No. 1244 **28 December 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

Engineering

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

This notice contains the title, field, sub-field, NQF level, credits, and purpose of the Qualification. The full Qualification 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 should reach SAQA at the address below and ***no later than 1 February 2008.*** All correspondence should be marked **Standards Setting – Engineering** and addressed to

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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate: Engineering

SAQA QUAL ID	***QUALIFICATION TITLE***		
60110	National Certificate: Engineering		
ORIGINATOR		***PROVIDER***	
SGB Engineering			
QUALIFICATION TYPE	***FIELD***	***SUBFIELD***	
National Certificate	6 - Manufacturing, Engineering and Technology	Engineering and Related Design	
ABET BAND	***MINIMUM CREDITS***	***NQF LEVEL***	***QUAL CLASS***
Undefined	120	Level 5	Regular-ELOAC

This qualification does not replace any other qualification and is not replaced by another qualification.

PURPOSE AND RATIONALE OF THE QUALIFICATION
Purpose:

The qualification, prepares the learner for an established engineering support occupation by:

- Providing a base of technical knowledge for the specific occupation.
- Provides competencies required for the specific occupation.
- Provides fundamental knowledge relevant to and applicable in the specific occupation.
- Provides sufficient fundamental knowledge to support progression to other engineering qualifications.
- Provides learners with management principles appropriate to the specific occupation.

Designers of specific qualifications may build on this generic base by specifying occupation-related content and specific skills required.

The particular occupation may also require other qualifications, learnerships, skills programmes or further learning.

Rationale:

The Engineering profession contributes though its range of distinctive skills to the technological, socio-economic, built environment and environmental infrastructure of the country. Engineering activity facilitates socio-economic growth and sustainability. Engineering activity requires a range of types of professionals (engineers, technologists, technicians and certificated engineers), specialised support personnel as well as artisans. A large number of focussed, specialised or specified occupations support the engineering process. Functions include completion of designs by insertion of codified detail, development and supply of manufacturing and construction information, quality control, inspections, or supervision of production or construction in support of engineering professionals.

These occupations may originate in several ways: they may be generally recognised, may be an industry sector requirement, may be required by an Act or may be established by ECSA as specified registration categories.

These occupations have a common set of generic competencies but differ in detailed technical knowledge and work-related skills. This qualification specifies the generic requirements for this class of focussed occupations, allowing specialities to be defined by standards and employer bodies within its framework. Because these occupations are each focussed on specific technical activities, the qualification allows the learner to become proficient in a limited time. At the same time, the qualification seeks to provide the basis for vertical and horizontal articulation to and from other technical qualifications.

Engineering higher education and training qualifications are structured in a coherent framework with common sets of generic requirements and discipline- or occupation-specific specialisation. This qualification is intended to create a generic base common to a large number of engineering support occupation qualifications. The generic standards approach used to define the requirements for BEng, BTech, ND is therefore used for these certificate qualifications.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
It is assumed that learners are already competent in communication, mathematics and Physics or Physical Science at NQF Level 4.

Recognition of Prior Learning:

This qualification may be obtained in part or wholly through recognition of prior learning.

Access:

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

QUALIFICATION RULES
The minimum credits in the various knowledge areas are as follows:

Table 1: Minimum credits by knowledge area:

Component; Credits:

- Mathematical Sciences; 10 Credits.
- Basic Sciences; 10 Credits.
- Engineering Sciences; 50 Credits.
- Computing and IT; 15 Credits.
- Complementary Disciplines; 10 Credits.
- Subtotal; 100 Credits.
- Discretionary for addition to above areas; 25 Credits.

Total Credits;120.

Notes to Table 1:

- Complementary studies include communication skills.
- Minimum Engineering Practice credits are not specified and may be incorporated in engineering sciences or in the discretionary credits.
- Learners intending to proceed to the Certificate: Engineering: NQF Level 6 should complete 15 credits of Mathematics.

EXIT LEVEL OUTCOMES

1. Interpret a given problem into the procedures and methods of the occupation and carry out required operations.

• Range: Problems are repetitive in nature, procedures are defined in particular work or site contexts, best practice is used, solutions referred for checking. Problem statement is concrete, requirements are well defined. Problems are routine and but may be unfamiliar within a familiar context.

2. Perform operational procedures appropriate to the occupational context.

• Range: Occupational contexts involve at least one of the following:
o Perform design support functions, by applying design procedures using given parameters and produce construction/manufacturing/implementation information.
o Perform inspections according to specified requirements.
o Maintain specific equipment, plant or infrastructure.
o Perform tests in accordance with specified requirements.
o Set up and run manufacturing operations.

3. Apply relevant scientific and engineering knowledge in the occupational context.

• Range: Engineering knowledge is that underpinning knowledge applied in occupational processes. Underpinning knowledge includes principles that would allow building further knowledge. Mathematical, statistical and basic science knowledge is that required specifically for the operation together with relevant fundamentals.

4. Communicate technical, supervisory and general management information.

• Range:
o Communication includes orally or in writing, using appropriate medium, language, terminology, structure, style and graphical support.
o Writing: Predefined reporting formats, reports results of work functions performed.
o Reading and interpretation: Technical specifications, instructions procedures, product information, trade or occupation-related magazines.
o Communication methods/conventions used in occupation.
o Spoken: one-to-one, small groups receive and comprehend instructions, issue instructions.

5. Explain and apply ethics and engineering best practice to own work context.

• Range: Minimum standards of ethical behaviour are defined in applicable codes of conduct, including the ECSA Code of Conduct.

6. Demonstrate the ability to apply basic management principles.

ASSOCIATED ASSESSMENT CRITERIA
Associated Assessment Criteria for Exit Level Outcome 1:

1.1 The problem is interpreted and clarified in terms of the requirements and possible solutions.
1.2 Problems that cannot be competently dealt with are identified and referred to a person with the requisite competency.
1.3 Procedures and techniques for solving the problem are selected in accordance with the requirements of the discipline.
1.4 Solution procedures are executed systematically.
1.5 Results are evaluated and verified in terms of their acceptability to the problem.

Asoociated Assessment Criteria for Exit Level Outcome 2:

2.1 Procedures, processes, codes and regulations within the occupation are identified and explained in terms of their purpose and limitations of operation.
2.2 Procedures or processes are executed in accordance with context requirements.
2.3 Operational records and reports are documented accurately and systematically as required.
2.4 Variances and risks within the operational procedures are identified and the action taken is appropriate to the situation.

Associated Assessment Criteria for Exit Level Outcome 3:

3.1 Processes in the occupational context are explained and applied in terms of underpinning scientific and engineering principles
3.2 Physical phenomena occurring in the occupational context is described in terms of the cause and effect.
3.3 Materials, fabrication processes and operational processes are explained and applied in the occupational context.
3.4 Measurements and procedures are explained and applied in terms of underlying principles.
3.5 Mathematical formulae are applied to perform calculations.

Associated Assessment Criteria for Exit Level Outcome 4:

4.1 Reports are generated in defined formats.
4.2 Data is assembled in tabular and graphical format.
4.3 Information is effectively communicated with junior members, peers and supervisors.
4.4 Specifications, drawings, technical reports and data sheets are read and interpreted in accordance with their original meanings.

Associated Assessment Criteria for Exit Level Outcome 5:

5.1 Relevant legislation, policies and procedures are explained and applied in a given work context.
5.2 Ethical activities are explained and applied in the occupational context.
5.3 The impact of hazards and risks within the occupation are explained in terms of their cause and effect.
5.4 Consequences of acting outside own limits of competence are explained in terms of ethics and liability.

Associated Assessment Criteria for Exit Level Outcome 6:

6.1 Self-management principles are explained and applied appropriately to a given scenario.
6.2 Time management is explained and applied throughout work activities.
6.3 Work relationships are established and maintained in accordance with applicable team requirements and ethics.
6.4 Own development is mapped out and followed in accordance with an agreed personal development plan.
6.5 Generic management principles are demonstrated in working with groups of people and organising work functions.

Integrated Assessment:

Providers of programmes shall in the quality assurance process demonstrate that an effective integrated assessment strategy is used. Clearly identified components of assessment must address summative assessment of the exit level outcomes. Evidence should be derived from major work or multiple instances of limited scale work.

INTERNATIONAL COMPARABILITY

Comparability was done against qualifications offered in various countries and particularly to those that are signatories to the various international agreements which place recognition of the equivalence of Accredited Engineering Education Programs which articulates to the Engineering Degrees and beyond. It is an essential quality assurance process and is based on world best practice.

SADC and Other African Countries:

International Comparability with qualifications of countries within the SADC region proved to be difficult as in most countries no similar qualifications could be found. Only Namibia has qualifications similar but not the same.

United Kingdom:

Several certificate qualifications comparable to this Certificate exist internationally. Some have the fundamental components that are comparable, for example the UK Business and Technology Education Council (BTEC) HNC which are one year qualifications requiring fundamentals such as Analytical methods and Engineering Science.

Australia:

The Australian Qualifications Framework Diplomas are similar. Other qualifications are comparable in their specialized engineering content.

New Zealand:

The New Zealand NQF has certificates which are focused on particular disciplines or engineering occupations, all unit standards based at NZ NQF Level 6.

Ireland:

The National Qualifications Authority of Ireland and the Irish FET Awards Council that has awards in Engineering Skills, Engineering Technology and General Engineering Operations at a comparable level.

Emerging Economies:

In an attempt to do a comparison with a country with an emerging economy, the following websites were searched:

www.lan.gov.my:

- This sites directs searches to the Malaysian Accreditation Body: Lenbaga Akcreditasi Negara

www.naac-india.com:

- This site directs searches to the National Assessment and Accreditation Council (India).

www.nigeria.com:

- Provides links and access to the Federal Ministry of Education in Nigeria.

This qualification could not be compared to qualifications of any of the countries with an emerging economy because some of the websites are not presented in English and from those that are; there is no information available on the accreditation of learning programmes against national standards and/or qualifications.

ARTICULATION OPTIONS
Horizontal Articulation:

- ID 58883: National Certificate: Fluid Power Level 5.
- ID 49745: National Certificate: Value Engineering Level 5.
- ID 49511: National Certificate: Lift Inspection, Level 5.
- ID 49746: National Certificate: Measurement, Control and Instrumentation, Level 5.
- ID 5722: National Certificate: Metrology, Level 5.
- ID 21007: National Certificate: Automotive component manufacturing and assembly, Level 5.
- ID 22861: National Certificate: Autotronics, Level 5.
- ID 58025: National Certificate: CNC Production Machining, Level 5.
- ID49061: National Certificate: Master Craftsmanship (Electrical), Level 5.

Vertical Articulation:

- ID 60071: National Certificate: Engineering, level 6.

MODERATION OPTIONS
- Anyone assessing a learner or moderating the assessment of a learner against this Unit Standard must be registered as an assessor with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

- Any institution offering learning that will enable the achievement of this Unit Standard must be accredited as a provider with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

- Assessment and moderation of assessment will be overseen by the relevant ETQA or by an ETQA that has a Memorandum of Understanding with the relevant ETQA, according to the ETQA's policies and guidelines for assessment and moderation.

- Moderation must include both internal and external moderation of assessments 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 as well as the integrated competence described in the Qualification.

- Anyone wishing to be assessed against this Unit Standard 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
Registration of assessors is delegated to the Higher Education and Training (HET) providers responsible for programmes. However, they must be registered as generic assessors in the first instance and then as constituency assessors.

NOTES
Appendix 1:

Definitions:

- Engineering Operations and Support Occupation: A narrowly specified occupation that relies on technical knowledge and skills to perform specific technical or supervisory functions in engineering activity.
- Specified categories: A category of registration created for persons who must be licensed through the Engineering Profession Act or a combination of the Engineering Profession Act and external legislation as having specific competencies related to an identified need to protect the

public safety, health and interest or the environment, in relation to an engineering activity. (ECSA definition).
• Portable credits: Are transferable to other qualifications and providers and, in the context of this qualification, support progression to learning at higher levels.
• Occupation specific credits: May not be transferable to other qualifications.

Narrowly defined engineering problems: These are problems with the characteristics:

• Problem statement is concrete, requirements are well defined in a specified field.
• Problems are routine within a familiar context.
• Approach to the solution is to apply known/recognized methods, procedures and techniques of the field or discipline.
• Information is narrowly defined, complete, and concrete, and requires appropriate application.
• Solutions are encompassed by standards, codes and documented procedures.
• Involves known issues but with few of these imposing conflicting constraints within limitations of procedures.

Appendix 2:

Knowledge area definitions:

• Basic Sciences: Physics (including mechanics), chemistry, earth sciences and the biological sciences which focus on understanding the physical world, as applicable in each engineering disciplinary context.
• Complementary studies: Cover those disciplines outside of engineering sciences, basic sciences and mathematics which: (a) are essential to the practice of engineering, including engineering economics, the impact of technology on society and effective communication, and (b) (for levels 6 and above) broaden the student's perspective in the humanities or social sciences to support an understanding of the world.
• Computing and Information Technologies: Encompasses the use of computers, networking and software to support engineering activity and as an engineering activity in itself as appropriate to the discipline.
• Engineering Practice: Embraces in an appropriate mix for the level and target occupation includes design-related, inspection, testing, maintenance and operations activities.
• Engineering Sciences: Have roots in the mathematical and basic sciences, and where applicable, in other basic sciences but extend knowledge and develop models and methods in order to lead to engineering applications and solve engineering problems.
• Mathematical sciences: An umbrella term embracing the techniques of mathematics, numerical analysis, statistics and aspects of computer science cast in an appropriate mathematical formalism.

Appendix 3:

Informative Examples of Occupations Supported by this Qualification:

The Addendum gives informative (non-definitive) examples of development paths to occupations that can be supported by this qualification (with additional education and training as required).

Type and Speciality of Occupation:

• Detail Designer: Roadworks.
• Detail Designer: Structural Steel.
• Detail Designer: Reinforced Concrete.
• Inspector: Lifting Equipment.
• Inspector: Lifts and Escalators.
• Maintenance: Medical Equipment Maintenance.

- Maintenance: Mechanical Practitioner, Electrical Practitioner.
- Materials Tester: Construction materials.
- Metrologist: Electrical/temperature Mass.
- Overseer: Mine/Operations Overseer.
- Detail Designer: Airconditioning.

UNIT STANDARDS
This qualification is not based on Unit Standards.

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION
None