

No. 1094

17 October 2008

**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

**Manufacturing and Assembly Processes**

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 Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at [www.saga.org.za](http://www.saga.org.za). Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and **no later than 17 November 2008**. All correspondence should be marked **Standards Setting SGB for Manufacturing and Assembly Processes** and addressed to

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## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**QUALIFICATION:**  
**National Certificate: Metals Production**

SAQA QUAL ID		QUALIFICATION TITLE	
64190		National Certificate: Metals Production	
ORIGINATOR		PROVIDER	
SGB Manufacturing and Assembly Processes			
QUALIFICATION TYPE	FIELD	SUBFIELD	
National Certificate	6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	120	Level 3	Regular-Unit Stds Based

**This qualification replaces:**

Qual ID	Qualification Title	NQF Level	Min Credits	Replacement Status
49019	National Certificate: Metals Production	Level 3	138	Will occur as soon as 64190 is registered

**PURPOSE AND RATIONALE OF THE QUALIFICATION****Purpose:**

This qualification is for any individual who is, or wishes to be, involved in a metals production environment and be able to perform a range of activities to operate and maintain process equipment for a particular process or operation within a specific metals production environment. Such processes or operations will include extracting, melting, refining, casting, rolling, shearing, forging and other metallurgical processes. In general, individuals at this level in the metal production environment will operate a furnace, casting machine or a converter among other process machines or equipment. These are large and complex machines which require training a learner over an extended period of time before s/he acquires sufficient competence to operate them. An individual acquiring this qualification will be able to contribute towards the smooth and efficient operation of the production processes in the metal production sector.

The core component contains generic competencies covering, inter alia:

- > Quality procedures.
- > Organisational procedures, health, safety and environmental procedures.
- > Preparation, setting-up and operating process equipment.
- > Performing first line maintenance.

These competencies will enable the learner to work in different industries within the diverse production sector.

The qualification ensures progression of learning, enabling the learner to perform optimally and provides access to a higher qualification within the same or a related sector. The qualification will facilitate access to, and mobility within, education and training for learners who:

- > Would like to achieve this qualification through the process of Recognition of Prior Learning (RPL) and/or formal study.
- > Wish to extend their range of skills and knowledge and hence their competencies in the metals production environment.

The qualification also focuses on the skills, knowledge, values and attitudes required to progress further. The intention is to:

- > Release the potential of people.
- > Provide opportunities for people to explore different but related activities within the metals production sector.

#### Rationale:

Metals production can be defined as the processing of raw materials into metal products, including value adding processes. The metals production sector constitutes the following industries - iron and steel, aluminium, platinum, chrome and zinc and is characterised by sophisticated processes. Companies within this sector operate in a global competitive and challenging environment. The products produced have to respond to a wide variety of customer requirements and safety, health, environmental, quality and risk management issues.

Typical learners will be persons who wish to become qualified operators in a metals production environment. Many of these will be persons currently operating in this environment who have not received any formal recognition for their skills and knowledge. Other learners will be those who have completed the National Certificate: Metals Production at NQF Level 2.

In terms of the learning pathway, this is the second in a series of three qualifications for anyone wishing to follow a career in a ferrous or non-ferrous metals production working environment, in a variety of contexts. The qualification will allow this learner to progress to the level of a process controller in a metal production environment by completing the National Certificate: Metals Production at NQF Level 4.

South Africa has a very extensive and highly developed metals production sector. This sector employs a large number of people, is well-established and economically powerful. In terms of transformation in the country, learners will require skills and competencies to gain access to positions within management structures by completing other Qualifications and training. It will be in the interest of the country and the sector to ensure that those who operate in the metals production environment are trained according to this Qualification to improve productivity and efficiency.

This national Qualification and its related unit standards were developed to standardise the accreditation of learning programmes, resulting in improved quality management in terms of programme delivery.

This National Certificate: Metal Production at NQF Level 3 supports the objectives of the NQF in that it gives the learner access to a registered qualification. It will ensure that the quality of education and training in the sub-field is enhanced and of a world-class standard. The qualification will allow learners to benchmark their competencies against international standards.

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

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#### **LEARNING ASSUMED IN PLACE**

Learners wishing to study towards this qualification are assumed to have:

- > Mathematical literacy at NQF Level 2.

- > Communication at to NQF Level 2.
- > Natural Science at NQF Level 2 or equivalent.
- > Computer Literacy.

#### Recognition of Prior Learning:

This Qualification may be achieved in part (or whole) through the recognition of relevant prior knowledge and/or experience. The learner must be able to demonstrate competence in the knowledge, skills, values and attitudes implicit in this Qualification. As part of the provision of recognition of prior learning providers are required to develop a structured means for the assessment of individual learners against the Unit Standards of the Qualification on a case-by-case basis. A range of assessment tools and techniques during formative and summative assessment procedures should be used which have been jointly decided upon by the learner and the assessor. Such procedures, and the assessment of individual cases, are subject to moderation by independent assessors. The same principles that apply to assessment of this Qualification also apply to recognition of prior learning.

Learners may provide evidence of prior learning for which they may receive credit towards the Unit Standards and/or the Qualification by means of portfolios or other forms of appropriate evidence as agreed to between the relevant provider and relevant ETQA or ETQA that has a Memorandum of Understanding in place with the relevant ETQA.

RPL is particularly important, as there are people in the metal production sector with a variety of skills and competencies of differing quality and scope. It is important that an RPL process be available to assist in making sense of existing competencies and skills, and helping to standardise these competencies and skills towards a common standard.

#### Access to the Qualification:

There is an open access to this qualification, keeping in mind the "Learning Assumed to be in Place". It is preferable for a learner to have completed the National Certificate: Metal Production at NQF Level 2.

#### **QUALIFICATION RULES**

The Qualification consists of a Fundamental, a Core and an Elective Component. To be awarded the Qualification learners are required to obtain 120 credits as detailed below.

#### Fundamental Component:

The Fundamental Component consists of Unit Standards in:

- > Mathematical Literacy at NQF Level 3 to the value of 16 credits.
- > Communication at NQF Level 3 to the value of 20 credits.

All Unit Standards in the Fundamental Component are compulsory.

#### Core Component:

The Core Component consists of Unit Standards to the value of 61 credits all of which are compulsory.

#### Elective Component:

The Elective Component consists of two specialisation areas, each with its own set of Unit Standards. Learners are to choose one specialisation and choose Elective Unit Standards

totalling a minimum of 23 credits from the Unit standards listed under that specialisation area so as to attain a minimum of 120 credits for this Qualification.

**Specialisation Area 1: Metal Production: (Manufacturing, Engineering and Related Industries):**

Learners must choose Elective Unit Standards from the list below to give a minimum of 23 credits for the Elective Component:

- > ID 116720: Show understanding of diversity in the workplace - Level 3, 3 Credits.
- > ID 8038: Operate lift trucks - Level 3, 6 Credits.
- > ID 8039: Operate cranes, Level 3, 10 Credits.
- > ID 12456: Explain and use organisational procedure - Level 3, 6 Credits.
- > ID 9530: Manage work time effectively - Level 3, 3 Credits.
- > ID 13234: Apply quality procedures - Level 3, 3 Credits.
- > ID 116534: Carry out basic first aid treatment in the workplace - Level 3, 2 Credits.
- > ID 120329: Respond to, implement and manage emergencies according to an emergency action plan in a workplace - Level 3, 2 Credits.
- > ID 253656: Communicate with clients - Level 3, 3 Credits.

Total Number of Credits for Metal Production Electives: 38

**Specialisation Area 2: Mining and Minerals:**

Learners must choose Elective Unit Standards from the list below to give a minimum of 23 credits for the Elective Component:

- > ID 8039: Operate cranes - Level 3, 10 Credits.
- > ID 12456: Explain and use organisational procedure - Level 3, 6 Credits.
- > ID 9530: Manage work time effectively - Level 3, 3 Credits.
- > ID 13234: Apply quality procedures - Level 3, 3 Credits.
- > ID 116534: Carry out basic first aid treatment in the workplace - Level 3, 2 Credits.
- > ID 120329: Respond to, implement and manage emergencies according to an emergency action plan in a workplace - Level 3, 2 Credits.
- > ID 259698: Control slag magnetite content in a vertical converter - Level 3, 7 Credits.
- > ID 259727: Install electrode casings of an arc furnace. - Level 3, 12 Credits.
- > ID 259726: Pulverise Material by means of a Vertical Ball Type Pulveriser - Level 3, 10 Credits.
- > ID 259738: Control slipping and baking of electrodes in an electric arc furnace - Level 3, 14 Credits.
- > ID 259699: Shut down a furnace for maintenance - Level 3, 10 Credits.
- > ID 259689: Remove impurities from molten metal by means of a converting process - Level 3, 10 Credits.
- > ID 259718: Load a charge exceeding 10 tons into an electric arc furnace - Level 3, 7 Credits.

Total Number of Credits for Mining and Minerals Electives: 96.

**EXIT LEVEL OUTCOMES**

1. Prepare, set-up and operate process equipment for metals production processes.
2. Monitor the performance of process equipment.
3. Select and apply appropriate procedures to solve problems within metals production process environment.
4. Perform first line process maintenance to maintain efficiency.

**Outcome Note:**

> First line maintenance is performed at this level while minor maintenance is performed at NQF Level 2. First line maintenance is performed by operators not qualified as artisans.

5. Communicate with roleplayers in the production process.

**Critical Cross-Field Outcomes:**

Identify and solve problems in which responses display that responsible decisions using critical and creative thinking have been made when:

- > Reporting problems beyond scope of practice to control and/or maintenance personnel.
- > Monitoring equipment and making relevant adjustments.
- > Referring repairs/maintenance to specialists.
- > Engaging with process-related problems.

Work effectively with others as a member of a team, group, organisation, community to:

- > Ensure that production process equipment runs smoothly and efficiently.
- > Ensure that the safety of all personnel and equipment is maintained.
- > Ensure that repairs/maintenance is carried out quickly and efficiently.

Organise and manage oneself and one's activities responsively and effectively when:

- > Interpreting production schedules.
- > Planning the set-up equipment.
- > Setting-up and operating the equipment.
- > Checking equipment during operation.
- > Repairing/maintaining equipment.

Collect, analyse, organise and critically evaluate information to:

- > Solve problems by making adjustments.
- > Deal with changes and deviations.
- > Repair equipment.
- > Refer the problem to supervisors.

Communicate effectively using visual, mathematical and/or language skills in the modes of oral and/or written presentation to:

- > Ensure the efficient functioning of the production process equipment.
- > Prepare reporting documents.

Use science and technology effectively and critically, showing responsibility towards the environment and the health of others by:

- > Using the equipment according to manufacturer's instructions and standard operating procedure.
- > Repairing/maintaining equipment according to manufacturer's instructions.

**ASSOCIATED ASSESSMENT CRITERIA**

Associated Assessment Criteria for Exit Level Outcome 1:

- > Process equipment is set-up according to equipment specifications and production requirements.

- > Process equipment availability and readiness for metals production processes is checked and maintained to ensure efficient production.
- > Process equipment is operated and monitored according to production requirements.
- > A clean and safe work area is maintained to minimise risk to health.
- > Safety, health, environmental, quality and risk management policies and procedures are applied and maintained to ensure worker and workplace safety.
- > Basic mathematical principles and techniques are applied while performing the tasks related to metals production activities.
- > Oral and written communication is maintained and adapted as required to promote effective interaction in a metals production context.

#### Associated Assessment Criteria for Exit Level Outcome 2:

- > Equipment is monitored to detect deviations from the norm.
- > Problems at set-up and during operations are observed and addressed so that there is no negative impact on production.
- > Control mechanisms are applied to ensure quality of the product within the production environment.
- > Adjustments or changes are made as and when the need arises, within defined parameters, to eliminate deviations.
- > Work is performed in a manner that protects equipment or components from damage so that the quality of the product is not compromised.
- > Quality, safety and environmental procedures are applied to maintain safety standards.
- > Instruments are used and cared for according to manufacturer's requirements and standard operating procedure.

#### Associated Assessment Criteria for Exit Level Outcome 3:

- > Problems are identified and assessed so that the relevant steps can be taken to solve the problem.
- > Appropriate procedures are selected and applied to solve problems within area of expertise in an efficient and effective manner.
- > Mathematical calculations are utilised for the solution of common operational problems.
- > Unfamiliar problems are reported to appropriate personnel to take action as per procedure.

#### Associated Assessment Criteria for Exit Level Outcome 4:

- > First line maintenance is performed regularly and consistently on process equipment.
- > Relevant procedures are used to perform maintenance.
- > Process agents are applied according to equipment specifications.
- > Health and safety requirements are complied with in the performance of first line maintenance.

#### Associated Assessment Criteria for Exit Level Outcome 5:

- > Information is gathered from a range of sources and accurately summarised, interpreted, recorded and reported in an appropriate and timely manner to relevant parties.
- > Production issues in work area are discussed and resolved on a regular basis with other team members, internal customers and supervisors/management.

#### Integrated Assessment:

The importance of integrated assessment is to confirm that the learner is able to demonstrate applied competence (practical, foundational and reflexive) and ensure that the purpose of this Qualification is achieved. Both formative and summative assessment methods and strategies are used to ensure that the Exit Level Outcomes and the purpose of the Qualification are

achieved through achieving the Unit Standards. Learning, teaching and assessment are inextricably linked.

Learning and assessment should be integrated and assessment practices must be fair, transparent, valid and reliable. A variety of assessment strategies and approaches must be used. This could include tests, assignments, projects, demonstrations and/or any applicable method. Evidence of the acquisition of competencies must be demonstrated through the Unit Standards, which enhance the integration of theory and practice as deemed appropriate at this level.

Formative assessment is an on-going process which is used to assess the efficacy of the teaching and learning process. It is used to plan appropriate learning experiences to meet the learner's needs. Formative assessments can include a mix of simulated and actual (real) practice or authentic settings. Feedback from assessment informs both teaching and learning. If the learner has met the assessment criteria of all the Unit Standards then s/he has achieved the Exit Level Outcomes of the Qualification.

Summative assessment is concerned with the judgement of the learning in relation to the Exit Level Outcomes of the Qualification. Such judgement must include integrated assessment(s) which test the learners' ability to integrate the larger body of knowledge, skills and attitudes, which are represented by the Exit Level Outcomes. Summative assessment can take the form of oral, written and practical examinations as agreed to by the relevant ETQA.

Integrated assessment must be designed to achieve the following:

- > An integration of the achievement of the Exit Level Outcomes in a way that reflects a comprehensive approach to learning and shows that the purpose of the Qualification has been achieved.
- > Judgement of learner performance to provide evidence of applied competence or capability.

Assessors and moderators should make use of a range of formative and summative assessment methods. Assessors should assess and give credit for the evidence of learning that has already been acquired through formal, informal and non-formal learning and work experience.

Assessment should ensure that all specific outcomes, embedded knowledge and critical cross-field outcomes are assessed. The assessment of the critical cross-field outcomes should be integrated with the assessment of specific outcomes and embedded knowledge.

### **INTERNATIONAL COMPARABILITY**

This is the second in a series of three qualifications. In terms of the learning pathway, a learner has the opportunity to start at Level 2 and progress to Level 4 in the Metal Production environment. Hence, there is a slight overlap in terms of the competencies between the three qualifications; competencies acquired at Level 2 are used as a foundation to acquire other competencies at Level 3 and competencies acquired at Level 3 form the foundation for competencies at Level 4. It follows that the international comparability also reflects the overlap of the competencies.

The following competencies are addressed by this qualification:

- > Prepare, set-up and operate process equipment for metals production processes.
- > Monitor the performance of process equipment.
- > Select and apply appropriate procedures to solve problems within metals production process environment.
- > Perform first line process maintenance to maintain efficiency.
- > Communicate with roleplayers in the production process.



The following countries were chosen primarily for two reasons:

1. They are significant metal producing countries. and/or
2. They have a substantial number of providers for this type of training.

These are:

- > The United Kingdom.
- > India.
- > The United States.
- > Canada.
- > Zambia.
- > China and Japan.
- > New Zealand.
- > Australia.

It must be noted that although India, for instance, is a significant metal producer, information on the training is severely limited. The websites of Nigeria, Ghana, Angola, Botswana and Tunisia were checked, to no avail in terms of comparability purposes.

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United Kingdom:

Oxford Cambridge RSA Qualification Examination:

The Manufacturing and Product Design (Level 2) qualification of the Oxford Cambridge RSA Qualification Examination in the United Kingdom is also to be implemented in 2009. Its draft unit titles - which constitute the principal learning - have resonance with the competencies of the South African Level 3 qualification in Metal Production. Although the UK qualification is focussed on product design and is located primarily in the manufacturing environment, there are many generic competencies that can be drawn upon for comparison purposes. In fact, manufacturing and production are closely related but not identical.

The draft unit titles are:

- > Running a manufacturing business.
- > Manufacturing in a global business world.
- > Working in manufacturing.
- > Designing and developing products for manufacture.
- > Manufacturing: Applied Materials Science.
- > Processing systems used in manufacturing.
- > Product manufacture.

Assessment and Qualification Alliance (AQA) and City & Guilds:

Assessment and Qualification Alliance (AQA) is the UK's main provider of GCSEs and A levels. City & Guilds is well-known for vocational qualifications. It works closely with employers and industry bodies to ensure that its qualifications provide the benchmark standard for workplace skills and knowledge.

The collaboration between AQA and C&G brings together the providers of qualifications in both fields to provide all the support needed to deliver them at one point of contact.

AQA and C&G offer the Foundation Diploma in Engineering at Level 1 in the UK. As part of this course they offer a unit on 'Routine maintenance operations' which is offered in this qualification at NQF Level 3.

The purpose of this unit is to introduce learners to routine maintenance operations. Learners will understand the importance of ensuring that equipment and systems operate correctly to specification. The unit has a practical focus and learners will perform basic maintenance routines and fault-finding tasks which require the use of simple hand tools, measuring equipment, product information and reporting documentation.

#### Learning Outcomes:

The learner will:

- > Be able to interpret and use technical terms, measurements and data relating to routine engineering maintenance procedures.
- > Understand the hazards and risks associated with maintenance, and be able to work responsibly and report Health and Safety issues.
- > Be able to select and use appropriate engineering tools, equipment and materials used to carry out routine maintenance procedures.
- > Know how to complete documents and records for procedure undertaken.

#### Assessment Criteria:

##### 1. Routine engineering maintenance procedures and accessing data.

> The learner can:

- a. Describe and carry out the various examination procedures.
- b. Use technical terms, data and measurements relating to engineering maintenance.
- c. Describe how to find, interpret and use sources of technical information.
- d. Use technical information, including drawings and manuals, to support all maintenance activities.

##### 2. Hazards and risks associated with maintenance activities.

> The learner can:

- a. Describe legal duties and their responsibility for Health and Safety.
- b. Report Health and Safety matters promptly and to the relevant person:
  - i Identifying any hazards that may exist in a workplace.
  - ii Describing safe working practices, realising the need for safe personal conduct.
- c. Demonstrate the skill to work safely, including the use of personal protective equipment (PPE).

##### 3. Carrying out maintenance operations.

> The learner can:

- a. Select and use correct tools, equipment and materials safely and correctly when carrying out engineering maintenance operations such as measurement, inspection, adjustment, assembly and disassembly.
- b. Investigate causes of failure.

##### 4. Documenting maintenance procedures.

The learner can:

- a. Explain the importance of documenting maintenance operations (EP2).
- b. Plan and record maintenance procedures.

Another relevant unit of learning is entitled 'Producing engineering solutions', again bearing in mind the relationship between manufacturing and production as understood in the context of this qualification.

The purpose of this unit is to provide learners with first hand practical experience of planning and producing engineering solutions whilst ensuring that Health, Safety and quality standards are applied throughout the process. Learners will use hand, machine and computer controlled methods of manufacture. These methods are particularly important to environments such as production, maintenance etc. The Engineering sector also recognises the significance of preparing and following a production plan for both planning and quality assurance processes.

Learning Outcomes:

The learner will:

1. Be able to plan and prepare engineering solutions.
2. Be able to use tools and equipment, and select parts, materials and components to achieve the solutions.
3. Know the Health and Safety and quality standards, and be able to apply them in the context of the process required for the solutions.

Assessment criteria - Those relevant to the qualification:

1. Use tools and equipment, and select parts, materials and components to achieve the solutions.

> The learner can:

- a. State the functions of parts and components including:

- i Mechanical.
- ii Pneumatic/hydraulic.
- iii Electrical/electronic.

- b. Specify and use tools and equipment:

- i Hand tools for fabrication and assembly.
- ii Machine tools for shaping or cutting.
- iii Test equipment for fault-finding or ensuring quality.

- c. Select and use materials, parts and components, working with a range of engineering materials.

- d. Use a system to produce a single item which matches a product specification.

2. Apply Health and Safety and quality standards in the context of the process required for the solutions.

> The learner can:

- a. Apply Health and Safety procedures by:

- i Selecting suitable clothing and personal protective equipment (PPE) as necessary.
- ii Completing processes in accordance with risk assessments (SM4).

- b. Carry out quality checks by applying standards and specifying the use of test and measurement equipment.

- c. Evaluate the process of producing engineering solutions to inform future progress.

National Standards Developed by Specialist Bodies:

A variety of national standards developed by sector skills authorities in the United Kingdom has relevance for aspects of this qualification. Some of these bodies are Metal Processing and Allied operations (Metals Industry Skills & Performance Ltd), Chemical, Pharmaceutical and Petro-Chemicals Operations (Cogent) and others.

Unit Title: Contribute to the maintenance of plant and equipment:

This unit is about the care and effective operation of plant and equipment in order to minimise machine down time and facilitate optimum production. It covers preparing for the maintenance of plant and equipment and undertaking maintenance of plant and equipment. Working safely, in the optimum time, using correct tools, equipment and materials, and carrying out maintenance in accordance with statutory and organisational procedures are essential features of this unit.

This unit contains two elements:

- > Prepare for the maintenance of plant and equipment.
- > Undertake maintenance of plant and equipment.

Unit Title: Operate plant and equipment for heating:

This unit is about heating metals to the required temperature and controlling the temperature for a specified duration. This involves ensuring:

- > You monitor the equipment throughout the process, taking appropriate action when required.
- > You maintain the correct temperature and residence times.
- > You maintain stock identity.

You may find this unit a suitable choice if you are working with reheating furnaces, soaking pits and batch and continuous annealing processes.

This unit contains two elements:

- > Operate plant and equipment for heating.
- > Heat metals to schedule.

Unit Title: Heat Treating Materials for Manufacturing Activities:

This unit identifies the competences you need to heat treat ferrous and non-ferrous materials, in order to assist with the manufacturing activities, in accordance with approved procedures. You will be required to access the appropriate heat treatment specifications, check that these are of the latest issue and extract all necessary information in order to carry out the heat treatment operations. You will be required to check that all necessary preparations to the base materials have been carried out (such as cleaning, degreasing, masking, jigging techniques and other appropriate preparations). You will be expected to prepare and adjust the heat treatment equipment to give the required results. You will be expected to identify any heat treatment defects, and carry out the necessary actions and adjustments to the heat treatment process in order to correct them. You will need to ensure appropriate tests are carried out on the materials to ensure the heat treatment meets the specification requirements.

The heat treatment processes will include hardening, carburising, tempering, annealing and normalising/stress relieving, and can be applied to raw materials used in manufacturing, manufactured components or structures.

Unit Title: Melting Metal for Casting:

This unit identifies the competences you need to prepare and process the materials and metal used in the production of molten metal to cast moulds and shells. Manual and mechanised methods will be used, in accordance with approved procedures. You will be required to select the appropriate equipment to use, based on the type and amount of molten metal needed. Single, batch and continuous production methods for the metal are included in this unit, which also covers both ferrous and/or non-ferrous alloys.

Unit Title: Prepare for heating:

This unit is about Preparing for heating to ensure the heating plant and equipment are ready to perform in an optimum manner. This involves ensuring:

- > That you receive and check incoming stock.
- > That discrepancies and defects are correctly dealt with.
- > You set up plant and equipment correctly.
- > Damaged and malfunctioning plant and equipment are dealt with.

You may find this unit a suitable choice if you are working with reheating furnaces, soaking pits and batch and continuous annealing processes.

This unit contains two elements:

- > Select and transfer stock for heating.
- > Prepare plant and equipment for heating.
- > Aspects of this unit are also at Level 2 of the Metal Production Qualification.

Unit Title: Achieve product specification by adjusting process parameters:

This unit is for those working on the manufacture of metal products and covers set-up, monitoring and checking of machinery and equipment in line with production specifications. You must demonstrate competence in setting up machinery and equipment accurately, evaluating the design under production conditions, identifying possible discrepancies, and testing and checking that products meet specifications.

This unit contains two elements:

- > Set up machinery and equipment to produce prototype product.
- > Monitor, evaluate and adjust the processing parameters to achieve product specification.

An individual doing the Level 4 Metal Production Qualification will also require these competencies.

Unit Title: Carry out complex manual operations:

This unit covers the skills and knowledge you need to produce process outcomes by carrying out complex manual operations. It is suitable for process industries personnel who have responsibility for complex manual operations at any stage of the process, including complex manual packaging.

This involves:

- > Interpreting specifications and setting up equipment accordingly.
- > Operating and responding to problems with equipment.
- > Monitoring the operation and taking steps to deal with problems so that an optimum outcome is achieved.
- > Making sure that equipment is left in a suitable state after use.
- > Keeping records.

This unit is suitable for process industries personnel who have responsibility for complex manual operations at any stage of the process, including complex manual packaging.

There are three elements in this unit, each of which has performance standards, a scope section specific to each element, and the associated knowledge base is detailed at the end of the unit:

- > Prepare for complex manual process operations.
- > Control the outcomes of complex manual operations.
- > Restore the manual process equipment and work area after use.

Unit Title: Cast metals:

This unit is about Casting metals to meet customer specification. This involves ensuring:

- > You operate plant and equipment correctly.
- > You monitor the process.
- > You correctly finish the casting operation.
- > That you follow the correct procedures for additions and sampling.
- > That you achieve the production schedule.

You may find this unit a suitable choice if you are working in continuous casting plants, ingot teeming plant and foundries.

This unit contains two elements:

- > Operate plant and equipment during casting.
- > Cast metals to schedule.

Unit Title: Configure processing equipment:

This unit is about configuring processing equipment according to given procedures. The processing equipment may be for continuous or batch production and should include ancillary equipment. Configuring process equipment may involve, for example, mounting moulds or extrusion dies.

This involves:

- > Safely and effectively removing the forming tool and ancillary equipment, making sure that all services and connections are disconnected before starting work.
- > Mounting, aligning and configuring the new forming tool to meet production requirements.
- > Connecting and integrating ancillary equipment.
- > Connecting the services required for the process operation.
- > Setting the process parameters to achieve efficient and effective processing of materials.
- > Carrying out safety checks both before, during and after handover of the equipment.
- > Following prescribed procedures for handing over the equipment.
- > Identifying and taking appropriate actions to deal with potential hazards at all stages of the configuration and handover process.

1. Providing others with the information required to ensure that configuration is completed safely, effectively and within the specified timescale.

India:

India is a substantial producer of metals mainly steel. While websites for the many Indian steel companies provide much information, unlike in the UK they contain very little information on the kind of training and the respective levels at which the training takes.

The following information - Pertinent to this qualification was obtained from the website of the National Institute of Secondary Steel Technology in India. Seminars/Workshops/Training/In-house Programmes are held on the following aspects:

Details of Seminars/Workshops/Training/In-house Programmes:

- > Reheating Furnace Operation.
- > Heat Treatment.
- > 8 modules Training programme on Melting & Casting covering Induction Furnace.
- > Improving efficiency of reheating furnace.
- > Energy optimisation of reheating furnace.
- > Casting Method, Casting Technique etc. - Role of Computer.
- > Reheating Furnace Optimisation.
- > Safety Awareness in Secondary Steel Sector - Four days.
- > Forging of Steel.
- > Blast Furnace Steelmaking.
- > Sponge Iron Making.
- > Safety for Industrial Handling.

The Bhilai Steel Plant, one of India's biggest steel producers does provide training as illustrate in a report on one of its plants. The training involved the operation of ore handling plant, the blast furnace (raw material section and furnace section) and all requirements to produce steel.

The United States:

According to the websites of the American Iron and Steel Institute the education and training you need to work in the steel industry depends on the kind of job you want. Some companies prefer to hire high school or vocational school graduates for processing jobs. Most training is done on the job, however. Usually, workers start in unskilled jobs and learn by helping experienced workers. It takes up to four years to learn some of the most highly skilled jobs, such as those of blowers or rollers, but you may have to wait much longer for an opening in one of these positions. Steel companies often encourage their employees to take courses in subjects such as chemistry, physics, or metallurgy to upgrade their skills.

To qualify for one of the maintenance trades such as those of machinists, millwrights, or pipe fitters, you usually have to serve a three- to four-year apprenticeship. Generally, apprentices are chosen from among high school or vocational school graduates already employed in the plant. To qualify for a job as an administrator or engineer, you usually need a bachelor's degree in the appropriate field. New professional employees often go through a formal training period in the plant before they are fully qualified.

Advancement in plant jobs in the steel industry usually follows a set pattern. For example, a worker may start as a laborer and become a second helper, a first helper, and then a keeper before advancing to a job as a blast furnace blower. Companies usually consider such factors as experience and leadership ability when promoting workers into positions that require the supervision of other workers.

The website of the United Steelworkers of America does not have any information regarding training in metals production at these levels.

Canada:

According to the Human Resources and Social Development Canada, in the primary metal industry most training is done on the job and does not involve the acquisition of formal certifiable skills. In recent years the steel division has made a major effort to increase levels of literacy and numeracy among its personnel. Much of this has been done through the Canadian Steel Trade and Employment Congress (CSTEC) which has developed a wide range of programs offered through secondary schools, community colleges, CEGEP's and, in some cases, through universities. CSTEC has also developed a distance learning initiative to teach basic skills. The levels at which training is done remains unspecified.

While on-the-job training is the most common form of training in the primary metal industry, training is becoming increasingly formalised through the work of CSTECH. CSTECH has begun to develop standardised job descriptions for basic occupations in the industry and to design training packages in basic steel making practice.

#### Zambia:

Zambia is the world's largest producer of copper. However, not much information is available on training in metal production in that country. The only information on training pertains to the copper smelter, which is a large piece of equipment, similar to the equipment used in other metal production environments.

Xstrata Technology commissioned the new ISASMELT<sub>2</sub> plant with Mopani Copper Mines during 2006. The plant is located at the Mufulira copper smelter in Zambia's copper belt, close to the border to Congo. In terms of XT's multi-faceted approach to technology transfer, Mopani staff trained at the Mount Isa copper smelter for over 3 months prior to startup of the plant, while Xstrata personnel with many years of operating experience on various smelters assisted with the pre-operational training and hot commissioning of the plant in Mufulira. Key process personnel remained on site for an extended period to assist with ramp up of the plant and provide comprehensive training for Mopani operations staff.

#### China and Japan:

China is one of the world's biggest metals producers. Japan is a producer of steel. However, an intense internet search proved futile in terms of locating and obtaining information about training within the metal production at this level. In Japan, a search of the following steel producing companies yielded no results: Itoshu Corporation and Nippon Steel Corporation, the second largest steel producer in the world.

#### New Zealand:

The following Qualification is registered on the New Zealand Qualification Framework. It is the National Certificate in Steel Manufacturing at Level 3 with strands in Electric Arc Furnace (EAF) and Oxygen Bodenblasten Maxhutte Process (OBM). Although this Qualification is focussed on steel manufacturing, many of the competencies resonate with the Level 3 Qualification in Metal Production.

In addition, the following Unit Standards are relevant to the competencies that will be acquired through this Qualification.

#### Standard Title: Discharge iron making kiln products:

> People credited with this unit standard are able to: Discharge reduced primary concentrate and char (RPCC); remove accretions from the RPCC discharge; and operate the RPCC recovery system.

#### Standard Title: Monitor and adjust iron making kilns:

> People credited with this unit standard are able to: Monitor plant performance; carry out hands-on operations; and provide samples for analysis.

#### Standard Title: Prepare raw materials for iron making:

> People credited with this standard are able to: De-water primary concentrate (PC); stack and blend raw materials; reclaim and convey primary concentrate and coal; and provide samples for analysis.



Standard Title: Demonstrate knowledge of basic oxygen furnace steelmaking:

> People credited with this unit standard are able to describe: Basic oxygen furnaces; basic oxygen furnace processes; and the measurement of performance of basic oxygen furnaces.

Standard Title: Demonstrate knowledge of cold working and forming of steel:

> People credited with this unit standard are able to describe: Cold working and forming equipment; cold working and forming processes; and the measurement of performance of cold working and forming.

Standard Title: Demonstrate knowledge of continuous casting of steel:

> Learners credited with this unit standard are able to describe: Continuous casting; continuous casting processes; and the measurement of performance of continuous casting.

Standard Title: Demonstrate knowledge of electric arc furnace steelmaking:

> People credited with this unit standard are able to describe: electric arc furnaces; electric arc furnace processes; and the measurement of performance of electric arc furnaces.

Standard Title: Demonstrate knowledge of hot rolling of steel:

> People credited with this unit standard are able to describe: hot rolling equipment; the hot rolling process; and the measurement of performance of hot rolling.

Standard Title: Demonstrate knowledge of ironmaking melters:

> Learners credited with this unit standard are able to describe: ironmaking melters; ironmaking melter processes; and the measurement of performance of the ironmaking melters.

Standard Title: Demonstrate knowledge of ladle furnace steelmaking:

> People credited with this unit standard are able to describe: ladle furnaces; ladle furnace processes; and the measurement of performance of ladle furnaces.

Standard Title: Demonstrate knowledge of the coating of steel products:

> Learners credited with this standard are able to describe: steel coating equipment; coating processes; and the measurement of performance in steel coating.

Standard Title: Mechanically test metals:

> People credited with this unit standard are able to select and apply mechanical tests to samples, and record and report test data.

Australia:

The following information has been taken from the National Training Information Service (NTIS) of Australia.

The following standards are relevant to this Qualification.

MEM04001B - Operate melting furnaces:

> This unit applies to the operation of singular or multi, coke, oil, gas fired or electric furnaces, the melting of a range of metals, and operational maintenance. Furnaces would primarily be used for continuous or staged bulk melting/smelting of metals, holding of hot liquids, or the melting of metals for production processes e.g. casting/moulding, galvanising, etc.

MEM03001B - Perform manual production assembly:

> This unit applies to production-orientated assembly operations that are essentially manual in nature and do not require complex adjustments.

MEM07001B - Perform operational maintenance of machines/equipment:

> This unit mainly applies in a manufacturing setting, where routine programmed operational maintenance to machines/equipment is required. It is not intended to be used where higher level maintenance activities are performed. Machines/equipment range includes manual, semi-automatic and automatic machines of a stand-alone continuous production or process nature.

MEM04007B - Pour molten metal:

> This unit applies to the manual pouring of molten metal as part of metal casting and moulding processes.

MEM13004B - Work safely with molten metals/glass.

In conclusion, a Qualification identical to this one could not be found, although there is the Level 3 New Zealand Qualification in Steel Manufacturing. At this level most countries seem to offer skills programmes. This Qualification is far more comprehensive in terms of the competencies it offers.

### **ARTICULATION OPTIONS**

This Qualification lends itself to both vertical and horizontal articulation possibilities.

Horizontal articulation is possible with the following Qualifications:

- > ID 58785: National Certificate: Production Technology at NQF Level 3.
- > ID 62769: National Certificate: Mineral Processing at NQF Level 3.

Vertical articulation is possible with the following qualifications:

- > ID 64209: Further Education and Training Certificate: Metals Production at NQF Level 4.
- > ID 58779: Further Education and Training Certificate: Production Technology at NQF Level 4.
- > ID 62769: National Certificate: Mineral Processing at NQF Level 4.

### **MODERATION OPTIONS**

> Anyone assessing a learner or moderating the assessment of a learner against this Qualification must be registered as an assessor with the relevant Education, Training, Quality, and Assurance (ETQA) Body.

> Any institution offering learning that will enable the achievement of this Qualification must be accredited as a provider with the relevant ETQA.

> Assessment and moderation of assessment will be overseen by the relevant ETQA according to the ETQA's policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQA's (including professional bodies); and in terms of the moderation guideline detailed immediately below.

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

competence described in the Qualification and will include competence within core sales and the elective standards relevant to the economic sector.

> 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

For an applicant to register as an assessor, the applicant needs:

- > A minimum of 2 (two) years' practical, relevant occupational experience.
- > A relevant Qualification at NQF Level 4 or higher.
- > To be registered as an assessor with the relevant ETQA.

### NOTES

This qualification replaces qualification 49019, "National Certificate: Metals Production", Level 3, 138 credits.

### UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	9010	Demonstrate an understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	Level 3	2
Fundamental	9013	Describe, apply, analyse and calculate shape and motion in 2-and 3-dimensional space in different contexts	Level 3	4
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	9012	Investigate life and work related problems using data and probabilities	Level 3	5
Fundamental	119467	Use language and communication in occupational learning programmes	Level 3	5
Fundamental	7456	Use mathematics to investigate and monitor the financial aspects of personal, business and national issues	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5
Core	259624	Control workplace hazards and risks	Level 2	4
Core	244108	Apply safety, health and environment protection procedures in a process plant	Level 3	6
Core	259723	Perform first line maintenance on equipment in the metals production process	Level 3	10
Core	259724	Prepare for maintenance in a production plant	Level 3	5
Core	259697	Prepare, set up and operate process equipment in a production environment	Level 3	36
Elective	13234	Apply quality procedures	Level 3	8
Elective	116534	Carry out basic first aid treatment in the workplace	Level 3	2
Elective	253656	Communicate with clients	Level 3	3
Elective	259698	Control slag magnetite content in a vertical converter	Level 3	7
Elective	256817	Control slipping and baking of electrodes in an electric arc furnace	Level 3	14
Elective	12456	Explain and use organisational procedures	Level 3	6
Elective	256815	Install electrode casings of an arc furnace	Level 3	12
Elective	259718	Load a charge exceeding 10 tons into an electric arc furnace	Level 3	7
Elective	9530	Manage work time effectively	Level 3	3
Elective	8039	Operating cranes	Level 3	10
Elective	8038	Operating lift trucks	Level 3	6
Elective	256741	Pulverise Material by means of a Vertical Ball Type Pulveriser	Level 3	10
Elective	256698	Remove impurities from molten metal by means of a converting process	Level 3	10
Elective	120329	Respond to, implement and manage emergencies according to an emergency action plan in a workplace	Level 3	2
Elective	116720	Show understanding of diversity in the workplace	Level 3	3

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	<b>ID</b>	<b>UNIT STANDARD TITLE</b>	<b>LEVEL</b>	<b>CREDITS</b>
Elective	256816	Shut down a furnace for maintenance	Level 3	10

**LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION****None**



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Prepare, set up and operate process equipment in a production environment***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259697	Prepare, set up and operate process equipment in a production environment		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Manufacturing and Assembly Processes			
<b>FIELD</b>		<b>SUBFIELD</b>	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 3	36

***This unit standard replaces:***

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
116596	Prepare, set up and operate process equipment	Level 3	36	Will occur as soon as 259697 is registered

**SPECIFIC OUTCOME 1**

Plan the set-up process production equipment.

**SPECIFIC OUTCOME 2**

Prepare and set-up equipment.

**SPECIFIC OUTCOME 3**

Operate equipment.

**SPECIFIC OUTCOME 4**

Perform post operation activities.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Core	64190	National Certificate: Metals Production	Level 3



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Control slag magnetite content in a vertical converter**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259698	Control slag magnetite content in a vertical converter		
<b>ORIGINATOR</b>	<b>PROVIDER</b>		
SGB Manufacturing and Assembly Processes			
<b>FIELD</b>	<b>SUBFIELD</b>		
6 - Manufacturing, Engineering and Technology	Fabrication and Extraction		
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 3	7

**This unit standard replaces:**

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
110120	Control slag magnetite content in a vertical converter	Level 3	7	Will occur as soon as 259698 is registered

**SPECIFIC OUTCOME 1**

Demonstrate knowledge relating to the controlling of magnetite.

**SPECIFIC OUTCOME 2**

Prepare to control magnetite.

**SPECIFIC OUTCOME 3**

Control magnetite.

**SPECIFIC OUTCOME 4**

Complete the duties pertaining to the process of controlling magnetite.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	64190	National Certificate: Metals Production	Level 3



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:****Load a charge exceeding 10 tons into an electric arc furnace**

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259718	Load a charge exceeding 10 tons into an electric arc furnace		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Manufacturing and Assembly Processes			
<b>FIELD</b>		<b>SUBFIELD</b>	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 3	7

**This unit standard replaces:**

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
9581	Load a charge exceeding 10 tons into an electric arc furnace	Level 3	7	Will occur as soon as 259718 is registered

**SPECIFIC OUTCOME 1**

Demonstrate knowledge relating to the charging of the furnace.

**SPECIFIC OUTCOME 2**

Prepare to charge furnace.

**SPECIFIC OUTCOME 3**

Charge the furnace.

**SPECIFIC OUTCOME 4**

Complete the duties pertaining to the charging process.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	64190	National Certificate: Metals Production	Level 3



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Perform first line maintenance on equipment in the metals production process***

SAQA US ID	UNIT STANDARD TITLE		
259723	Perform first line maintenance on equipment in the metals production process		
ORIGINATOR	PROVIDER		
SGB Manufacturing and Assembly Processes			
FIELD	SUBFIELD		
6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly		
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	10

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Demonstrate knowledge relating to process equipment maintenance.

**SPECIFIC OUTCOME 2**

Identify process equipment problems during production.

**SPECIFIC OUTCOME 3**

Perform first line maintenance as per standard operating procedures.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Core	64190	National Certificate: Metals Production	Level 3





## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**UNIT STANDARD:*****Prepare for maintenance in a production plant***

<b>SAQA US ID</b>	<b>UNIT STANDARD TITLE</b>		
259724	Prepare for maintenance in a production plant		
<b>ORIGINATOR</b>		<b>PROVIDER</b>	
SGB Manufacturing and Assembly Processes			
<b>FIELD</b>		<b>SUBFIELD</b>	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
<b>ABET BAND</b>	<b>UNIT STANDARD TYPE</b>	<b>NQF LEVEL</b>	<b>CREDITS</b>
Undefined	Regular	Level 3	5

***This unit standard does not replace any other unit standard and is not replaced by another unit standard.***

**SPECIFIC OUTCOME 1**

Demonstrate knowledge relating to preparing for maintenance.

**SPECIFIC OUTCOME 2**

Determine maintenance requirements.

**SPECIFIC OUTCOME 3**

Prepare for maintenance.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	<b>ID</b>	<b>QUALIFICATION TITLE</b>	<b>LEVEL</b>
Core	64190	National Certificate: Metals Production	Level 3