No. 414 11 May 2007

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

Chemical Industries

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

This notice contains ihe 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.saqa.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 June 2007.*** All correspondence should be marked Standards Setting – Chemical Industries and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. *D. Mphuthing*

DR. S. BHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:

National Certificate: Chemical Operations

SAQA QUAL ID	***QUALIFICATION TITLE***		
58515	National Certificate Chemical Operations		
SGB		***PROVJDER***	
Chemical Industries SGB			
ETQA			
QUALIFICATION TYPE	***FIELD***	***SUBFIELD***	
National Certificate	6 - Manufacturing, Engineering and-Technology	Manufacturing and Assembly	
ABET BAND	***MINIMUM CREDITS***	***NQF LEVEL***	***QUAL CLASS***
Undefined	135	Level 2	Regular-Unit Stds Based

PURPOSE AND RATIONALE OF THE QUALIFICATION

Purpose:

This qualification builds onto the GETC: Chemical Operations. This competence builds onto the largely theoretical foundation laid at NQF Level 1, needed to take responsibility for a significant process in the chemical operations industry. It also provides the basis upon which further related learning and career development can take place.

Through the employment of competent operating personnel, employers and in turn the field and sub-field have confidence that this critical work in the industry is efficiently carried out.

Social development and economic transformation are enhanced through efficient production, and career development and personal job satisfaction of operating personnel are facilitated through the learning process used to achieve the competency specified.

Qualifying learners will:

Have an understanding of the various process operations that are used in chemical or explosives operations:

- Understand the principles of chemistry and the applications in industry.
- Apply safety and environmental protection procedures in the workplace.
- Monitor and control operations in a chemical or process environment.
- Maintain quality in a processing environment.

Rationale:

The National Certificate in Chemical Operations: NQF Level 2 qualification replaces the following two qualifications:

- National Certificate: Chemical Equipment Operation; NQF Level 2 (ID 22866).
- National Certificate: Explosives Operations; NQF Level 2 (ID 48725).

This qualification is the second in a learning pathway for people working in the chemical or processing industries who need to progress beyond NQF Level 2 in Chemical Operations. The

qualification reflects the workpiace-based common or non-specific needs that a learner requires in the chemical operations industry, before progressing to learning at a higher level.

Typical learners are operating personnel working in a chemical processing plant. The chemical processing industry is well established in South Africa and its success is dependant upon the efficient production of chemical products. Achievement of this objective is largely dependant upon the competence, recognised by this qualification, of the people who operate chemical processing equipment. An adequate number of people with these skills are needed to ensure that the production units in South Africa operate productively.

Competence in chemical process operations requires appropriate general, chemical specific technical and other knowledge and its application, as well as expertise in operating production equipment and controlling a chemical process. This knowledge and expertise can form a basis for further learning particularly in the production/operational, engineering and supervisory aspects of chemical operations and similar industries in the chemical and other sectors.

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 1.

Recognition of Prior Learning:

Recognition of prior learning must be carried out in accordance with the policy and rules specified and used by the ETQA responsible for evaluation of people seeking RPL for a part of the whole qualification.

Access to the qualification:

Access to this qualification is open, however it is preferable that learners have completed the GETC in Chemical Operations,

Access for learners with disabilities is dependant on the:

- Type and severity of the disability.
- Nature of the operational processes and requirements of the equipment.

QUALIFICATION RULES
In the compulsory Fundamental Component of the qualification, a learner must demonstrate his/her competence in the 20 credits in the field of Communication plus 16 credits in the field of Mathematical Literacy.

The unit standards in the compulsory Core Component of the qualification reflect the skills and competencies needed for building expertise in the chemical operations field. In the Core Component, the learner must demonstrate his/her competence in the total of 64 credits.

The Elective Component:

Speciaiisation areas consist of the following unit standards:

Speciaiisation area 1: Explosive Operations: 28 credits

Category; ID; Unit Standard Title; Level; Credits:

e Elective; ID 114643; Apply occupational health, safety and environmental protection in an explosive manufacturing environment; Level 2; 8 Credits.
e Elective; ID 114644; Demonstrate an understanding of the behaviour. performance and use of explosives: Level *2;* 8 Credits.
• Elective; ID 114649; Destroy hazardous waste or redundant explosive; Level 2; 6 Credits.
• Elective; ID 114650; Mix explosive and non-explosive materials; Level *2;* 6 Credits.

Specialisation area 2: Chemical Operations: 25 credits.

Category; ID; Unit Standard Title; Level: Credits:

e Elective; ID 244072; Demonstrate understanding of heat transfer equipment; Level *2;* 10 Credits.
• Elective; ID 244081: Understand the properties and applications of materials in a processing environment; Level *2;* 5 Credits.
• Elective; ID 244077; Demonstrate understanding of chemicals in a processing environment; Level 2; 6 Credits.
• Elective; ID 115188; Apply environmental protection procedures; Level 2; 4 Credits.

A minimum of 35 credits is required for the elective components. Learners must choose balance of the credits from additional electives to make up 35 credits.

EXIT LEVEL OUTCOMES
1. Understand the principles of chemistry and their applications in industry.

2. Apply safety and environmental protection procedures in the workplace.

3. Monitor and control operations in a chemical or process environment.

4. Maintain quality in a processing environment

Critical Cross-Field Outcomes:

Each critical cross-field outcome was considered in terms *of* its applicability to each of the specific outcomes for each unit standard. Where it was found to be applicable, the nature *of* the skills being developed was specified by the working group and captured in the standard.

Critical cross-field outcomes are assessed per unit standards and are part of all exit level outcomes.

Critical cross-field outcomes have been addressed by the exit level outcomes as follows:

While performing integrated chemical process operations, qualifying learners can:

Identify and solve problems in which response displays that responsible decisions, using critical and creative thinking, have been made by:

• Responding to emergencies in a processing environment; Evident in Exit Levei Outcomels 2
• Monitoring and controlling quality assurance practices; Evident in Exit Level Outcomels 2. 3.
• Applying operating procedures; Evident in Exit Level Outcomels 1, 2, 3.
• Controlling variables impacting on chemical process operations; Evident in Exit Level Outcomels 1, 2, 3.

Work effectively with others as a member *of* a team, group, organisation or community by:

• Working in a coordinated team during system start-up and shut down; Evident in Exit Level Outcome/s ▮

• Co-ordinaiing cne's work with that of others in the direct surrounding area, internal and external operations; Evident in Exit Level Cutcomeis 1, *2,* 3.

Organise and manage oneself 2nd one's activities responsibly and effectively by:

• Planning and implementing one's own start-up and shutdown activities; Evident in Exit Level Outcomeis 1
• Planning and implementing one's own routine operational functions; Evident in Exit Level Outcomeis 1, 2, 3.
• Planning and implementing corrective action to maintain product quality; Evident in Exit Level Outcome/s 3.

Collect, analyse, organise and critically evaluate information by:

• Monitoring operational parameters; Evident in Exit Level Outcome/s 1, 2.
• Collating and sorting product quality data; Evident in Exit Level Outcomeis 3.
• Monitoring and interpreting product quality data and data obtained from product analysis; Evident in Exit Level Outcomels 2, 3.
• Managing records, reports and stock; Evident in Exit Level Outcomeis 1, 2, 3.

Communicate effectively by using mathematical and/or language skills in the modes of oral and/or written presentations by:

• Recording and interpretation of instrument readings, Evident in Exit Level Outcomeis 1, 2, 3.
• Preparing and presenting reports; Evident in Exit Level Outcomeis 1, 2, 3.

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

• Working according to health and safety regulations; Evident in Exit Level Outcomels 1, 2, 3.
• Controlling technoiogically advanced production equipment according to operating procedures; Evident in Exit Level Outcomeis 1, 2, 3.
• Working and interpreting technologically advanced instrumentation and computer systems; Evident in Exit Level Outcome/s 1, 2, 3.

Demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation by:

• Monitoring and controlling quality assurance practices; Evident in Exit Level Outcomeis 2, 3.
• Adjusting equipment and machinery while taking cognisance of the downstream impact; Evident in Exit Level Outcomeis 1, 2, 3.

Contribute to the full personal development of each learner and the social and economic development of the society at large by:

• Maintaining and applying safety practices in the production environment; Evident in Exit Level Outcomeis 1, *2,* 3.
• Maintaining and applying quality practices in the production environment; Evident in Exit Level Outcomeis 2, 3.
• Performing core operating functions; Evident in Exit Level Outcomels 1, 2, 3.
Performing specialised computer functions; Evident in Exit Level Outcomeis 1, 2, 3.

ASSOCIATED ASSESSMENT CRITERIA

1.
• The elementary principles of industrial chemistry are explained in terms of generally accepted scientific principies.

- The applications of chemistry in manufacturing operations are described by relating the chemical principles to actual industrial examples.

2.

- Emergency action is taken in line with emergency procedures and as may be dictated by situational considerations to ensure the safety of both personnel and equipment.
- Hazardous chemicals are received, handled and stored as required by plant safety rules and standard operating procedures.
- Environmental protection procedures are applied according to standard operating procedures.

3.

- The work permit system requirements are implemented according to legal and relevant workplace instructions.
- The principles of physics related to heat and energy and its application in a processing environment are explained in terms of accepted scientific principles.
- Standard Operating Procedures are applied according *to* given procedures.
- Process plant and equipment are monitored to detect any operational deviations according to operating schedules, procedures and prevailing operational requirements.
- The principles governing heat transfer, liquid-solid and solid-solid separation processes are explained in terms of accepted scientific principles and applications are described by relating the scientific principles to actual industrial examples.
- Instruments on production or packing equipment are read and adjusted to maintain continued smooth and efficient operation.

4.

- Sampling is done according to best sampling practice principles.
- Quality of products is maintained within given product specifications.
- Basic statistical process control principles are applied according *to* the statistical framework requirements.

Integrated Assessment:

The applied competence (practical, foundational and reflexive competencies) of this qualification will be achieved if a candidate is able to achieve all the exit level outcomes of this qualification.

Appropriate methods and tools must be used to assess practical, foundational and reflexive competence of the learner in all the exit level outcomes listed above, as well as to determine a learner's ability *to* solve problems, work in a team, organize himlherself, use applied science, and understand the implications of actions and reactions in the world as a set of related systems. Such an assessment process will determine development of the whole person, and the integration of applied knowledge and skills.

Assessors should develop, conduct, and ensure integration of, assessment by making use of a range of formative and summative assessment methods against the unit standards that make up the qualification. Combinations of applied, foundational and reflective competencies, including critical cross-field outcomes, should be assessed wherever possible.

Moderators should ensure that assessment is valid, consistent and integrated into work or learning, and that there is sufficient and authenticated evidence of learner competence against the whole qualification.

INTERNATIONAL COMPARABILITY

The comparability was done against qualifications from the USA, Germany, the British NVQ, a range of European countries, Australian as well as New Zealand Qualification Frameworks. African countries with manufacturing facilities (including SADC countries) were scanned for applicable qualifications or training programmes, but no relevant qualifications are offered iri any of these countries.

Both local and international qualifications place high emphasis on safety with a range of unit standards relating to emergencies, environmental protection and operating procedures forming the core. However, the rest of the Australian and British qualifications are made up of standards addressing operational functions with very little theoretical support. In contrast, the German qualification offers a model which seems more in line with the objectives of the NQF and the South African industry than any of the others. A wide theoretical basis is established before operational aspects are addressed, while menial tasks are not included to complete the qualification.

The Introduction to Chemical Operations was therefore broadly based on the German qualification model, except for the exclusion of laboratory practice which is considered as a separate field of study. The compulsory theoretical content incorporated in the qualification will serve to support qualifying learners to make better informed, autonomous decisions within a more compact timeframe than most international learners and will increase transportability of the qualification considerably.

An extensive international comparability was done which included the United States of America, Australia, New Zealand, Germany, Britain, European Community Chemical Operator Project and relevant African countries.

United States of America:

In the USA training for chemical process operators are generally considered as on-the-job training with some specialised multi-media and simulator training modules offered by private providers. However a small number of technical colleges offer certificate programmes which are very similar in design to the NQF Level 2 qualification.

Germany:

The German qualification was seen as the best benchmarking partner due to their position as international leaders in the chemical industry in both technical and operational issues. From our firsthand experience, the training provided in this field is partially responsible for their leading position. **A** contributing factor that leads **us** to this conclusion is the international regard for German technology. The German two year "Produktionsfachkraft Chemie" (Chemical Production Specialist) qualification was used as basis for the development of the NQF Level 1 and NQF Level 2 chemical operations qualifications. The main deviations from the German qualification are:

- No laboratory work is done in either the local NQF Level 1 or NQF Level 2 qualifications since this **is** considered a separate occupation.
- Some of the areas were addressed either earlier or later in the training process in order to minimise the workplace requirements for the NQF Level 1 qualification.
- Subjects were divided and combined in a somewhat different fashion.

Britain:

A comparison with the British qualification was included, because the British chemical industry is very well developed and the NVQ is an educational structure comparable to the NQF. An internet search revealed that The British Level 2 NVQ qualification in Chemical, Pharmaceutical and Petrochemical Operations provides for the following areas of specialisation: Process Operations; Process Support Services and Control Operations Process.

When compared to the British qualification, the South African NQF Level 2 qualification has a higher theory component while the British qualification is focused on job skills without any foundational science, process or equipment modules. The qualification contains compulsory core units consisting of safety, teamwork, work handover and a choice of five elective units

ranging from processing operations, maintenance of equipment, packaging, transfer of material, to quality management.

European Community Chemical Operator project:

The European Community Project (Leonardo da Vinci) is aimed at establishing common educational and outcomes specifications for chemical operators in the European Union. At this stage of the project, their outcomes are virtually identical to ours, but standards have not yet been set to indicate how these outcomes would be achieved.

Australia:

The Australian processing industry is of a similar size and sophistication as the South African industry. For this reason a comparison with the Australian qualification was included, as well as the AQF being an educational structure comparable to the NQF. An internet search of the AQF revealed that the Australian Certificate II in Process Plant Operations contains compulsory core units in communication, safety, quality and work procedures and it allows the learner to choose elective unit standards in domains comparable to the local qualification, e.g. operate and monitor a range of processing equipment.

Africa and SADC:

African countries with processing facilities (including SADC countries) were searched for applicable qualifications or training programmes, but no relevant qualifications are offered in any of these countries.

New Zealand:

A comparison with the New Zealand qualification was included because the NZQA is an educational structure comparable to the NQF. The research in the NZQA showed that a Level 2 Certificate in Energy and Chemical Plant Operations (Process Operation) and a similar level 4 Process Operation qualification are registered. Subject content is similar to that contained in the South African qualification, namely: communication, safety, quality control and equipment operation, monitoring and maintenance.

Summary:

Both local and international qualifications place high emphasis on safety with a range of unit standards relating to hazards, emergencies and environmental protection included.

The Chemical Operations Qualification compares well with the best international qualifications and training programmes offered. The compulsory technical content incorporated in the qualification will serve to support qualifying learners to make better informed, autonomous decisions within a more compact timeframe than most international learners and will increase transportability of the qualification considerably.

ARTICULATION OPTIONS

This qualification is the first in a series of four chemical operations qualifications and it will allow the learner a vertical progression from the introductory NQF Level 1 qualification. The qualifying learner may progress to a NQF level 4 supervisory qualification in an internal process control role in the chemical or processing industry.

Vertical articulation within the processing industry can occur with the following registered NQF Level 3 qualifications.

- Process Plant Operation, NQF Level 3.
- ID 48905: National Certificate. Wastewater Reticulation Services. NQF Level 3.

- ID 48916: National Certificate: Explosive Manufacturing Operations, NQF Level 3.
- ID 48434: Naiionai Certificate: Molten Glass Production, NQF Level 3.
- ID 49535: National Certificate: Cperation of Mobile Explosives Manufacturing Unirs, NQF Level 3.
- ID 49044: National certificate: Mineral Processing, Gold Extraction, NQF Leve! 3.

The generic knowledge and expertise enables the learner to progress norirontally in a range of other processing operations or to develop a career where knowledge of process operations is necessary

Horizontal articulation within the processing industry can occur with the following registered NQF Level 2 qualifications:

- Continuous Processes: Chemical Operations, NQF Level 2.
- Electrics: Chemical Electrical, NQF Level 2.
- Mechanics: Chemical Rigging, NQF Level 2.
- Mechanics: Chemical Turning, NQF Level 2.
- ID 24253: National Certificate: Batch Mixing, NQF Level 2.
- ID 48890: Naiional Certificate: Chemical Liquid, Gas Storage and Transfer, NQF Level 2.
- ID 36156: National Certificate: Chemical Manufacturing Operations, NQF Level 2.
- ID 21494: National Certificate: Dry Lumber Processing, NQF Level 2.
- ID 21490: National Certificate: Lumber Drying, NQF Level 2.
- ID 35941: National Certificate: Pulp and Paper Manufacturing, NQF Level 2.

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 ETQA.

- 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 ETQAs policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQAs (including professional bodies); and in terms of the moderation guideline detailed immediately below.

- Moderation should also encompass achievement of the competence described both in individual unit standards. exit level outcomes as well as the integrated competence described in the qualification.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

In order to assess this qualification, the assessor needs:

- Assessors to meet the requirements of the generic assessor standards.
- Competence against the unit standard "Conduct outcomes-based assessments".
- Detailed dociumentary proof of educational qualification, practical training undergone, and/or experience gained at an appropriate level in the work concerning the production of molten glass. This must meet the relevant ETQA policies and guidelines. The subject matter expertise of the assessor can be established through the recognition of prior learning.
- Registration with, or recognition by, the relevant ETQA as specified through an appropriate memorandum of understanding.

NOTES

This qualification replaces qualifications:

- ID 22866, "National Certificate: Chemical Equipment Operations", Level 2, 126 credits.
- ID 38775. "National Certificate: Explosives Operations", Level 2, 120 credits.

Range of equipment covered:

- A system is understood to be equipment operated in combination to achieve a desired result in process operation.
- Operating a system includes the integrated operation of the equipment that makes up the system.

Range statements:

- This qualification addresses the theoretical knowledge required by learners in the processing industries.
- Knowledge relating to the processing industries includes process specific technology, communication, mathematics, applied science, and SHEQ.
- This qualification may be applicable to other processing operations. This is subject to its acceptance by appropriate subject matter experts.

UNIT *STANDARDS*

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	244078	Demonstrate understanding of a work permit system	Level 2	3
Core	244073	Receive, handle and store hazardous chemicals safely	Level 2	5
Core	244071	Apply sampling theory and practice	Level 2	5
Core	244079	Respond to emergencies in a process environment	Level 2	3
Core	244075	Maintain the quality of products in a production environment	Level 2	5
Core	244082	Monitor plant and equipment in a process environment	Level 2	10
Core	12317	Read and adjust instruments on production or packing equipment	Level 2	7
Core	244080	Apply standard operating procedures in a process environment	Level 2	10
Core	244074	Demonstrate understanding of liquid-solid and solid-solid separation processes	Level 2	10
Core	244076	Apply elementary statistical process control principles	Level 2	6
Elective	110300	Clean inspect and lubricate a production machine, and repair minor faults	Level 2	9
Elective	244081	Understand the properties and applications of materials in a processing environment.	Level 2	5
Elective	115188	Apply environmental protection procedures	Level 2	4
Elective	116937	Use a Graphical User Interface (GUI)-based spreadsheet application to create and edit spreadsheets	Level 2	4
Elective	9322	Work in a team	Level 2	3
Elective	12483	Perform basic first aid	Level 2	4
Elective	114647	Decontaminate equipment and work areas in an explosive environment	Level 2	5
Elective	114644	Demonstrate an understanding of the behaviour, performance and use of explosives	Level 2	8
Elective	114643	Apply occupational health, safety and environmental protection in an explosive manufacturing environment	Level 2	8
Elective	114641	Transport and store explosives and explosive containing materials	Level 2	6
Elective	114640	Prepare and treat metal surfaces of empty containers or components in the manufacturing environment	Level 2	6
Elective	114651	Operate small arms ammunition manufacturing equipment	Level 2	10
Elective	114653	Operate propellant manufacturing equipment in an explosive manufacturing environment	Level 2	10
Elective	114642	Operate hydraulic and pneumatic presses in an explosive manufacturing environment	Level 2	6
Elective	114637	Operate explosives accessories manufacturing equipment	Level 2	10
Elective	114652	Operate an X-ray machine in an explosive environment	Level 2	4
Elective	114645	Operate initiating device manufacturing equipment in an explosive manufacturing environment	Level 2	10
Elective	114650	Mix explosive and non-explosive materials	Level 2	6
Elective	114649	Destroy hazardous waste or redundant explosives	Level 2	6
Elective	114639	Control waste or effluent water in a manufacturing	Level 2	4

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
		environment		
Elective	244083	Solve operating problems using relevant technologies	Level 2	5
Elective	117924	Use a Graphical User Interface (GUI)-based word processor to format docu r s	Level 2	5
Elective	113877	Understand fundamentals of electricity	Level 2	8
Elective	244077	Demonstrate understanding of chemicals in a processing environment	Level 2	6
Elective	244072	Demonstrate understanding of heat transfer equipment	Level 2	10
Fundamental	119463	Access and use information from texts	Level2	5
Fundamental	119460	Use language and communication in occupational learning programmes	Level 2	5
Fundamental	9009	Apply basic knowledge of statistics and probability to influence the use of data and procedures in order to investigate life related problems	Level2	3
Fundamental	9008	Identify describe, compare, classify, explore shape and motion in 2-and 3-dimensional shapes in different contexts	Level 2	3
Fundamental	9007	Work with a range of patterns and functions and solve problems	Level 2	5
Fundamental	7469	Use mathematics to investigate and monitor the financial aspects of personal and community life	Level 2	2
Fundamental	7480	Demonstrate understanding of rational and irrational numbers and number systems	Level2	3
Fundamental	119456	Write/present for a defined context	Level 2	5
Fundamental	119454	Maintain and adapt oral/signed icati	Level 2	5

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UNIT STANDARD:

Apply sampling theory ***and practice***

SAQA US ID	***UNITSTANDARD TITLE***		
244071	Apply sampling theory and		
SGB		***PROVIDER***	
Chemical Industries **SGB**			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	***UNITSTANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 2	5

SPECIFIC OUTCOME 1
Explain the purpose of sampling and the scientific and technical bases upon which sampling is based.

SPECIFIC OUTCOME 2
Take a variety of samples in a process related environment

SPECIFIC OUTCOME 3
Evaluate sampling procedure.

SPECIFIC OUTCOME 4
Evaluate analysis results.

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UNIT STANDARD:

Demonstrate understanding of heat transfer equipment

SAQA US ID	*UNIT STANDARD TITLE*		
244072	Demonstrate understanding of heat transfer equipment		
SGB		*PROVIDER*	
Chemical Industries SGB			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	10

SPECIFIC OUTCOME **1**
Demonstrate an understanding of heat exchangers in process applications.

SPECIFIC OUTCOME *2*
Demonstrate an understanding of air coolers in process applications,

SPECIFIC OUTCOME 3
Demonstrate an understanding of cooling towers in process applications

SPECIFIC OUTCOME **4**
Demonstrate an understanding of different fuel types in process applications.

SPECIFIC OUTCOME 5
Demonstrate an understanding of direct fired heaters in process applications.

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UNIT STANDARD:

Receive, handle and store hazardous chemicals safely

SGB		PROVIDER	
Chemical industries ***SGB***			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	UNIT STANDARD TYPE	*NQF* LEVEL	CREDITS
Undefined	Regular	Level 2	5

SPECIFIC OUTCOME 1
Prepare to receive hazardous chemicals

SPECIFIC OUTCOME 2
Receive and check chemicals

SPECIFIC OUTCOME 3
Handle chemicals safely.

SPECIFIC OUTCOME 4
Conduct post-handling processes.

SPECIFIC OUTCOME 5
Store hazardous chemicals for production requirements.

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UNIT STANDARD:

Demonstrate understanding of liquid-solid and solid-solid separation processes

SAQA US ID	*UNIT STANDARD TITLE*		
244074	Demonstrate understanding of liquid-solid and solid-solid separation processes		
SGB		*PROVIDER*	
Chemical Industries SGB			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level *2*	10

SPECIFIC OUTCOME 1
Demonstrate an understanding of filtration in process applications.

SPECIFIC OUTCOME 2
Demonstrate an understanding of density separation in process applications.

SPECIFIC OUTCOME 3
Demonstrate an understanding of electrically based separation process applications

SPECIFIC OUTCOME 4
Demonstrate an understanding of solid-solid separation process applications.

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UNIT STANDARD:

Maintain the quality of products in a production environment

SAQA US ID	*UNIT STANDARD TITLE*		
244075	Maintain the quality of products in a production environment		
SGB		*PROVIDER*	
Chemical Industries SGB			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	5

SPECIFIC OUTCOME 1
Perform quality checks on incoming materials.

SPECIFIC OUTCOME 2
Perform quality checks on processed products.

SPECIFIC OUTCOME 3
Perform quality checks on final products.

SPECIFIC OUTCOME 4
Take corrective action to address non conforming results

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UNIT STANDARD:

Apply elementary statistical process control principles

SAQA US ID	*UNIT STANDARD TITLE*

SGB		*PROVIDER*	
Chemical Industries SGB			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	6

SPECIFIC OUTCOME 1
Demonstrate an understanding of monitoring product parameters in a processing environment.

SPECIFIC OUTCOME 2
Assess product suitability by means of measurements, checks and simple tests.

SPECIFIC OUTCOME 3
Plot analysed values and compare these values against maximum/minimum control limits.

SPECIFIC OUTCOME 4
Take corrective action to address non conforming results

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

SAQA US ID	UNIT STANDARD TITLE		
244077	Demonstrate understanding of chemicals in a processing environment		
SGB		PROVIDER	
Chemical Industries SGB			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	UNITSTANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 2	6

SPECIFIC OUTCOME 1
Describe the role of sulphurous compounds in the process industry

SPECIFIC OUTCOME 2
Describe the role of nitrogen bearing (nitrogenous) compounds in the process industry.

SPECIFIC OUTCOME 3
Describe the role of halogens and halides in the process industry

SPECIFIC OUTCOME 4
Describe the role of organic compounds in the process industry.

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UNIT STANDARD:

Demonstrate understanding *of* a work permit system

SAQA *US* ID	UNIT STANDARD TITLE		
244078	Demonstrate understanding of a work permit system		
SGB		***PROVIDER***	
Chemical Industries SGB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 2	3

SPECIFIC OUTCOME 1
Demonstrate an understanding *of* the underlying principles of a permit system.

SPECIFIC OUTCOME 2
Demonstrate an understanding of permit requirements.

SPECIFIC OUTCOME 3
Participate in meeting permit requirements

SPECIFIC OUTCOME 4
Retrieve permit on completion of work or when permit conditions change.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Respond to emergencies in a process environment

SGB		*PROVIDER*	
Chemical industries SGB			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	3

SPECIFIC OUTCOME 1
Demonstrate an understanding of emergencies.

SPECIFIC OUTCOME 2
Assess emergency conditions.

SPECIFIC OUTCOME 3
Explain initial response to emergencies,

SPECIFIC OUTCOME 4
React to emergency conditions.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply standard operating procedures *in a* process environment

SAQA *US ID*	*UNIT* STANDARD TITLE		
244080	Apply standard operating procedures in a process environment		
SGB		***PROVIDER***	
Chemical Industries SGB			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 2	10

SPECIFIC OUTCOME 1
Apply Standard Operating Procedures (SOPs) in taking over shift and handing over shift.

SPECIFIC OUTCOME 2
Apply Standard Operating Procedures (SOPs) in starting **up** equipment.

SPECIFIC OUTCOME 3
Apply Standard Operating Procedures (SOPs) to achieve normal operating conditions.

SPECIFIC OUTCOME 4
Apply Standard Operating Procedures (SOPs) in shutting down equipment.

SPECIFIC OUTCOME 5
Apply Standard Operating Procedures (SOPs) in correcting abnormal shutdown conditions.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

244081	Understand the properties and applications of materials in a processing environment.		
SGB		***PROVIDER***	
Chemical Industries **SGB**			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	***UNITSTANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level *2*	5

SPECIFIC OUTCOME 1
Describe the different solid materiais used in a processing environment

SPECIFIC OUTCOME 2
Demonstrate an understanding of the use of metals in **a** processing environment.

SPECIFIC OUTCOME 3
Demonstrate an understanding of the use of polymers in a processing environment

SPECIFIC OUTCOME **4**
Demonstrate an understanding of the use of ceramics in a processing environment.

SPECIFIC OUTCOME 5
Demonstrate an understanding of the **use** of composites and organic materials in a processing environment

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Monitor plant and equipment in a process environment

SAQA US ID	UNIT STANDARD TITLE		
244082	Monitor plant and equipment in a process environment		
SGB		PROVIDER	
Chemical Industries SGB			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 2	10

SPECIFIC OUTCOME 1
Monitor process variables

SPECIFIC OUTCOME 2
Monitor product quality.

SPECIFIC OUTCOME 3
Monitor plant integrity.

SPECIFIC OUTCOME 4
Check plant safety.

SPECIFIC OUTCOME 5
Check housekeeping.

SPECIFIC OUTCOME 6
Check environmental aspects.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Solve operating problems using relevant technologies

SAQA US ID	UNIT STANDARD TITLE		
244083	Solve operating problems using relevant technologies		
SGB		PROVIDER	
Chemical Industries SGB			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 2	5

SPECIFIC OUTCOME 1
Identify variables deviating from the normal operating standards

SPECIFIC OUTCOME 2
Determine likely cause of the deviation experienced

SPECIFIC OUTCOME 3
implement corrective action

SPECIFIC OUTCOME 4
Evaluate the impact of corrective action