No. 875 **22 August 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

Engineering

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

This notice contains the titles, fields, sub-fields, NQF levels, 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 22 September 2008.*** All correspondence should be marked **Standards Setting – SGB for Engineering** and addressed to

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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate: Certificated Engineering

SAQA QUAL ID	*QUALIFICATION TITLE*		
63450	National Certificate: Certificated 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 7	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 purpose of the Qualification is to develop the necessary knowledge, understanding and skills required for learner's further learning towards becoming a competent Certificated Engineer. It is intended to subsequently empower Certificated Engineers to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the engineering working environment.

A person meeting the requirements of this Qualification is assessed as competent at the level required for entry to:

> Registration with the relevant Engineering Council as a Professional Certificated Engineer, and the accompanying statutory licensing.
> Recognition as a competent Certificated Engineer for specific statutory, industry or company functions.

The context of assessment, expressed in terms of the engineering, management and legal knowledge, differentiates the various qualifications. The contextual information for each certificate is defined in the section E of the range statement.

Rationale:

Engineering is an activity concerned with the solution of problems of economic importance and those essential to the progress of society. Solutions are reliant on basic scientific, mathematical and engineering knowledge. Solutions rely on analysis and synthesis, underpinned by sound techno-economic analysis. Solutions must take into account the needs of society and protection of the physical environment. Engineering work requires management and communication, and must be conducted ethically and subject to applicable legislation.

Engineering activity is essential to both economic activity and to national development. Engineering activity, while offering such benefits also involves health, safety, environmental and sustainability risks that must be managed. Effective, safe and sustainable engineering activity is founded on the competence of engineering professionals.

Engineering activities include:

> Designing materials, components, systems or processes.
> Planning the capacity and location of infrastructure.
> Investigating, advising and reporting on engineering problems.
> Improvement of materials, components, systems or processes.
> Managing the operation and maintenance of plant, machinery and processes.
> Managing implementation or construction projects.
> Implementing designs or solutions.
> Research, development and commercialisation of products.

The practice of engineering activities at professional level involves a number of roles that are recognized by the Engineering Profession Act: Professional Engineer, Professional Engineering Technologist, Professional Engineering Technician, and Professional Certificated Engineer.

The Certificated Engineer applies current engineering technology with creativity and innovation. A Certificated Engineer has significant expertise and depth of knowledge in an industry context and area of technology. The Certificated Engineer brings to engineering leadership, management and a technologically specific approach, supported by financial, commercial, statutory, safety, and environmental knowledge as required. The Certificated Engineer manages interactions within and at the boundaries of the industry context and technology domain. This Qualification therefore defines the level of competency required by a Certificated Engineer at the baseline level required for competent practice and to register with the relevant Engineering Council as a Professional Certificated Engineer. In keeping with the objectives of the National Qualifications Framework (NQF), a person assessed as competent against this Qualification qualifies for a Stage 2 Certificated Engineer Certificate.

This occupation may originate in several ways, may be generally recognized, may be an industry sector requirement, may be required by an Act or may be established by ECSA as specified registration categories. The informative examples of occupations supported by this qualification give informative examples of development paths to occupations that can be supported by this qualification with additional education and training as required. The types and specialties of occupations are as follows:

> Certificated Engineer (Electrical: Factories).
> Certificated Engineer (Mechanical: Factories).
> Certificated Engineer (Electrical: Mines).
> Certificated Engineer (Mechanical: Mines).
> Certificated Engineer (Mining: Metalliferous).
> Certificated Engineer (Mining: Coal).

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
It is assumed that learners are already competent in:

> Communication, Mathematics and Natural (Basic) Science at NQF Level 6 and completed the National Certificate: Engineering at NQF Level 6.

Recognition of Prior Learning:

This Qualification may be achieved in part or wholly through recognition of prior learning (RPL) processes in the form of workplace practice and can submit or produce evidence for summative

assessment against this Qualification at the level equivalent to that specified under learning assumed to be in place.

The provision that the Qualification may be obtained through the recognition of prior learning facilitates access to an education, training and career path in engineering and thus accelerates the redress of past unfair discrimination in education, training and employment opportunities.

Evidence of prior learning must be assessed through formal RPL processes through recognized methods. Any other evidence of prior learning should be assessed through formal RPL processes to recognize achievement thereof.

Learners submitting themselves for RPL should be thoroughly briefed prior to the assessment and will be required to submit a Portfolio of Evidence (PoE) in the prescribed format to be assessed for formal recognition. While this is primarily a workplace-based qualification, evidence from other areas of learning may be introduced if pertinent to any of the Exit Level Outcomes (ELOs).

The structure of this non-unit standard based Qualification makes the RPL possible, if the learner is able to demonstrate competence in the knowledge, skills, values and attitudes implicit in this second stage engineering qualification.

Learners who already work in the engineering industry who believe they possess competencies to enable them to meet some or all of the ELOs listed in the qualification will be able to present themselves for assessment against those of their choice.

Access to the Qualification:

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

However, learning assumed to be in place at the start of a programme of training and experience leading to this Qualification depends on the route taken by the candidate from the several possible pathways. All pathways must result in the candidate achieving Stage 1 outcomes at NQF Level 7 as specified in the Engineering contextual Level Descriptors for Stage 1. Routes to achieving Stage 1 status are defined in the guideline "Framework for Progression to Certificated Engineer". Hence, a Qualification meeting Engineering Council standards provides a benchmark for the learning assumed to be in place to enter a programme of training and experience leading to this certificate.

QUALIFICATION RULES
Fundamentals:

> Natural (Basic) Sciences, 10 Credits.
> Mathematical Sciences, 15 Credits.

Core:

> Engineering Practice, 10 Credits.
> Computing and Information Technologies, 15 Credits.
> Engineering Sciences, 40 Credits.

Electives:

> Complementary Studies, 10 Credits.
> Discretionary Studies, 20 Credits. Complementary Studies are portable and cover those disciplines outside of engineering sciences which includes modules/subjects on communication

skills, etc. Discretionary study credits range from 0-20 provided the total credits for the complete qualification is not less than a 120 Credits.

Knowledge Area Definitions:

> Natural (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.
(b) For NQF 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, and 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.

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.

EXIT LEVEL OUTCOMES
The candidate is declared competent as a Certificated Engineer at stage 1 by demonstrating in an integrated manner, in a workplace context, the following outcomes exhibiting the attributes mainly of broadly defined engineering activities defined in the General Range Statement.

1. Identify, clarify, and analyze broadly defined engineering problems.
> Range Statement: Problems include problematic situations in an existing component, system or process involving health and safety and risk assessment. The problem may be operational, a design requirement or an applied research and development requirement. The problem is one amenable to solution by technologies known to the candidate. This outcome is concerned with the understanding of a problem: Outcome 2 is concerned with the solution.

2. Design or develop solutions to broadly defined engineering problems.
> Range Statement: The solution may be the design of a component, system or process or a recommendation of the remedy to a problematic situation. Solutions are those enabled by the technologies in the candidate's practice area.

3. Comprehend and apply the knowledge embodied in widely accepted and applied engineering procedures, processes, systems or methodologies and those specific to the industry context in which he/she practices.

> Range Statement: Technological knowledge is well established and applicable to the practice area irrespective of location, supplemented by locally relevant knowledge, for example, established properties of local materials. Industry contextual knowledge includes legal and regulatory requirements as well as prescribed codes of practice, specifically H & S legislation. Emerging technologies are adopted from formulations of others. Practice contexts are appropriate to scope of certificate:
> Mechanical and Electrical in Factory context.
> Mechanical and Electrical in Mining context.
> Mining Engineering and Operations.
Specific knowledge and contextual considerations required in each of these practice areas in Range Statements E1, E2 and E3 respectively.

4. Lead and manage part or all of one or more broadly defined engineering activities.
> Range Statement: These management abilities support the effective discharge of responsibilities as a certificated engineer, achieve results through other persons.

5. Recognize and address the foreseeable social, cultural and environmental effects of broadly defined engineering activities generally.
> Range Statement: Impacts considered extend over the lifecycle of the project and include the consequences of the technologies applied.

6. Meet relevant legal and regulatory requirements and protect the health and safety of persons in the course of his or her broadly defined engineering activities.
> Range Statement: Requirements include both explicitly regulated factors and those that arise as a consequence of particular work or activity. Persons whose health and safety are to be protected are those explicitly identified in terms of the applicable health and safety legislation and those outside the workplace who are subject to risks as a consequence of workplace activity. The candidate will be proficient in one of the health and environmental protection contexts:
> Occupation Health and Safety Act OR
> Mine Health and Safety Act OR
> Marine Act; together with other relevant acts and regulations applicable in each case.
Sections E5, E6 and E7 list the principal parts of Acts and Regulation applicable to different contexts.

7. Conduct his or her engineering activities ethically.
> Range Statement: Ethical behaviour is at least that defined by the applicable Code of Conduct.

8. Exercise sound judgment in the course of broadly defined engineering activities.
> Range Statement: Judgment is expected both within the application of the candidate's technologies, in their wider impacts and when dealing with interfaces to other disciplines and technologies.

9. Be responsible for making and executing decisions on part or all of one or more broadly defined engineering activities.
> Range Statement: The candidate is expected to demonstrate adequately discharging responsibility for significant parts of a one or more broadly defined engineering activity.
> Note 1: The candidate in demonstrating responsibility would under supervision of a competent certificated engineer be expected to perform as if he/she is in a responsible position taking actual responsibility for the work due to statutory or other requirements for a practicing Certificated Engineer.

10. Communicate clearly with others in the course of his or her broadly defined engineering activities.

> Range Statement: Material relates to technical aspects and wider impacts of the Certificated Engineer's work. Audience includes peers, other disciplines, client, stakeholder's audiences and Government Departments. Appropriate modes of communication must be selected. While the assessment criteria are similar to those at Stage 1, the Stage 2 Certificated Engineer is expected to perform the communication functions reliably and repeatable.

11. Plan and execute professional development activities.
> Range Statement: In proceeding from Stage 1 to Stage 2, the candidate must bear this competency standard in mind in developing the strategy and activities. A candidate in a structured programme is expected to take ownership of the strategy. Boundaries of practice area linked to technologies used, change by adoption of new technology into current practice.

Critical Cross-Field Outcomes (CCFOs):

This qualification promotes, in particular, the following Critical Cross-Field Outcomes:

Identifying and solving problems in which responses indicate that responsible decisions using critical and creative thinking have been made when:

> Identifying potential risks in the workplace and implementing appropriate solutions to maintain a safe and secure working environment.
> Identifying and resolving general client queries and deviations from regulatory requirements.
> Identifying and pro-actively reporting on non-availability of resources and materials.

Working effectively with others as a member of a group, organization and community during:

> Directing appropriate colleagues to attend to client queries.
> Understanding the impact of service delivery to the client.
> Activities involving clients, co-workers and suppliers.
> Communicating and receiving advice from supervisors.

Organising and managing oneself and one's activities responsibly and effectively when:

> Identifying, minimizing and reporting potential occupational health and safety hazards and risks in the workplace.
> Performing work activities in accordance with industry standard operating procedures.
> Safety equipment and clothing is selected and prepared in accordance with legislative requirements.

Collecting, analysing, organising and critically evaluating information to better understand and explain by:

> Carrying out written instructions issued by the clients and supervisors, correctly and efficiently.
> Interpreting and recording correct client contact details.

Communicating effectively using visual, mathematical and/or language skills in the modes of oral and/or written persuasion when:

> Issuing clear verbal instructions to team members, other colleagues and clients.
> Actively listening to feedback received from team members, other colleagues and clients.
> Evaluating and reporting problem situations to team members, other colleagues and clients.

Using science and technology effectively and critically, showing responsibility towards the environment and health of others when:

> Interpret various gauge settings, readings and recording the impact on the business.

> Understanding and interpreting the various gauge reading equipment.

Demonstrating and understanding of the world as a set of related systems by recognizing that problem-solving contexts do not exist in isolation when:

> Applying the inter-relatedness of the engineering industry as a set of related systems.
> Recognizing the inter-relatedness between the various business units within the organization.

ASSOCIATED ASSESSMENT CRITERIA
Assessment Criteria for Exit Level Outcome 1:

The candidate is expected to perform a structured analysis of problems typified by the following performances:

1. Interprets and clarifies requirements, leading to an agreed definition of the problem to be addressed.
2. Identifies interested and affected parties and their expectations.
3. Gathers, structures and evaluates a sufficient range of information relating to the problem.
4. Performs structured analysis.
5. Evaluates the result of the analysis and revise or refine as required.
6. Evaluates health and safety risks and perform analyses required by applicable legislation.
7. Documents and reports conveying outcome to the requesting party.

Assessment Criteria for Exit Level Outcome 2:

This outcome is normally demonstrated after problem analysis as defined in outcome 1. The candidate is expected to work systematically to synthesise a solution to a problem, typified by the following performances:

1. Proposes potential approaches to the solution.
2. Conducts a preliminary synthesis following selected approaches.
3. Evaluates potential solutions against requirements and wider impacts.
4. Presents reasoned technical, economic and contextual arguments for the selected option.
5. Fully develops chosen solution.
6. Evaluates the resulting solution.
7. Documents the solution for approval and implementation.

Assessment Criteria for Exit Level Outcome 3:

This outcome is normally demonstrated in the course of design, investigation or operations. The candidate typically:

1. Displays mastery of understanding of current and emerging technologies in the practice area.
2. Applies general and underpinning engineering knowledge to support activities of certificated engineers.
3. Displays working knowledge of areas that interact with the practice area.
4. Applies related knowledge: financial, statutory, safety, management.

Assessment Criteria for Exit Level Outcome 4:

The candidate is expected to display personal and work process management abilities when doing the following activities:

1. Manages self.
2. Envisions and plans strategically to fulfil company goals.

3. Establishes understanding and acceptance of goals and plans in other.
4. Leads and works effectively in a team environment, energizing individuals and teams to realize goals.
5. Manages people, works priorities and resources, asserting authority and control over affairs, systems, processes and people.
6. Establishes and maintains professional and business relationships.
7. Provides leadership in technology and health and safety.

Assessment Criteria for Exit Level Outcome 5:

This outcome is normally displayed in the course of analysis and solution of problems. The candidate typically;

1. Identifies interested an affected parties and their expectations.
2. Identifies environmental impacts of the engineering activity.
3. Proposes measures to mitigate negative effects of engineering activity.
4. Communicates with stakeholders.
5. Determines or develops work processes to be used as required by health and safety legislation.

Assessment Criteria for Exit Level Outcome 6:

The candidate is expected to:

1.Demonstrate knowledge and understanding of applicable Health and Safety legislation.
2.Identify and ensure compliance with applicable legal, regulatory and health and safety requirements for the operational and engineering activity.
3.Identify hazards, assess and manage risk, applying defined, widely accepted risk management strategies.
4. Select safe and sustainable materials, components and systems.
5. Ensure that required records on health and safety matters are kept.

Assessment Criteria for Exit Level Outcome 7:

The candidate is expected to be sensitive to ethical issues and adopt a systematic approach to resolving these issues typically when the candidate:

1. Identifies the central ethical problem.
2. Identifies affected parties and their interests.
3. Searches for possible solutions for the dilemma.
4. Evaluates each solution using the interests of those involved, accorded suitable priority.
5. Selects and justifies solution that best resolves the dilemma.

Assessment Criteria for Exit Level Outcome 8:

A candidate typically exhibits judgment by:

1. Considering several factors, some of which may not be well defined.
2. Considering the interdependence, interactions and relative importance of factors.
3. Foreseeing consequences of actions.
4. Evaluating a situation in the absence of full evidence.
5. Drawing on experience and knowledge.

Assessment Criteria for Exit Level Outcome 9:

The candidate displays responsibility by performance when he/she:

1. Demonstrates a professional approach at all times.
2. Has due regard to technical social, environmental and sustainable development considerations.
3. Takes advice from a responsible authority on any matter considered to be outside area of competence.
4. Makes decisions and takes responsibility for work output.

Assessment Criteria for Exit Level Outcome 10:

The candidates demonstrate effective communication when they:

1. Write clear, concise, effective, technically, legally and editorially correct reports using a structure and style, which meets communication objectives and user/audience requirements.
2. Read and evaluate technical and legal matter relevant to the function of the practicing Certificated Engineer.
3. Ensure correct interpretation of received instructions.
4. Issue clear instructions to subordinates using appropriate language and communication aids, ensuring that language and other communication barriers are overcome.
5. Make oral presentations using structure, style, language, visual aids and supporting documents appropriate to the audience and purpose.

Assessment Criteria for Exit Level Outcome 11:

The candidate demonstrates the ability to manage his or her own professional development toward the Stage 2 Certificate when he/she:

1. Plans and executes own professional development strategy.
2. Selects appropriate professional development activities.
3. Keeps record of professional development strategy and activities.
4. Displays independent learning ability.

General Assessment Criteria:

Professional level competence is more than satisfying a set of attributes individually. Rather, professional level competence must be assessed holistically.

Demonstration of competence must take place in a typical work context of a Certificated Engineer and involve different types of work. Competence statements accommodate different types of technical work, engineering management and in all cases have occupational health and safety considerations.
Work involves the supervision, management and leadership of different levels of workforce who must work effectively and safety.

Note on Associated Assessment Criteria:

Overlap exists between performances specified for different outcomes. The same evidence may be used toward assessing competence under different outcomes.

Integrated Assessment:

The applied competence (practical, foundational and reflective competencies) of this qualification will be achieved if a learner is able to achieve the Exit Level Outcomes of the qualification as per the rules specified. Applicable Critical Cross-Field Outcomes must be assessed during any combination of practical, foundational and reflexive competencies

assessment methods and tools to determine the whole person development and integration of applied knowledge and skills.

Certain Exit Level Outcomes are measurable and verifiable through assessment criteria assessed in one application. Applicable assessment tools to assess the foundational, reflective and practical competencies within the regulatory environment.

A detailed portfolio of evidence is required of the practical, foundational and reflective competencies of the learner. Assessors and moderators should develop and conduct integrated assessment by making use of a range of formative and summative methods.

Assessors should assess and give credit for the evidence of learning that has already been acquired (RPL) through any form of learning. Unit standards associated with this qualification must be used to assess Specific and Critical Cross-Field Outcomes.

During integrated assessment, the assessor should make use of formative and summative assessment methods and should assess combinations of practical, foundational and reflective competencies. Because assessment practices must be open, transparent, fair, valid, and reliable and ensure that no learner is disadvantaged in any way whatsoever, the qualification applies in an integrated assessment approach.

Learning, teaching and assessment are inextricably linked. Whenever possible, the assessment of knowledge, skills, attitudes and values shown in the unit standards should be integrated. Assessment of the fundamental unit standards should be conducted in conjunction with the core and elective unit standards where applicable.

A variety of methods must be used in assessment, and tools and activities must be appropriate to the context in which the learner is working. Where it is not possible to assess the learner in the workplace or on-the-job, simulations, case studies, role-plays and other similar techniques should be used to provide a context appropriate to the assessment.

Assessors and moderators should use 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 evaluated.

The assessment of the critical cross-field outcomes should be integrated with the assessment of specific outcomes and embedded knowledge.

Formative Assessment:

Assessment criteria for formative assessment will typically take place during training and serves to guide the learner towards full competence and is described in the various unit standards. Formative assessment takes place during the process of learning and assessors can use a range of appropriate assessment methods and tools or in any agreed-upon method of assessment of the knowledge required to perform the various competencies in a holistic manner. To be allowed access to the final qualifying assessment, a learner must show that he/she has reached a level of overall integrated competence.

The methods of assessment could include but not limited to the following:

> On-the-job Observations.
> Role-play and/or Simulations.
> Knowledge tests, exams, case studies, projects, logbooks, workbooks.
> Verbal report backs (presentations).

> Portfolios of Evidence (RPL).
> Working in teams (360 degrees evaluations).
> Scenario sketching Incident reports.

The assessment tools and methods used by the assessor must be:

> Fair, not to hinder or disadvantage the learner in any way.
> Valid, to measure what is intended to measure.
> Reliable, consistent and delivers the same output across a range of learners and assessors.

Summative Assessment:

For the learner to be certified competent against the qualification, he/she must prove overall competence through the integration of the competencies expressed in the unit standards. The elements of importance here are overall abilities, problem-solving capability and safe working. In addition, assessors should be satisfied that the learner has achieved a level of competence to be able to take charge of any aspect of the regulatory operations.

The learner's ability to demonstrate competence against a particular unit standard, under real-life working conditions and in the presence of an assessor, will be assessed. The summative assessment can also be used as a diagnostic assessment tool aimed at identifying the learner's skills gaps.

Workplace Assessment:

Workplaces can be used for assessment purposes provided that the appropriate facilities, tools, equipment, and support systems are available and accessible to both the assessor and the learner. The regulatory operations industry agreed on the following requirements for workplace assessment:

> Assessment needs to occur in a familiar environment at the time of assessment.
> Assessment needs to take place at a time and venue mutually agreed to by the assessor and the learner.

Methods of Assessment:

The following methods of assessment have been identified as the preferred measurement and assessment of learner competence in the assessment criteria:

> Portfolio of Evidence.
> Written tests.
> Practical tests.
> Oral Assessment methods.
> In-situ (on-the-job) observations.
> Simulation.
> Structured classroom discussions and oral tests.

These methods will be selected carefully based on the purpose of the assessment. For example, the written method will be used to assess knowledge and on-the-job demonstration for practical competence. The assessment must integrate a number of different methods (no less than two of those detailed above) in order to give the assessor reliable and valid proof of competence and evidence of required attitudes.

INTERNATIONAL COMPARABILITY
Introduction:

International Comparability of this qualification is based on the combination of the Level 5 and Level 6 Engineering qualifications that would typically precede a programme leading to this particular engineering certificate course. The combination of these qualifications is comparable with the Washington, Dublin and Sydney Accord degrees, diplomas and certificates in Canada, USA, Ireland, Australia, UK and New Zealand of two - four years duration with no work-integrated learning.

International comparability of this qualification and standards was done against qualifications that are offered in various countries and particularly to those that are signatories to the various international agreements, like the Washington, Sydney and Dublin Accords. These 3 International Accords places recognition of the equivalence of Accredited Engineering Education Programmes which articulates to the Engineering Degrees, Diplomas, and Certificates and beyond. It is an essential quality assurance process and is based on world best practice. Hence, these standards are comparable with those for professionally-oriented certificates' and diplomas in engineering in countries having comparable engineering education systems to South Africa. The combination of these qualifications is comparable with certificates and diplomas in Canada, USA, Ireland, UK and New Zealand of two years duration with no work-integrated learning.

Hence, there are six international agreements governing mutual recognition of engineering qualifications and professional competence. In each of these agreements countries/economies who wish to participate may apply for membership, and if accepted become members or signatories to the agreement. In broad principle, each country/economy must meet its own costs, and the body making application must verify that it is the appropriate representative body for that country/economy.

Agreements covering tertiary qualifications in Engineering:

There are three agreements covering mutual recognition in respect of tertiary-level qualifications and standards in engineering:

The Washington Accord:
> Signed in 1989 was the first and it recognises substantial equivalence in the accreditation of qualifications in professional engineering, normally of four years duration. It recognizes the substantial equivalency of programmes accredited by those bodies and recommends that graduates of programs accredited by any of the signatory bodies be recognized by the other bodies as having met the academic requirements for entry to the practice of engineering.

The Sydney Accord:
> Commenced in 2001 and recognises substantial equivalence in the accreditation of qualifications in engineering technology, normally of three years duration. Flowing from the Washington Accord, a similar Agreement was developed for Engineering Technologists or Incorporated Engineers, called the Sydney Accord (SA), which was signed in June 2001. It also recognizes the substantial equivalency of programmes accredited by those bodies and recommends that graduates of programmes accredited by any of the signatory bodies be recognized by the other bodies as having met the academic requirements for entry to the practice of engineering.

The Dublin Accord:
> Is an agreement for substantial equivalence in the accreditation of tertiary qualifications in technician engineering, normally of two years duration and it commenced in 2002. The Dublin Accord is an agreement for the international recognition of Engineering Technician qualifications and in May 2002 the national engineering organisations of the United Kingdom, Republic of Ireland, South Africa and Canada signed an agreement mutually recognising the qualifications which underpin the granting of Engineering Technician titles in the four countries. Since then, two further economies have attained provisional membership, and are working towards signatory status. They are New Zealand and the United States.

Agreements covering competence standards and qualifications for practising engineers.

The other three agreements cover recognition of equivalence at the practising engineer level i.e. it is individual people, not qualifications that are seen to meet the comparable and benchmark standard. The concept of these agreements is that a person recognised in one country as reaching the agreed international standard of competence should only be minimally assessed (primarily for local knowledge) prior to obtaining registration in another country that is party to the agreement.

The oldest such agreement is the Asia-Pacific Economic Cooperation (APEC) APEC Engineer agreement: which commenced in 1999:
> This has Government support in the participating APEC economies. The representative organization in each economy creates a "register" of those engineers wishing to be recognised as meeting the generic international standard. Other economies should give credit when such an engineer seeks to have his or her competence recognised. The Agreement is largely administered between engineering bodies, but there can be Government representation and substantive changes need to be signed off at governmental APEC Agreement level.

The Engineers Mobility Forum (EMF) agreement:
> Commenced in 2001. It operates the same competence standard as the APEC Engineer agreement but any country/economy may join. The parties to the recognition of the qualification and standards agreement are largely engineering bodies and there are intentions to draw EMF and APEC closer together.

The Engineering Technologist Mobility Forum agreement was signed by participating economies/countries in 2003. The parties to the Agreement have agreed to commence establishing a mutual qualification and standards recognition scheme for engineering technologists.

Australia:

The Australian Qualifications Framework has Engineering Diploma and Certificate courses that are similar which prepares candidates for both employment and further education and training according to the Commonwealth Engineers Council (CEC) and Engineers Australia (EA), formerly as the Institution of Engineers. These qualifications in the Australian context may be gained through a wide range of pathways, including: Australian Apprenticeships (including traineeships); work-based and/or school/institution-based training; recognition of prior learning (which may include training programmes or an accumulation of short courses).

Ireland:

The National Qualifications Authority of Ireland and the Irish FET Awards Council has qualifications and standards awards in Engineering Skills, Engineering Technology and General Engineering Operations at a South African Engineering comparable level. These qualifications enable holders to undertake further training and develop new skills within a structured and managed environment and will arm them with qualities and transferable skills necessary for employment requiring the exercise of some personal responsibility as required by the World Federation of Engineering Organizations (WFEO).

United Kingdom:

The UK Business and Technology Education Council (BTEC) HNC has one year engineering qualifications and standards that are quality assured and underwritten through the Engineering Council of the United Kingdom (ECUK). The requirements of these qualifications and standards are fundamental to the engineering courses and comprises modules or subjects such as

Analytical Methods and Engineering Science which have fundamental components that are comparable to the South African qualifications context.

New Zealand:

The New Zealand National Qualifications Framework has National Certificates and Diploma at NZ NQF Level 7, which is quality assured and underwritten by the Institution of Professional Engineers New Zealand (IPENZ). All these courses are focused on particular disciplines or engineering occupations which prepare candidates for both employment and further education and training. These National Certificates in Engineering recognise skills and knowledge that meet nationally endorsed standards.

SADC Nations:

International Comparability with qualifications of countries within the SADC region proved to be difficult, as in most SADC Countries no similar qualifications could be found and thus they use the Engineering Council of South Africa (ECSA) qualifications as a point of comparing standards. Only Namibia, who has previously been a part of South Africa, has similar qualifications, but does not necessarily practice exactly the same standards as in South Africa.

South African companies also have a strong and respected tradition of training in engineering. Prior to the development of this qualification, training has been company based, in-house and on-the-job, but to international standards, using internationally recognized American or British generated materials. South African companies provide training to other African countries such as Botswana and Zambia, as well as further-a-field in a range of other countries, including the Middle East.

In the early 2000's the South African engineering industries identified a need to develop qualifications that align with the principles of the National Qualifications Framework. Such qualifications would provide a national standard for training and would support the need to maintain and improve standards of safety and quality in this important industry sector. There was also considerable pressure from industry stakeholders for quality learning to be developed and implemented.

Emerging Economies:

In an attempt to do a comparison with countries with an emerging economy, the following websites were searched:
www.lan.gov.my

This site directs searches to the Malaysian Accreditation Body: Lenbaga Akcreditasi Negara, but does not give any details of any engineering qualifications that could be compared, although there is an Institution of Engineers in Malaysia (IEM) and a Board of Engineers in Malaysia (BEM).

www.naac-india.com
This site directs searches to the National Assessment and Accreditation Council (India), but does not give any details of any engineering qualifications that could be compared, although there is an Institution of Engineers in India (IEI) and a National Board of Accreditation of All India Council for Technical Education (NBA-AICTE).

www.nigeria.com
Provides links and access to the Federal Ministry of Education in Nigeria, but does not give any details of any engineering qualifications that could be compared with those in South Africa.

Conclusion:

South African companies also have a strong and respected tradition of training in engineering. Prior to the development of this qualification, training has been company based, in-house and on-the-job, but to international standards, using internationally recognized American or British generated materials.

South African companies provide training to other African countries such as Botswana and Zambia, as well as further-a-field in a range of other countries, including the Middle East.

In the early 2000's the South African engineering industries identified a need to develop qualifications that align with the principles of the National Qualifications Framework. Such qualifications would provide a national standard for training and would support the need to maintain and improve standards of safety and quality in this important industry sector. There was also considerable pressure from industry stakeholders for quality learning to be developed and implemented.

However, this qualification has generic competencies equivalent to a Professional Engineering Technologist, industry-specific contextual knowledge and practices and knowledge of South African health and safety legislation relevant to the particular industry. The generic competencies are compared and benchmarked by ECSA against those of international signatories to the Washington, Dublin and Sydney Accords and the Engineering Technologist Mobility Forum. Engineering Industry specific practices and standards are internationally compared and benchmarked by the various employers to these international accords and forums.

ARTICULATION OPTIONS

Routes for articulation and progression to this qualification are detailed in ECSA's guideline under "Framework for Progression Certificated Engineer." Having obtained this qualification, the holder is able to progress through continuing professional development activities. This qualification provides for both horizontal and vertical articulation.

Horizontal Articulation is possible with:

> ID 48694: Bachelor of Science: Engineering, NQF Level 7.

Vertical Articulation:

> ID 19635: Master of Engineering Science, NQF Level 8 and above.

MODERATION OPTIONS

It is likely that candidates will offer a single body of work-based evidence for assessment against the eleven outcomes. Assessors must therefore examine the evidence holistically, recognizing that a given body of work-based evidence may demonstrate performance against several outcomes.

> Anyone assessing a learner or moderating the assessment of a learner against this Qualification must be registered as an assessor with a 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 Qualification must be accredited as a provider with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with relevant ETQA.

> 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 relevant ETQA's policies and guidelines for assessment and moderation.

> A learner wishing to be assessed for this qualification can only be assessed through an accredited assessment provider/centre.

> 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 in the Exit Level Outcomes described in the Qualification.

CRITERIA FOR THE REGISTRATION OF ASSESSORS
Assessors must be Professional Certificated Engineers registered with ECSA and fully trained in the methods of assessment.

The assessor for this qualification must be:

> Have a similar qualification or that is at least one level higher than this qualification.
> Meet the requirements of National Assessor Unit Standards.
> Registered as an assessor with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.
> Have at least a minimum of 1 year on the job relevant experience.

NOTES
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: Means 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.

Well defined specific Engineering problems:

> Are largely defined but may require refinement.
> Are routine or unfamiliar but in familiar context.
> Are encompassed by standards, codes and documented procedures.

General Range Statement:

Practice Area:

Each certificated engineer, by the time of reaching the point of assessment against this standard, will have followed a programme of education, training and experience that may conform to an established pattern or may be distinctive. Each individual therefore develops an area of knowledge and expertise that, in addition to the common elements listed below, may be distinctive. This pattern of knowledge and expertise is termed the individual's practice area. A practice area falls in a particular industry context, for example factories or mines.

A. Broadly-defined Engineering Activities (BDEA): Are characterized by several or all of:

> Activities involve one or more of: Design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; engineering operations; project

management; research, development and commercialisation. It specifically includes operations, plant maintenance, application of company policy, procedures and best practice subject to applicable health and safety legislation.
> Boundaries of practice area linked to technologies used, change by adoption of new technology and legal requirements into current practice. Advances health and safety beyond minimum legal baseline; applies best practice; advances operational engineering practice; adapts to changing technologies, business environment and new safety hazards.
> Practice area is located within a wider and complex context, requires teamwork and has interfaces to other parties and disciplines.
> Involve the use of diverse resources (including people, money, equipment, materials, technologies), dealing with risks in practice area, including evaluation of immediate H&S risks, and perform analyses required by applicable laws.
> Require resolution of significant problems arising from interactions between wide- ranging or conflicting technical, engineering or other issues.
> Constrained by time, finance, infrastructure, resources, facilities, standards & codes, applicable laws. Work is significantly regulated by H&S legislation best practice (standards and codes) applicable in plant or mine contexts.

B. Broadly defined Engineering Problems (BDEP): are characterized by several or all of:

> Requires underpinning knowledge and skills in the technology area.
> May encompass systems within complex engineering systems.
> Ill posed, unpredictable, under or over specified problems requiring identification and interpretation into practice area.
> Information from sources interfacing with practice area is complex and possibly incomplete, requires analysis and compilation into information base.
> Can be solved by structured analysis techniques.
> Involves a variety of factors which may impose conflicting constraints.
> Belong to families of problems which are solved in well-accepted and innovative ways although infrequent unfamiliar problems are encountered.
> Problems may be partially outside standards and codes; operate outside with justification.
> Involves several groups of interested and affected parties with differing and occasionally conflicting needs.
> Have significant consequences which are important in the practice area, but may extend more widely.
> Requires judgment in decision making, in the practice area, considering interfaces with other areas.

C. Skills required by Certificated Engineer in order to undertake Broadly-defined Engineering activities and solving broadly defined Engineering Problems: are characterized by several or all of:

> Skills are intellectual and practical.
> Thinking focuses on creatively applying technology its impact within entire process or project including optimising resources and health and safety aspects within the operational boundaries requiring occasional lateral and divergent thinking.
> Range of specific skills related to plant or another or mine relevant workplace.
> Teamwork and multidisciplinary work, leadership of technological aspects including the leadership of health & safety aspects.
> Deal with changing work requirements, human and industrial relations and evolving technologies.
> Select or extend processes to suit operational and resource requirements taking cognisance of health and safety legislation.
> Communicate professional work to peers, other disciplines, client, interested and affected parties, and selecting appropriate modes of communication in order to optimise plant or mine operations.

D. Responsibility for Broadly defined Engineering Activities: Are characterized by several or all of the following:

> Responsibility within broad parameters for functions in practice area and full responsibility for occupational health and safety risks, preventive action, and plant/mine engineering.
> As required by specific health and safety legislation, by code of conduct and company policies.
> Fully accountable for personal contribution, to the team, and for adding value to the operational requirements including health and safety within their work activity.
> Responsible for assessing immediate and long-term impacts of technology and interaction areas within and beyond boundaries of plant/mine.
> Work within value system for assurance of health and safety, enterprise objectives and effective application of technology.
> Work strategically, focusing on time, in-specification completion of deliverables with occasional strategically focus on operational matters.
> Work outcomes are subject to review by experienced Certificated Engineer.
> Full personal responsibility and accountability for own Continuing Professional Development.

E. Contextual knowledge:

E.1. Electrical and Mechanical Engineering: Factories:

Competence must be demonstrated in the context of the following plant, equipment, practices and processes at factories with emphasis on the general design, lay out, production capacity, reticulation, energy requirements, motion characteristics, economic operation, efficiency testing, commissioning, maintenance, safety precautions and safety devices:

> Project Engineering including planning (Gantt Charts), management (critical path scheduling), commissioning and development of a planned maintenance scheme; Loss control management, incident investigations and corrective actions.
> Electrical Plant and Equipment including generation, transforming, rectification, control and measurement; Testing and repairing of electric motors; Phasing and synchronizing a.c. motors operating in tandem; Fault detection in electric systems; Emergency electric plant; Explosion proof equipment.
> Hydraulics including hydrostatic drives-classification and characteristics, hydraulic pumps, actuators and circuits for sequence operation; General properties of lubricants and additives to lubricants (oil and grease).
> Pressure equipment and plant including boiler, super heater and economizer efficiencies, vessels under pressure inspection and testing, steam ancillary equipment and pipe systems; Maintenance and fault diagnosis of compressors, refrigeration compressor and systems; Pumps, pump stations and fluid mechanics; Gas fuel system maintenance and safety.
> Factory equipment and plant including lifting and conveying machinery, ie lifts, belt conveyors, aerial ropeways, lift trucks, steel rope, chains and connections, welders, heat treatment plant, lathes, drills, the maintenance, inspection and testing and repairs of all typical machinery used in factories; Flammable and hazardous substance environments, machinery and equipment.
> Strengths and structures of plant including steel structures (stresses), beams, mechanical properties of fabrication materials, heat treatment and application of steel alloys and man made products (i.e. nylons), abrasion and protection of structures (steel an other materials). Utilization of concrete, reinforcement, composite beams, curing, chemical protection and wear.
> Environmental engineering including ventilation systems, air-conditioning systems, dust suppression, emission control of diesel engines, occupational noise originated by machines and hearing protection, illumination types, effects and efficiencies.
> Safety equipment and systems includes machine guarding, automatic control systems, detection systems, safety precautions and safety devices as found and used on all types of machines; Fire prevention equipment and systems, flammable and hazardous substance plants and continuous plant.

E.2. Electrical and Mechanical Engineering: Mines:

Competence must be demonstrated in the context of the following plant and equipment on surface and underground with basic knowledge in:

> Project management, critical path analysis, time and cost control, commissioning.
> Maintenance management, life cycle costs, efficiency testing, testing for design conformance, maintenance of warning symbols and machine guards, vibration measurements, nett present value calculations, interpretation of mine plans, mechanical drawings and electrical diagrams.
> Design requirements, intrinsically safe and explosion protected designs, provision of symbols, machine guarding.
> Operational requirements, production capacity, motion characteristics.
> Mine Health and Safety Act and Regulations, Risk Assessment, Code of Practices, Guidelines.

Inspector Guidance Notes:

Plant and equipment:

1. All types of winding plant and ancillary equipment:

> Control systems, signalling - and protection devices, cycle times.
> Wire ropes and attachments.
> Sheave wheels, - shafts, -bearings.
> Cages, skips and other types of conveyances.
> Shafts - guides, shaft steelwork, vertical and incline.
> Loading and unloading arrangements for persons, material and mineral.
> Headgears - bins and loading chutes.
> Brakes, drums, gears, shafts, bearings.
> Elevators, multi-rope applications.

2. Electrical plant and equipment for non-fiery and fiery mines with measuring - and protection devices:

> AC and DC calculations, waveforms, networks.
> Distribution networks - transformers, overhead lines, switchgear, power factor improvement equipment, fault discrimination, cables.
> Motors and generators - AC and DC motors, synchronous motors and generators, starting arrangements, speed control systems.
> Surge arrestors - types, lightning protection, high frequency transients.
> Power costs, maximum demand calculations, load factors, emergency power supplies.

3. All types of air compressors and ancillary equipment with measuring and protection devices:

> Intercoolers, after coolers, air receivers, pressure vessels.
> Water treatment, cooling characteristics.
> Distribution and transmission of compressed air.
> Compressed air motors.

4. Environmental requirements with personal protection equipment:

> Ventilation, evaporative cooling, acclimatization, humidity, fans.
> Dust, fumes, noxious gasses from engines and fires.
> Refrigeration, air conditioning.

> Occupational noise.
> Lighting - types, illumination, installations.
> Water, mine run-off, potable.
> Waste disposal, household waste, hazardous waste.

5. Plant for the loading, conveying and unloading of men, material and mineral:

> Belt conveyers, aerial ropeways, endless rope haulages, chairlifts and capstan winches.
> Locomotives, hoppers, carriages, track bound loaders.
> Trackless mobile machines, trucks, draglines with associated equipment.
> Winches, scrapers, shakers.

6. Plant for the handling of water and slurry with measuring and protection devices:

> Clear water pumps, pump stations, settling systems, storage dams.
> Slurry pumps, solids to water ratios, storage dams.
> Pipe characteristics, orifices, launders.

7. Plant for the generation and utilization of steam with measuring and protection devices:

> Boilers, fuel, super heaters, condensers, autoclaves, steam vessels, water treatment, cooling towers, and chimneys.
> Piping systems, steam traps, reducing valves, throttling.
> Steam turbines, heat exchangers.

8. Plant for drilling, cutting and boring of rock and coal:

> Rotary and percussion drills, mobile cutters, coal cutters.
> Drills and cutters - sharpening, heat treatment, transportation.

9. Plant for the use of hydraulic power with measuring and protection devices:

> Hydraulic pumps and motors, control systems, filters, accumulators, water turbines.
> Hydrostatic drives and ancillary equipment.

10. Plant for the storing and processing of mineral:

> Shaker and rotary screens, filters, crushers, milling, classifiers, thickeners, settlers, silos, bins, chutes, cyclones, furnaces.
> Slimes dams, waste rock dumps.

11. Utilization of concrete:

> Reinforced concrete, composite beams, stresses, bending moments.
> Concrete hardening, shuttering support, waterproofing.
> Protection against chemical attack and wear.

12. Application of steels and alloys:

> Application of alloys, mechanical properties, temperature behaviour, wear properties, corrosion, protection of steel.
> Composite beams, stresses, crack detection.

13. Fire prevention and the handling of hazardous chemicals:

> Types of fire extinguishers, effectiveness of chemical warning signs.
> Flammable and hazardous substances, warning signs.

14. Lifting equipment:

> Overhead cranes, mobile cranes, truck mounted cranes.
> Chain blocks, lever hoists, rope hoists.
> Lifting ropes, chains, shackles.

15. Mechanical components and members:

> Bearings - journal, roller, ball, tapered.
> Gears, clutches, brakes, flywheels.
> Chain drives, V-belt drives, rope pulleys.
> Transmission shafts - bending moments, torsion, power transfer, critical speeds, couplings.
> Fasteners - bolts and screws, rivets, welded joints.
> Springs - leaf - and helical springs.
> Lubrication: Properties of oils and greases, detergent additives, extreme pressure additives, anti-oxidants.

E3. Mining:

Competence must be demonstrated in the context of a mine or section of a mine. The mine may be of various types: hard rock, underground coal, surface large quarry or mine. Knowledge of the following must be demonstrated with an acceptable balance between topics of depth and appreciation:

> Working knowledge enabling interaction with related professionals: electrical and mechanical engineers, geologists and surveyors.
> Mining operation and practice: setting up a mine, accessing and exploiting the ore body, support, transport, disposal of waste.
> Managing risks both in terms of relevant legislation and in general, ensuring health and safety and sustainable operations are maintained.
> Managing people, materials, money; plan, organize lead and control.
> Technical services (including rock engineering, environmental engineering, mineral resource management, mine economics).
> Special conditions and considerations for the particular type of mine.

As noted previously, there is no present definition of Stage 2 functions.

E4. Occupational Health and Safety (Mechanical/Electrical):

Competence must be demonstrated in applying in and interpreting into the technical or work context the Occupational Health and Safety Act, 1993 (No. 85 of 1993), definitions, Regulations promulgated in terms of section 43 of the Act, standards referenced by the Regulations, Notices, Chief Inspector's Instructions, and any subsequent amendments to the Act and Regulations. Applicable regulations include:

1. The "General Administrative Regulations" (Notice No. R. 929 of 25 June 2003).
2. The "Electrical Installation Regulations" (Notice No. R. 2920 of 23 October 1992).
3. The "General Safety Regulations" (Notice No. R. 1031 of 30 May 1986).
4. The "Asbestos Regulations" (Notice No. R. 155 of 10 February 2002).
5. The "Environment Regulations for Workplaces" (Notice No. R. 2281 of 16 October 1987).
6. The "Driven Machinery Regulations" (Notice No. R. 295 of 26 February 1988).
7. The "General Machinery Regulations" (Notice No. R. 1521 of 5 August 1998).

8. The "Electrical Machinery Regulations" (Notice No. R. 1593 of 12 August 1988).
9. The "Facility Regulations" (Notice No. R. 2362 of 5 October 1990).
10. The "Lead Regulations" (Notice No. R. 236 of 28 February 2002).
11. The "Vessels Under Pressure Regulations" (Notice No. R. 1591 of 4 October 1996).
12. The "Lift, Escalators and Passenger Conveyor Regulations" (Notice No. R. 797 of 29 April 1994).
13. The "Hazardous Chemical Substances Regulations" (Notice No. R. 1179 of 25 August 1995).
14. The "Major Hazard Installation Regulations" (Notice No. R. 692 of 30 July 2001).
15. The "Regulations for Hazardous Biological Agents" (Notice No. R.1390 of 27 December 2001).
16. The "Explosive Regulations" (Notice No. R.109 of 17 February 2003).
17. The "Construction Regulations" (Notice No. 1010 of 18 July 2003).
18. The "Diving Regulations" (Notice No. 10 of 11 January 2002).
19. The "Noise-Induced Hearing Loss Regulations" (Notice No. 307 of 7 March 2003).

E.5. Mine Health and Safety Act (Mechanical / Electrical):

Competence must be demonstrated in applying in the work context relevant sections of:

1. The Mine Health and Safety Act (No. 29 of 1996), definitions.
2. Regulations under the Mine Health and Safety Act.
3. Regulations under the Minerals Act Regulations.
4. Amendments to the Act and Regulations. Applicable regulations include:
> Machinery guidelines issued in terms of Section 9 (3) of the Mine Health and Safety Act.
> SANS referenced in Regulations and Guidelines.

E.6. Mine Health and Safety Act (Mining):

Competence must be demonstrated in applying in the work context relevant sections of:

1. Mine Health and Safety Act, No 29 of 1996.
2. Regulations made or deemed to have been made under the Mine Health and Safety Act (previously under the Minerals Act) that relate to health and Safety issues.
3. Mines and Works Act, 1956 Definition and Section 9 of the Mines and Works Act, which was not repealed by the Minerals Act 1991.
4. Act No 72 of 1997: Mine Health and Safety Amendment Act, 1997.

UNIT STANDARDS
This qualification is not based on Unit Standards.

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION
None