners are already competent in:

- > Communication and Mathematical Literacy at NQF Level 3.  
The following unit standards:
- > Work in accordance with the Mine Health and Safety Act at NQF Level 3.
- > Operate materials handling plant at NQF Level 3.
- > Mill material in a dry process mill, utilising grinding materials at NQF Level 3.

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 above.

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.

Access to the qualification:

Access to this qualification is open bearing in mind learning assumed to be in place.

### **QUALIFICATION RULES**

Fundamentals

> All **56** credits are compulsory.

Core

> All **58** credits are compulsory.

Electives

> **56** credits must be chosen as specified below.

There are two specialisations possible:

> **A:** Cement Manufacturing.

> **B:** Lime Manufacturing.

For Specialization area A: Cement Manufacturing, the following unit standards (**45** credits) are to be achieved:

- > Title: Demonstrate knowledge of cement quality, NLRD No: **10476**, Level: **3**, Credits: **6**.
- > Title: Understanding cement process technology, NLRD No: **10462**, Level: **4**, Credits: **22**.
- > Title: Install and maintain refractory brickwork/blockwork, NLRD No: **13976**, Level: **3**, Credits: **12**.
- > Title: Install and maintain castable/mouldable refractory materials, NLRD No: **13975**, Level: **3**, Credits: **5**.
- > Total Credits: **45**.

For Specialization area B: Lime Manufacturing, the following unit standards (**45** credits) are to be achieved:

- > Title: Demonstrate knowledge of lime quality, NLRD No: **10479**, Level: **3**, Credits: **6**.
- > Title: Demonstrate an understanding of lime technology, NLRD No: **10464**, Level: **4**, Credits: **16**.
- > Title: Hydrate burnt lime by means of hydration plant, NLRD No: **10475**, Level: **4**, Credits: **23**.
- > Total Credits: **45**.

A total of **159** credits is required to obtain the qualification.

### **EXIT LEVEL OUTCOMES**

1. Communicate in the workplace.
2. Solve problems by applying mathematical practical applications in a variety of ways.
3. Adhere to occupational health, safety and environmental standards in the workplace.
4. Manufacture product using relevant process technology in accordance with quality requirements.
  - > Range: Product refers to cement or lime.
5. Demonstrate an understanding of quality management requirements and apply them in the manufacturing process.
6. Coordinate work operations and lead teams within the manufacturing context.
  - > Range: Manufacturing context refers to cement or lime.

Consistency of Exit Level Outcomes with Critical Crossfield Outcomes

The following CCFO's have been addressed in this qualification as per the unit standards outlined in the Annexure.

**SAQA** Critical Cross-Field Outcomes: Equivalent Exit Level Outcome

- > Identifying and solving problems in which responses display that responsible decisions using critical

thinking have been made.; ELOs 1, 2, 3, 4, 5.

- > Working effectively with others as a member of a team, group, organization and community.; ELOs 1; 2, 3; 4, 5.
- > Organising and managing oneself and one's activities responsibly and effectively: ELO's 1, 3, 5.
- > Collecting, analyzing, organizing and critically evaluating information.; ELOs 1, 3, 4.
- > Communicating effectively using visual, mathematical and/or language skills; ELOs 1, 4.
- > Using science and technology effectively and critically, showing responsibility toward the environment and health of others; ELOs 1, 3, 4, 5.
- > Demonstrating an understanding of the world as a set of related systems by recognizing that problem contexts do not exist in isolation; ELO 3, 4, 5, 6.
- > Contributing to the full personal development of each learner and the social and economic development of society at large, by making it an underlying intention of the programme of learning to make an individual aware of ; ELO's 1, 6.
  - > Reflecting on and exploring a variety of strategies to learn more effectively.
  - > Participating as responsible citizens in the life of local, national and global communities.
  - > Being culturally and aesthetically sensitive across a range of contexts.
  - > Exploring education and career opportunities.
  - > Developing entrepreneurial opportunities.

#### **ASSOCIATED ASSESSMENT CRITERIA**

1.

- > Oral communication is maintained and adapted as required to promote effective interaction in a work context.
- > Written communication is conducted at an appropriate level for designated target audiences.

2.

- > Mathematical principles and techniques are applied while performing the tasks in the operational context.
- > Problems and solutions are recorded and monitored for reoccurrence.

3.

- > Workplace Occupational Health, Safety, Hygiene and Environmental requirements are adhered to at all times as per workplace requirements.
- > Hazardous conditions are identified and explained in accordance with specified requirements.

4.

- > Materials handling plant is operated in accordance with manufacturing requirements.
- > Mills are operated to produce materials ground to the required degree of fineness and homogeneity.
- > Kiln conditions are monitored and adjusted in order to produce material of the required quality.
  - > Range: Material refers to burnt lime and clinker.
- > Equipment is operated in compliance with the relevant environmental standards and requirements.
- > Burnt Lime (Lime manufacturing), Clinker and Cement (Cement manufacturing) are manufactured in accordance with specified requirements.
- > The Burnt Lime, Clinker and Cement manufacturing processes are controlled in accordance with workplace specified requirements.

5.

- > Quality requirements are explained and adhered to in the manufacturing process in terms of:
  - > Raw materials quality.
  - > In-process materials quality.
  - > Finished product quality.
  - > Processes.
  - > Reporting and dealing with non conformances.
  - > Record keeping.
  - > Range: Manufacturing process refers to cement or lime.

6.

- > Inputs from relevant sources are evaluated and discussed in order to achieve objectives.
- > Activities of team members are co-ordinated in order to achieve individual and team work objectives

#### Integrated Assessment:

Integrated assessment at the level of the qualification provides an opportunity for learners to show they are able to integrate concepts, actions and ideas achieved across a range of unit standards and contexts.

Integrated assessment must evaluate the quality of observable performance as well as the thinking behind the performance, and must be based on a summative assessment guide. The guide will spell out how the assessor will assess different aspects of the performance and will include:

- > Observing the learner at work (both in the primary activity as well as other interactions).
- > Asking questions and initiating short discussions to test understanding.
- > Looking at records and reports in the portfolio and reviewing previous assessments.

In some cases interference will be necessary to determine competence depending on the nature and context within which performance takes place.

The learner may choose in which language s/he wants to be assessed. This should be established as part of a process of preparing the learner for assessment and familiarising the learner with the approach being taken.

While this is primarily a workplace-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit-level outcomes. The assessment process should cover both the explicit tasks required for the qualification as well as the understanding of the concepts and principles that underpin the activities associated with manufacturing cement or lime.

#### **INTERNATIONAL COMPARABILIN**

The manufacture of cement or lime occurs in a large number of countries world-wide. Therefore the countries chosen to benchmark this qualification against, were selected based on proven best practice within the field of cement or lime manufacture and those are New Zealand, Southern California and Arabian countries.

New Zealand: (<http://www.nzqa.govt.nz/nqfdocs/quals/doc/0474.doc>)

A relevant qualification - National Certificate in Minerals Processing was found. The following is an outline of the qualification with a broad range of electives.

#### Unit Standard Titles:

- > Suppress fire with hand extinguishers and fixed hose reels.
- > Operate a lime mill processing plant.
- > Manage first aid in an emergency situation.
- > Provide first aid.
- > Provide resuscitation level 2.
- > Protect health and safety in the workplace.
- > Lift and move a range of loads at an extractive site.
- > Communicate information in a specified workplace.
- > Facilitate a group and/or team to gather ideas and information.
- > Participate in groups and/or teams to make decisions.

Favorable comparisons were found in terms of Occupational Health and Safety. The unit standard outcomes in "Operate a lime mill processing plant" compares well to the unit standards in this FETC "Clear hot, dry blockages in a mineral process" and "Demonstrate knowledge of Lime quality".

The FETC Cement Lime Manufacturing compares favorably in terms of structure and levels, both being Level 4 qualifications; however the unit standards in the New Zealand qualification span varying levels while this FETC is on Level 3 and 4 unit standards.

Portland Cement Association (PCA) - Regional programs run in Southern California, the Midwest and Texas, and Georgia:

The following customised training courses were found:

- > Cement and Concrete Overview.

This course covers much technical ground and is specifically designed for those entering the cement industry from other technical fields.

The following is the outline of the program.

- > Develop an understanding of the cement manufacturing process and the concrete production process.
- > Learn about the different concrete markets.
- > Understand cement and concrete terminology.
- > View an economic snapshot of the cement industry.

> Kiln Process.

This course is designed to give learners a thorough understanding of cement manufacturing processes and enable them to make intelligent decisions affecting quality and production efficiency. Rather than focusing on the specifics of daily kiln operation, the sessions emphasize the much larger picture of how to maximize kiln efficiency.

- > Gain a thorough background in the theory of cement manufacturing.
- > Understand the interrelationships between quarry, blending processes, quality control, and environmental issues.
- > Learn ways to optimize the manufacturing process.
- > Participate in interactive workshops to discuss specific problems.
- > Composition requirements.
- > Quarry operation.
- > Fundamentals of heat recuperation.
- > Effects of composition of kiln charge.
- > Theory of clinkering.
- > Rings and build-ups.
- > Gas analyzers.
- > Optimization techniques.
- > Principles of microscopic analysis.
- > Clinker coolers.
- > Process control.
- > Refractories.

While similar elements of competence were found, similar qualifications were not found. The outcomes of these two training programmes match closely with the outcomes of the unit standards incorporated in this FETC Cement and Lime Manufacture.

Arab Union for Cement and Building Materials: (<http://www.aucbm.org/english/activiti/trains/trainshtm>)

Training courses are conducted in "Quality Control in Cement Production" at the training center of The Jordan Cement Factories Co and Qatar.

These are some courses conducted:

- > Controlling cement quality, raw materials and products.
- > Refractory lining in cement kilns.
- > Operating preheater kilns Total Quality Management & ISO 9 000.
- > Kiln Maintenance.
- > Cement Chemistry and Quality Control.

Here again, the outcomes are very similar to the outcomes within this FETC:

- > The course outcomes "Controlling cement quality, raw materials and products" compared well to the unit standard outcomes of "Demonstrate knowledge of cement quality" in this FETC.

Similarly, the courses offered in "Refractory lining in cement kilns, Operating pre-heater kilns, Total Quality Management & ISO 9 000, Kiln Maintenance, Cement Chemistry and Quality Control" compare closely to the outcomes of the following unit standards:

- > " Install gunite materials for refractory linings.
- > Install and maintain refractory brickwork/block work.
- > Hydrate burnt lime by means of hydration plant.
- > Demonstrate an understanding of the refractory materials, products and processes, Manufacture calcined products in a rotary kiln.
- > Burn carbonate material in a kiln.
- > Contribute to and improve on the operation of a quality assurance system.

- > Clear hot, dry blockages in a mineral process.
- > Demonstrate knowledge of cement quality.
- > Demonstrate knowledge of lime quality.
- > Control limestone material stockpile quality".

These entire units standard are used respectively in this FETC Cement and Lime Manufacturing.

Africa:

No relevant qualifications could be found in other Southern African countries, although all the major cement/lime companies in South Africa have factories in other Southern African countries. For development of this **FETC** there was representation from the various leading cement producers. Their training and development interventions occur countrywide and thus best practices have been incorporated in the development of this FETC.

In conclusion whilst this qualification does not compare to any international qualifications as a whole, there is a degree of comparison with the individual building blocks (unit standards) and programs of the countries compared with. This information was utilised wherever possible when developing the related Unit standards for this qualification, therefore ensuring that the learners will acquire competencies which can be applied in other external countries.

### **ARTICULATION OPTIONS**

This qualification allows for both vertical and horizontal articulation.

Vertical articulation exists with:

- > National Certificate: Process management in cement/lime **NQF** Level 5

Horizontal articulation exists between the two specialisation areas (cement and lime) or to other minerals processing applications such as base minerals, chrome and industrial minerals. E.g. FETC: Minerals Processing NLRD ID: 49042,49050,49051.

### **MODERATION OPTIONS**

> Anyone assessing a learner or moderating the assessment of a learner against the qualification must be registered as an assessor with the relevant Education, Training, Quality, Assurance (ETQA) Body, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

> Any institution offering learning that will enable the achievement of this qualification must be accredited as a provider with the relevant Education, Training, Quality, Assurance (ETQA) Body, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

> Assessment and moderation of assessment will be overseen by the relevant Education, Training, Quality, Assurance (ETQA) Body, or by an ETQA that has a Memorandum of Understanding with the relevant ETQA, according to the ETQA's policies and guidelines for assessment and moderation.

> Moderation must include both internal and external moderation of assessments, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described in the associated unit standards.

> Anyone wishing to be assessed against this qualification may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

### **CRITERIA FOR THE REGISTRATION OF ASSESSORS**

Assessors should be in possession of:

- > An appropriate qualification at or above the level of the qualification and preferably relevant workplace practical experience.
- > Registration as an assessor with the relevant ETQA.

### **NOTES**

Range: Carbonate materials refers to Cement or Lime.



**UNIT STANDARDS****(Note: A blank space after this line means that the qualification is not based on Unit Standards.)**

	<b>UNIT STANDARD ID AND TITLE</b>	<b>LEVEL</b>	<b>CREDITS</b>	<b>STATUS</b>
Core	<b>10457</b> Clear hot, dry material blockages in a mineral process	Level 3	4	Reregistered
core	<b>7117</b> Contribute to and improve on the operation of a quality assurance system	Level 4	6	Reregistered
Core	<b>10461</b> Manufacture calcined products in a rotary kiln	Level 4	36	Reregistered
core	<b>10981</b> Supervise work unit to achieve work unit objectives (individuals and teams)	Level 4	12	Reregistered
Elective	<b>10476</b> Demonstrate knowledge of Cement quality	Level 3	6	Reregistered
Elective	<b>10479</b> Demonstrate knowledge of lime quality	Level 3	6	Reregistered
Elective	<b>11454</b> Install ceramic fibre materials	Level 3	7	Registered
Elective	<b>13974</b> Demonstrate an understanding of the refractory materials, products and processes	Level 3	5	Reregistered
Elective	<b>13975</b> Install and maintain castable/mouldable refractory materials	Level 3	5	Reregistered
Elective	<b>13976</b> Install and maintain refractory brickwork/blockwork	Level 3	12	Reregistered
Elective	<b>13977</b> Install gunite materials for refractory linings	Level 3	10	Registered
Elective	<b>242751</b> Control limestone stockpile quality	Level 3	10	Draft - Prep for P Comment
Elective	<b>10462</b> Demonstrate an understanding of cement technology	Level 4	22	Reregistered
Elective	<b>10464</b> Demonstrate an understanding of lime technology	Level 4	16	Reregistered
Elective	<b>10475</b> Hydrate burnt lime by means of a lime hydration plant	Level 4	23	Reregistered
Elective	<b>13941</b> Apply the budget function in a business unit	Level 4	5	Reregistered
Elective	<b>120341</b> Conduct a Task Analysis and take appropriate action to address identified risks	Level 4	4	Registered
Elective	<b>242756</b> Burn carbonate material in a kiln	Level 4	36	Draft - Prep for P Comment
Fundamental	<b>119457</b> Interpret and use information from texts	Level 3	5	Registered
Fundamental	<b>119458</b> Analyse and respond to a variety of literary texts	Level 3	5	Registered
Fundamental	<b>119465</b> Write/present/sign texts for a range of communicative contexts	Level 3	5	Registered
Fundamental	<b>119472</b> Accommodate audience and context needs in oral/sign ed communication	Level 3	5	Registered
Fundamental	<b>7468</b> Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues	Level 4	6	Reregistered
Fundamental	<b>9015</b> Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems	Level 4	6	Reregistered
Fundamental	<b>9016</b> Represent analyse and calculate shape and motion in 2-and 3-dimensional space in different contexts	Level 4	4	Reregistered
Fundamental	<b>119459</b> Write/present/sign for a wide range of contexts	Level 4	5	Registered
Fundamental	<b>119462</b> Engage in sustained oral/sign ed communication and evaluate spoken/sign ed texts	Level 4	5	Registered
Fundamental	<b>119469</b> Read/view, analyse and respond to a variety of texts	Level 4	5	Registered
Fundamental	<b>119471</b> Use language and communication in occupational learning programmes	Level 4	5	Registered



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

1

*Control limestone stockpile quality*

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
242751	Control limestone stockpile quality		
<b>SGB NAME</b>		<b>ORGANISING FIELD ID</b>	<b>PROVIDER NAME</b>
SGB Mining and Minerals		6	
<b>UNIT STANDARD TYPE</b>		<b>ORGANISING FIELD DESCRIPTION</b>	<b>SUBFIELD DESCRIPTION</b>
Regular		Manufacturing, Engineering and Technology	Fabrication and Extraction
<b>ABET BAND</b>	<b>CREDITS</b>	<b>NQF LEVEL</b>	<b>UNIT STANDARD TYPE</b>
Undefined	10	Level 3	Regular

**SPECIFIC OUTCOME 1**

Demonstrate knowledge of components in limestone stockpiles, their individual qualities and combinations for specific products.

**SPECIFIC OUTCOME 2**

Prepare for production start up.

**SPECIFIC OUTCOME 3**

Perform on-line analysis of stockpile samples.

**SPECIFIC OUTCOME 4**

Control stockpile quality.



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

2

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
242756	Burn carbonate material in a kiln		
<b>SGB NAME</b>		<b>ORGANISING FIELD ID</b>	<b>PROVIDER NAME</b>
SGB Mining and Minerals		6	
<b>UNIT STANDARD TYPE</b>		<b>ORGANISING FIELD DESCRIPTION</b>	<b>SUBFIELD DESCRIPTION</b>
Regular		Manufacturing, Engineering and Technology	Fabrication and Extraction
<b>BET BAND</b>	<b>CREDITS</b>	<b>NQF LEVEL</b>	<b>UNIT STANDARD TYPE</b>
Undefined	36	Level 4	Regular

**SPECIFIC OUTCOME 1**

Demonstrate knowledge relating to the operation and operating principles of carbonate material burning kilns.

**SPECIFIC OUTCOME 2**

Prepare to start the kiln.

**SPECIFIC OUTCOME 3**

Start the kiln.

**SPECIFIC OUTCOME 4**

Operate the kiln.

**SPECIFIC OUTCOME 5**

Shut down the kiln.