

Government

Statutes

**REPUBLIC OF SOUTH AFRICA
REPUBLIEK VAN SUID-AFRIKA**

Vol. 523

**Pretoria, 9 January 2009
Januarie**

No. 31762

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GOVERNMENT NOTICES

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

No. 3

9 January 2009



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

Aerospace Operations

registered by Organising Field 10: Physical Mathematical, Computer and Life Sciences, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saqqa.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 9 February 2009**. All correspondence should be marked **Standards Setting – SGB for Aerospace Operations** and addressed to

The Director: Standards Setting and Development
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ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION: National Certificate: Aviation Support Operations

SAQA QUAL ID	QUALIFICATION TITLE		
65010	National Certificate: Aviation Support Operations		
ORIGINATOR	PROVIDER		
SGB Aerospace Operations			
QUALIFICATION TYPE	FIELD	SUBFIELD	
National Certificate	10 - Physical, Mathematical, Computer and Life Sciences	Physical Sciences	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	121	Level 3	Regular-Unit Stds Based

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

PURPOSE AND RATIONALE OF THE QUALIFICATION

Purpose:

This Qualification is for any individual who is, or wishes to be, involved in the aviation sector especially in the fields of aviation support. The aspects of ramp handling, passenger handling, cargo handling, airport/aviation security, loads and balances and cabin crew constitute aviation support. While the focus of this Qualification is on these fields, it is possible that other airport services could also be included in the qualification. The Qualification contains all the competencies, skills and values required by a learner who may wish to access a higher qualification in management within the aviation support sector.

The core component contains competencies in:

- > Regulatory framework and regulatory bodies operating within the aviation industry (including international conventions).
- > Aircraft orientation, the theory of flight, general knowledge of loads and balances.
- > Geography and concepts pertaining to aviation.
- > Human factors in aviation.
- > Occupational Health and Safety.
- > Aviation security and safety.
- > Customer service excellence.
- > Team Work.
- > HIV and AIDS.

The Elective component currently allows for streams of specialisations in ramp handling, cargo handling and aviation/airport security. The learner will acquire specialist knowledge, skills and insight into one of these streams.

Learners working towards this qualification will find that the acquisition of competence in the Unit Standards, which make up the qualification, will add value to their work performance. This qualification is intended to enhance the provision of service within the aviation support operations sector.

Through building day-to-day aviation support operations specialisation related skills, as well as general operational competencies, the qualification ensures progression of learning, enabling the learner to meet standards of service excellence required within the aviation support operations field of learning.

The Qualification will provide the broad knowledge, skills and values needed in the aviation support operations field in all sectors and will facilitate access to, and mobility and progression within, education and training for learners who:

- > Were previously disadvantaged or who were unable to complete their schooling for whatever reason.
- > Have worked in this field for many years, but have no formal qualifications and would like to achieve this qualification through the process of Recognition of Prior Learning (RPL) and/or formal study.
- > Wish to extend their range of skills and knowledge and hence their competencies in aviation support operations.

The Qualification has building blocks that can be developed further in qualifications at a higher level. It also focuses on the skills, knowledge, values and attitudes required to progress further. The intention is:

- > To promote the development of knowledge, skills and values that are required for service excellence within the field of aviation support operations.
- > To release the potential of people.
- > To provide opportunities for people to move up the value chain.
- > To provide opportunities for people to explore different activities within the aviation support operations sector.

Rationale:

The National Certificate: Aviation Support Operations at NQF Level 3 is designed to meet the needs of those learners who are already involved, or wish to become involved, in this field. It is applicable to employed and unemployed learners. Currently there is no qualification for these learners. Aviation Support Operations constitutes a series of essential services currently being rendered at all airports. As the local demand for air travel increases significantly year on year, as South Africa becomes more of a tourist destination and as 2010 approaches the demand for these essential airport services will grow astronomically. It will in the interest of the country, airport management and operators ensure that their employees are trained according to this Qualification in order to improve productivity and efficiency.

The structure of this Qualification will allow learners to acquire a set of generic competencies in Aviation Support Operations and then to specialise in one of several streams. It will also allow learners to change direction within the Aviation Support Operations sector should they discover that a particular specialisation is not something that satisfies their career trajectory. There is therefore sufficient possibility for increased specialisation without the need to do an entire qualification. There is also the need for highly skilled Aviation Support personnel at our airports.

The National Certificate: Aviation Support Operations at NQF Level 3 is the first qualification in this sector. In terms of a learning pathway the learner will be able to pursue either a pathway in transport by doing the Further Education and Training Certificate: Dangerous Goods: Multi-modal Transport or a pathway in management by doing the Further Education and Training Certificate: Generic Management and the National Certificate: Generic Management at NQF Level 5. The latter two qualifications will make it possible for the learner to become a manager within the Aviation Support Operations sector and perhaps within the broader aviation sector.

The National Certificate: Aviation Support Operations at NQF Level 3 supports the objectives of the NQF in that it gives the learner access to a registered qualification. It will ensure that the quality of education and training in the sub-field is enhanced and of a world-class standard. The Qualification will allow learners not only to develop their knowledge and skills in the field of Aviation Support Operations but will also enable them to benchmark their competence against international standards.

RECOGNIZE PREVIOUS LEARNING?

Y

LEARNING ASSUMED IN PLACE

- > Mathematical literacy at NQF Level 2.
- > Communication at NQF Level 2.

Recognition of Prior Learning:

The structure of this Unit Standard-based Qualification makes the recognition of prior learning (RPL) possible, if the learner is able to demonstrate competence in the knowledge, skills, values and attitudes implicit in this Qualification.

Learners who already work in the Aviation Support Operations environment and who believe that they possess the competencies to enable them to meet all of the outcomes listed in the Unit Standards will be able to present themselves for assessment against the Unit Standards of their choice. Once found competent, these learners will be certified as competent and credited accordingly. Recognition of Prior Learning can also be conducted for these learners at qualification level, by means of Integrated Assessment.

RPL will allow for accelerated access to further learning and gaining of credits towards the qualification. All RPL ought to be carried out by the provider in agreement with the relevant ETQA or another ETQA that has a Memorandum of Understanding in place with the relevant ETQA.

QUALIFICATION RULES

A minimum of 121 credits is required to complete the Qualification which is made up of the following components:

- > Fundamental: 36 credits.
- > Core: 63 credits.
- > Electives: 22 credits.
- > Total: 121 credits.

Motivation for the number of credits assigned to the Fundamental, Core and Elective Components:

Fundamental Component:

There are 36 credits allocated to this component at the level of the Qualification. These credits are made up as follows:

- > 20 credits for Communication Fundamentals.
- > 16 credits for Mathematical Literacy Fundamentals.

All the Unit Standards designated as Fundamental are compulsory.

Core Component:

63 credits have been allocated to Unit Standards designated as Core for the purpose of this Qualification. These Unit Standards provide the generic knowledge and skills related to Aviation Support Operations as highlighted in the Purpose Statement.

All the Unit Standards indicated as Core are compulsory.

Elective Component:

Electives must add up to a minimum of 22 credits. The Elective component consists of three specialisation streams, namely, ramp handling, cargo handling and aviation security. It also consists of a general stream. Other streams, listed below, will be included in the future. Each of these streams constitutes/will constitute a set of appropriate Unit Standards that allow the learner the opportunity to obtain competencies in particular areas within the Aviation Support Operations sector.

These Elective streams provide opportunities for the holistic development of the learner and allow for maximum flexibility and multi-skilling to enable the learners to achieve a Qualification that is relevant to the context in which they work.

The proposed (future) streams are:

- > Weight and balances.
- > Passenger handling.
- > Cabin Crew.

Where the total credits of the Unit Standards in the specialisation do not add up to a minimum of 21 credits, the learner may choose any other Unit Standard/s from the General Stream component to complete the minimum number of Elective credits required.

Specialisation Stream 1: Ramp Handling:

Learners must do ALL the Unit Standards from the list below.

- > ID 261178: Discuss ground movement of aircraft by tow tractors, Level 4, 14 Credits.
- > ID 261217: Explain the functions and responsibilities of a flight supervisor and/or ramp agent, Level 4, 10 Credits.
- > ID 261177: Demonstrate understanding of transportation and aircraft support servicing, Level 3, 15 credits.
- > ID 261199: Handle and operate main deck freighter aircraft, Level 3, 7 Credits.
- > ID 242994: Handle and load dangerous goods for transportation by air, Level 3, 2 Credits.

Total Number of Credits for Ramp Handling: 48 credits.

Specialisation Stream 2: Cargo Handling:

Learners must do ALL the Unit Standards from the list below.

- > ID 252427: Outline the structure of the airfreight forwarding environment, Level 3, 4 Credits.
- > ID 252436: Document and handle export airfreight general non-hazardous cargo, Level 3, 6 Credits.
- > ID 242986: Accept and process dangerous goods for transportation by air, Level 4, 6 Credits.
- > ID 252422: Calculate cost of Airfreighting goods, Level 3, 5 Credits.
- > ID 242994: Handle and load dangerous goods for transportation by air, Level 3, 2 Credits.

Total Number of Credits for Cargo Handling: 23 credits.

Specialisation Stream 3: Aviation/airport Security:

Learners must do ALL the Unit Standards from the list below.

- > ID 252428: Secure cargo for airfreight, Level 3, 6 Credits.
- > ID 242835: Operate x-ray screening equipment within a security environment, Level 4, 3 Credits.
- > ID 242828: Apply passenger security assessment in a port environment, Level 4, 2 Credits.

Total Number of Credits for Aviation/airport security: 11 credits.

General Stream:

- > ID 113836: Apply basic computer technology, Level 3, 11 Credits.
- > ID 113829: Operate within a logistics environment, Level 3, 10 Credits.
- > ID 242814: Identify and explain the core and support functions of an organisation, Level 3, 6 Credits.
- > ID 113830: Conduct costing and budgeting, Level 4, 9 Credits.
- > ID 117731: Demonstrate an understanding of cultural awareness in the workplace, Level 3, 4 Credits.
- > ID 116490: Identify key ethical values for human conduct, Level 3, 6 Credits.
- > ID 242820: Maintain records for a team, Level 3, 4 Credits.
- > ID 244563: Perform work using a project approach, Level 3, 8 credits.

Total Number of Credits for the General Stream: 58 credits.

EXIT LEVEL OUTCOMES

1. Demonstrate and apply understanding of the legal framework within which aviation support takes place.
2. Maintain a healthy and safe aviation support environment.
3. Explain the importance of aviation security and aviation safety.
4. Discuss human factors as they relate to aviation.
5. Discuss aviation related aspects pertaining to aviation support operations.
6. Describe factors contributing to improving the performance of aviation support operations.

Critical Cross-Field Outcomes:

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

- > Applying the principles of conflict management when dealing with a client's complaints.
- > Developing a plan of action to minimise negative influences and enhance the performance of a group, and in applying a code of conduct to own decisions.
- > Making decisions about their own lifestyle and creating a caring environment for individuals with HIV/Aids.
- > Implementing and maintaining health and safety legislation in a workplace.
- > Encountering a security breach or unlawful interference and reporting to appropriate authority.

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

- > Participate with others in the appraisal of current customer care procedures and offer constructive criticism to improve these.
- > Render basic first aid.
- > Take reasonable care of his/her and other's safety in the workplace, which shows concern for entire team.
- > Tight fires in the workplace.
- > Ensure a safe and secure aviation environment at the airport at all times.

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

- > Preparing for a meeting with a client, ensuring that all the clients requests or queries have been fulfilled or are answerable.
- > Rendering basic first aid.
- > Planning a work schedule for a team based on the strengths and weaknesses of individual members.
- > Making lifestyle choices about HIV/AIDS.
- > Taking into account the activities around him/her and ensure that his/her actions regarding health and safety are complementary to other initiatives.
- > Ensuring a safe and secure aviation environment at the airport.
- > Explaining aircraft layout (main components and internal features) and the aerodynamics of flight.
- > Identifying and using aviation terminology, aviation codes and aviation concepts.

Collect, analyse, organise and critically evaluate information to:

- > Document all communications with clients, including the written confirmation of any verbal undertakings or commitments.
- > Assess the strengths and weaknesses of the group and individual members of a team.
- > Research situations that have a potential to spread HIV/Aids in the workplace and discuss and rate them in terms of high, medium and low risk.
- > Implement and maintain health and safety legislation.
- > Appreciate the importance and functions of regulatory bodies and the South African legislative framework.
- > Discuss the role of human factors in aviation.

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

- > Compile status reports on the interaction with clients and the feedback received.
- > Explain the stages of HIV/AIDS and present an example of what happens at each stage of the progression of the disease.
- > Communicate actions resulting from the implementation and maintenance of health and safety legislation.
- > Show understanding of the regulatory bodies and South African legislation.
- > Ensure a safe and secure aviation environment at the airport.
- > Use a ground radio and hand held radio and appropriate hand signals.
- > Communicate using the correct aviation terminology and aviation codes.

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

- > Utilising information technology and the associated electronic media to communicate with clients.
- > Using the radio equipment according to manufacturer's instructions.

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

> Demonstrating knowledge and understanding of the implications of HIV/AIDS for society, the economy, an organisation and a specific workplace.

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

- > International aviation regulatory bodies are discussed in terms of their roles and functions.
- > The importance of adhering to international aviation standards is discussed in terms of new technological innovations.
- > Regional and national aviation and transport regulatory bodies are discussed in terms of their roles and functions.
- > South African legislation pertaining to aviation and airport operations is discussed to emphasise the national legal parameters within which aviation activities are conducted.
- > Legislation and regulation pertaining to airport security are discussed to emphasise the need for secure national keypoints (in this case airports).

Associated Assessment Criteria for Exit Level Outcome 2:

- > The basic principles of the relevant legislation is explained to serve as a basis for deepening of knowledge in health and safety and ensuring compliance.
- > The requirements for compliance to current legislation are discussed so that the health and safety of workers/employees is not compromised.
- > The management and administrative controls required under legislation are determined to indicate the extent of company responsibility in occupational health and safety.
- > Basic first aid and fire-fighting skills are applied according to the health and safety regulations.
- > The aviation environment is discussed in terms of it being supportive to employees/workers living with HIV and Aids.

Associated Assessment Criteria for Exit Level Outcome 3:

- > The regulatory framework is discussed to show how it supports the maintenance of aviation security at the airport.
- > The airport is discussed in terms of restricted and non-restricted areas, and access and egress.
- > Violations of airport security are discussed using examples.

Associated Assessment Criteria for Exit Level Outcome 4:

- > Incidents in aviation are identified and described in terms of how they are attributable to the impact of human factors.
- > The effects of flight on the physiological functions of the human body are described with examples.
- > Human factors and environmental hazards that affect work performance are described with examples.
- > Knowledge of human performance and limitations in the context of aviation support is demonstrated with examples.
- > Knowledge of social psychology is demonstrated within the aviation context.

Associated Assessment Criteria for Exit Level Outcome 5:

- > Aviation terminology is describe and explained to outline the aviation operations.
- > Aviation codes, concepts and processes are discussed to familiarise learners with the sector.
- > Aircraft is discussed in terms of main external and internal components.

- > The aerodynamics of flight are explained to obtain a basic idea of how the aircraft flies.
- > Flight is discussed in relation to the influence of concepts like load and balance and centre of gravity on flying.

Associated Assessment Criteria for Exit Level Outcome 6:

- > The principles of customer care are applied in client interactions to provide service excellence and to improve the image of the organisation.
- > Knowledge of self and team is demonstrated in order to develop a plan to enhance team performance.
- > Problem solving strategies are applied to ensure efficiency and timeous delivery of service.

Integrated Assessment:

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

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

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

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

Integrated assessment must be designed to achieve the following:

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

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

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

INTERNATIONAL COMPARABILITY

The international comparability is done against the backdrop of the competencies in the core component of the qualification and the specialisations that have developed and that will be developed in future. The Core competencies in this Qualification are:

- > Regulatory framework and regulatory bodies operating within the aviation industry (including international conventions).
- > Aircraft orientation, the theory of flight, general knowledge of loads and balances.
- > Geography and concepts pertaining to aviation.
- > Human factors in aviation.
- > Occupational Health and Safety (Dangerous Goods).
- > Aviation security and safety (include sms and qms (awareness)).
- > Customer service excellence.
- > Team Work.
- > HIV and AIDS.

International Air Transport Association (IATA/ISAGO):

Training in the aviation sector must comply with common international standards which, in the case of this Qualification, fall in the realm of IATA's Safety Audit for Ground Operations (ISAGO).

ISAGO is meant to improve safety and reduce cost in the ground environment. Based on the IATA Operational Safety Audit framework, ISAGO aims to implement a formal, systematic process to manage operational risk and safety, reducing accidents, incidents and injuries.

Four task forces are active in standards development and maintenance:

- > Airside Operations.
- > Cargo Operations.
- > Terminal Operations.
- > Systems Organisation & Management.

These are the areas covered by this Qualification.

With the implementation of the IATA Safety Audit for Ground Operations (ISAGO), the primary aim is to drastically reduce accidents and injuries on the ground. Gain knowledge on the ISAGO programme and the standards to which Ground Service Providers will be audited.

ISAGO's programme is designed for:

- > Ground Services Providers' Operations Managers.
- > Airline Ground Handling Operations Managers.
- > Airline and Ground Service Provider.
- > Safety Managers.
- > Quality Managers.

The Course Content is as follows:

- > Introduction to ISAGO for Ground Services Providers.
- > ISAGO Programme.
- > ISAGO Registration.
- > Audit Sharing.
- > Audit Preparation.

- > ISAGO Standards and Recommended Practices (This is of relevance to this Qualification).
- > Electronic Audit System.

This programme is being offered in the following cities and countries:

- > Nairobi, Kenya.
- > Miami, USA.
- > Kuwait.
- > Cairo, Egypt.
- > Geneva, Switzerland.
- > Singapore.
- > Beijing, China.
- > Montreal, Canada.

Most of the courses from the countries investigated are short in duration. There is a huge overlap between competencies in the short courses and the Unit Standards that address those very same competencies.

The United States:

The US is the world leader in aviation.

Pan American Training Institute (PATI) offers IATA Certification in dangerous goods:

Course 1:

Dangerous Goods IATA Initial Certification.

Dangerous Goods Initial Certification courses for Air Cargo Agents, Forwarders, Warehouse Personnel, Truck Drivers, Fleet Service, Passenger Agents, First Responders and Crew. Attendees must be proficient in English. Dangerous Goods by Air is a three-day training course designed to meet the training requirements of ICAO, Annex 18, IATA Cargo Resolution 618, 172.702 and 172.704 Title 49 CFR. A fourth day is added for those wishing Radioactive Acceptance Certificate. Trainees will use IATA Dangerous Goods Regulations to learn:

- > Dangerous Goods Classes and Divisions - Dangerous Goods Definitions.
- > Dangerous Goods List - Marks and Labels - Packaging Requirements.
- > Documentation - Responsibilities of Shipper Agent and Carrier.
- > Radioactive Materials - State and Operator Variations.

Course 2:

Dangerous Goods Awareness Seminar.

Dangerous Goods Awareness Seminar for Pilots, Flight Attendants, Passenger Service and Ramp Agents, Line Maintenance as well as Shipping, Stores, and Warehouse Personnel who may come in contact with dangerous goods. Attendees must be proficient in English. Dangerous Goods Awareness Seminar is 1/2 day training course designed to meet the training requirements of 49 CFR 172.702, 172.704, IATA Cargo Resolution 618.

Reem Aviation Security Consultants, LLC offers the following training courses:

- > Cargo Security Training:
 - > This includes assessments, training, implementing procedures and oversight.

> Cargo Acceptance and Handling Training:

> A comprehensive solution to cargo acceptance that includes training programs, forms, records, handouts and implementing procedures.

> Cargo Screening Training:

> This is TSA compliant screener training. Components of the program include a training curriculum (with an extensive IED recognition module), forms for all your screening operations needs, handouts and implementing procedures.

> All Cargo Operations Training:

> Airlines operating or are interested to establish air service to the US can use our team of experts to assist corporate security managers in establishing procedures and training sessions that are compliant with Transportation Security Administration requirements.

Austria:

Austrian Airlines Group conducts the following training course:

> Aircraft Handling and Ramp Supervision.

Target Group:

> Personnel engaged in aircraft-, cargo- and ramp handling services.

Qualifications:

> At least 3 months employed at any airline (in any ground handling function).

> Basic airline knowledge and mathematical understanding.

> Passenger handling training recommended.

Objective:

You will be trained in all aspects of ramp- and aircraft handling procedures.

Contents of Course:

> Ramp handling (including safety at work, ground handling procedures, relevant documents).

> Ramp safety training at the Vienna Airport (including: policies, procedures, operating practices, human factors, operational hazards).

> Austrian Airlines Group fleet.

> Guidelines and manuals for ramp handling and load control staff.

> Cabin layout and compartment description.

> ULD handling.

> Compartment dimensions and limitations.

> Special load regulations.

> Load planning.

> Estimated zero fuel weight calculations.

> Loadsheet and balance tables basics.

> Operational-, schedule- and slot messages.

> Dangerous Goods.

Germany:

Munich Airport Academy - Airport and Aviation Training:

The ground-handling training courses include:

- > Dangerous goods.
- > Safety and security (ramp area, terminal and aircraft).
- > Aircraft compartments (all types of aircraft).
- > Loading instructions (all types of aircraft).
- > Airline/airport codes.
- > Towing vehicles and band conveyer.
- > Ground power units.
- > Container transporters.
- > Stairway for narrow-body and wide-body aircraft.
- > Lifter.
- > Air start units.
- > Potable water supply for aircraft.
- > Aircraft faeces disposal.
- > Passenger transport (buses, VIP services, disabled service).
- > Communication systems (radio, data-link, etc).

Our ICAO/IATA standard aviation training courses can be delivered to all personnel, including shippers, packers, cargo-handling staff, ground-handling passenger-handling staff, flight crews, load planners, cabin crews and screening staff.

Dangerous goods aviation training:

Our dangerous goods training is delivered to ICAO/IATA standards, and is available for all personnel involved in the flight process. This includes shippers, packers, staff involved in processing, handling and accepting dangerous goods and other cargo, and operators and ground-handling staff dangerous goods, cargo, mail and baggage.

We also supply dangerous goods courses for passenger handling staff, flight crew, load planners, cabin crew and screening staff.

Aircraft handling and passenger handling courses:

We also offer courses in aircraft handling and passenger handling. Elements of the former include aircraft loading and unloading, dangerous goods regulations, and special driving licences, while the latter covers ticketing, check-in procedures, baggage handling, and lost and found services.

Pilot, engineer and traffic controller courses:

Amongst the other courses we provide for those involved in the aviation industry, including pilots, aircraft engineers and air traffic controllers, are:

- > Radio communication licences.
- > VFR procedures.
- > IFR procedures.
- > Meteorology.
- > Navigation.
- > Marshalling.
- > Aircraft technical courses.
- > Aircraft recognition.
- > Apron control.

3D aviation training simulator:

The Aviation Academy of Munich Airport International is equipped with a state-of-the-art 3D real-time simulator. It possesses a six-channel back projection system, up to 270° field of view, flight information system, Thales multi-lateration radar system, airfield lighting panel, four communication systems and three pseudo pilot stations.

We are able to provide complete aerodrome control training, starting from receiving en route clearance, push-back and taxi control by apron or ground and tower control until the handover to departure control. The system can be easily adapted to each customer's needs.

We are able to offer the following simulator sessions:

- > Apron control.
- > Tower control.
- > Procedure development.
- > Procedure training.
- > Low visibility training.
- > Emergency training.
- > System failure training.

All simulator sessions can be coached by expert trainers, or you may rent the system and bring your own coaches.

We provide modern and inexpensive facilities for our trainees. These include air-conditioned course and conference rooms with a capacity of 80 people, a variety of social programmes, and accommodation - with any special conditions required - at several hotels near the academy.

India:

Speedwings Academy for Aviation Services.

Course 1: This is a 5 month course.

Level-1 IATA/UFTAA Foundation.

Learning the Basics of Travel and Tourism and pricing logic.

Key benefits:

- > Understand the important role of travel and tourism industry in achieving optimum levels of technology and professionalism.
- > Familiarize with industry codes.
- > Regulations.
- > World Geography.
- > Visa regulations.
- > Air fares.
- > Ticketing.
- > Answer customer queries.
- > Explain travel conditions.
- > Make appropriate travel arrangements and reservations.
- > Calculate and quote appropriate air fares.
- > Complete international travel formalities in accordance with the applicable IATA rules and procedures.

Major Topics:

- > Industry Country codes.
- > Airport/city codes.
- > Airline codes.
- > Airline prefix.
- > Geography in Travel Planning 1.
- > Travel Formalities.
- > Visa regulation.
- > Air Transport Essentials.
- > Customer Service.
- > Air Fares and Ticketing 1.

Most of these aspects are covered by the Qualification. The same applies to Course 2 below. In fact, the Cargo Handling specialisation in the Qualification is more extensive than Course 2 below.

Course 2: This is a 5 month course.

IATA-FIATA Cargo Introductory.

Learn cargo service skills to industry standards.

Key Benefits:

- > Enhance your knowledge and understanding in cargo acceptance and handling procedures.
- > Gain proficiency to extend useful advice to clients in Import/export rules and regulations.
- > Make appropriate arrangements and reservations for cargo shipments.
- > Acquire the skills and tools to apply the right cargo rates.
- > Identify cargo qualifying for specific commodity and class rates.
- > Learn how to correctly issue air way bills in accordance with the applicable IATA rules and procedures.
- > Acquire skills in Special Cargo acceptance and handling.
- > Familiarize in ULD's and aircraft structural limitations.

Major Topics:

- > Industry regulations.
- > The Air Cargo Agency.
- > World Geography.
- > Air Cargo acceptance.
- > Cargo booking procedures.
- > Cargo automation.
- > Air cargo rates and charges.
- > Shippers letter of Instruction (SLI).
- > Air way bill.
- > Aircraft Handling facilities.
- > Type of Aircrafts and Aircraft structural limitations.
- > Special cargo acceptance and handling procedures; Perishable cargo.
- > Introduction to ULD.

Course 3: This is a 4 month course:

IATA/FIATA Air Cargo Rating.

Gain better understanding of Cargo rating and Billing rules.

Key Benefits:

- > Learn to quote published rates and charges for cargo shipments.
- > Apply advanced construction and combination principles for unpublished rates.
- > Qualify to calculate the appropriate rates and charges for mixed consignments and unit load devices (ULDs).

Major Topics:

- > Review of basic cargo rating principles.
- > Currency Regulations.
- > Construction rates (add-on-amounts).
- > Combinations of Rates and Charges.
- > Mixed consignments.
- > Unit Load Devices.
- > Type of Aircrafts.
- > Aircraft structural limitations.
- > Special cargo acceptance and handling procedures; Perishable cargo.

Course 4: This is a 2 month course:

IATA-FIATA Dangerous Goods Regulations.

Handling of hidden dangerous goods and hazardous materials.

Key Benefits:

- > Understand the basics of the current Dangerous goods regulation.
- > Identification/Classifications/Labeling/Packaging/Documentation.
- > Handling.
- > Limitations and special provisions.
- > Gain awareness of hidden hazards.
- > Accident and incident reporting.
- > Emergency response matrix.
- > Dangerous goods in passenger baggage.
- > Awareness in legal aspects and the responsibility of shipper, agent and Airline.

Major Topics:

- > Purpose of Dangerous Goods Regulations.
- > How to use the Regulations.
- > Definition of Dangerous Goods.
- > Basis and application of the Regulations.
- > Shippers responsibilities/Operator's responsibilities.
- > Forbidden Dangerous Goods/Hidden Dangerous Goods.
- > Radioactive Materials.
- > Handling and Checking procedures.

Course 5: This is a 3 month course:

Flight Handling and Load Control.

Boost your knowledge of aircraft operations.

Key Benefits:

- > Understand the major ground handling concepts and principles.
- > Airside/airport security measures.
- > Managing complex issues that involve numerous people.
- > Increase your company's revenues and profitability through more effective quality services.
- > Gain insight into the latest developments and trends in aviation regulatory requirements.

Major Topics:

- > Passenger, baggage and cargo handling and manifestation.
- > Special Passengers and Cargo.
- > Transit and thru Connections.
- > Carriage of Live Animals and DGR.
- > ULD System control.
- > Flight planning.
- > Passenger and Cargo Aircraft.
- > Aircraft structural limitations.
- > Holds/Doors/Floor Load density.
- > Load Control.
- > Re-configuration.
- > Loading Instruction.
- > Seat plan.
- > NOTOC.
- > Ramp and safety.
- > Weight and Balance.
- > Aircraft loading and stowage.
- > Flight Dispatch Control system.

Indonesia:

The Training Centre in Garuda offers the following Ramp Handling Course:

Course Objective:

By the end of this course, the participants are expected to:

- > Understand ramp activities and responsibilities at the airport.
- > Know how to coordinate ramp activities.

Course Outline:

This course covers the following topics:

- > Catering control.
- > Load control.
- > Passenger control.
- > Cargo control.
- > Baggage control.
- > Cleaning service control.
- > Refueling control.

Singapore:

The Singapore Aviation Academy, Civil Aviation Authority of Singapore offers the Airport Ramp Operations and Management Course:

Course Synopsis and Methodology:

Module I: Airport Ramp Operations:

- > Overview of Airside Operations.
- > Airside Infrastructure and Operations.
- > Passenger/Baggage Handling Facilities.
- > Ramp and Aircraft Stand Planning.
- > Safety Clearances and Ramp Markings.
- > Stand/Gate Assignments.
- > Ramp Management Service.
- > Ramp Handling Service.
- > Civil Maintenance of the Airside.
- > Maintenance of Airfield Installations.
- > Airside Estate Management.
- > Aircraft Maintenance.
- > Pest, Animal and Bird Control.
- > Ground Movement Control.
- > Airside Rules and Regulations/Enforcement.
- > Standard Operating Procedures.
- > Contingencies for Airside Operations.
- > Performance Standards and Target Setting.
- > Ramp Safety Audits.
- > Airside Security.
- > Airside Fire Safety Requirements.
- > Aircraft Accident Investigation.
- > Accident Investigation (Personnel/Vehicles/Equipment).
- > Aircraft Salvage/Equipment.
- > Aircraft Emergency Support.
- > Fuel Farm and Hydrant Systems.
- > Future Trends in Airside Operations.
- > Case Study on Impact of Low Cost Carriers on Ramp Operations.
- > Improvement of Ramp Operations.
- > Group Exercise (Stand Assignment, Ramp Operations Committee, Contingency Planning).
- > Site Visits to Airport Fire Station, Passenger Terminal, Airside, Ramp Control, Baggage Coordination Centre and Fuel Farm.

Module II: Airport Ramp Management:

- > Overview of Airside Management and Organisational Structure.
- > Key Players in Ramp Operations and Management - Functions and Responsibilities.
- > Airside Planning, Development and Concepts.
- > Airside Management.
- > Airside Policies and Ground Handling Agreements.
- > Aerodrome Certification (International Ramp Requirements; Regulatory System).
- > Legislations applicable to Airside Operations (Penal Code, Air Navigation Order, Supplements, Regulatory Acts) Managing Ground Handling Agents and Changing Trends.
- > Air Cargo and Logistics Management.
- > Airside Maintenance (Cleaning, Inspection, Estate Management, etc).
- > Airport Emergency Plan.
- > Aircraft Crash Management and Action.
- > Crisis Management of Aircraft Accidents.

- > Working Committees, e.g. Airline Operators Committee.
- > Case Study on Apron Layout and Policy.
- > Group Exercise on adapting to Changing Trends in Airside Operations.
- > Site Visits to Ramp Control, Casualty Clearance Station, Baggage Handling Area.

Oman:

Oman Air offers the following courses:

Course 1: RH/Ramp Handling:

Objectives:

By the end of the course the participants will be able:

- > To appreciate the rules and regulations involved in loading.
- > To understand the responsibilities of each staff category.
- > To identify different types of load i.e. baggage, mail and cargo.
- > To read and understand the Loading Instructions Report Forms.
- > To identify ULD Types.
- > To apply restraint procedures for loads.

Contents: Aircraft Types (Narrow Bodied/Wide Bodied):

- > How Aircraft Flies.
- > Balance Conditions.
- > Different Types Of Loads i.e. Baggage, Cargo and Mail.
- > Loading Restrictions/Instructions and Forms/Load sheets.
- > ULDs.
- > Loading Restraints/Spreaders.
- > Ramp Safety.
- > Special Loads/Overview of Dangerous Goods.

Course 2: RSG/Ramp Safety (Arabic and English):

Objectives:

The participants will be able:

- > To work with an understanding of the basic ramp safety rules and procedures.
- > To understand the human factors involved in safety.
- > To understand that all accidents/incidents can be avoided by being attentive, aware and responsible.

Contents:

Airport Ramp Safety Rules and Regulations:

- > Ramp Safety Procedures.
- > Driving Skills.
- > Hazards on the Ramp.
- > Personal Protective Equipment and Weather Conditions.
- > Effects of Drugs and Alcohol.
- > Types of Fires/Extinguishers/Fire Hazards and Fire Prevention.
- > Foreign Object Damages (FOD).

- > Cost of Accidents and Un-reported Damages.
- > Dangerous Goods and Their Safe Handling.
- > Special Cargo and Unit Load Devices.
- > Hand Signals used on the Ramp.
- > Motivation/Attitude/Discipline/Team Work/Communication.
- > Creating a General Airside Safety Awareness.

Course 3: BCA/Basic Cargo Aviation Course:

Objectives:

To provide the participants with a good background of aviation, in order for them to understand the airline procedures. They will also become more aviation oriented and work more effectively in their capacity as new comers/trainees. Above all they will be in a position to start the cargo rates with a better understanding.

Contents: IATA/ICAO:

- > Traffic Rights.
- > 24-Hour Clock System/Time Calculations/UTC.
- > ABC/OAG Guides.
- > Shipper's Info to the Carrier.
- > Air Waybill.
- > Volume and Weight.
- > Complete An Air Waybill.
- > Post Office Mail.

Course 4: BCR/Basic Cargo Rates Course:

Objectives:

To be able to quote published rates/charges for most types of shipments and prepare appropriate document for the carriage.

Contents: Cargo Rating System:

- > Calculation of Chargeable Weight.
- > Minimum Charge.
- > General Cargo Rates.
- > Class Rates.
- > Specific Commodity Rates.
- > Valuation Charges.
- > Documentation.
- > Special Cargo/Live Animals/Dangerous Goods.
- > Loading.

Course 5: ACR/Advanced Cargo Rates Course:

Objectives:

To be able to apply correct rates/charges for most types of shipments, including ULD Rates/Mixed Consignments Combinations and prepare appropriate document for the carriage.

Contents: Cargo Rating System:

- > Calculation of Chargeable Weight.
- > Minimum Charge.
- > Mixed Consignments.
- > ULD Rates.
- > Construction and Combination of Rates and Charges.
- > Documentation.

Course 6: LCA/Load Control Awareness and Cargo Handling:

Objectives:

To create awareness in the non-load control staff, so that they will be able to identify how their application of correct principles of cargo handling and ramp handling will lead to the safety of the aircraft and its load.

Contents:

- > Theory of Flight.
- > Principles of Weight and Balance.
- > Maximum Operating Weights.
- > Load Planning and Restraint.
- > Special Loads/Load Control Documents.

Kuwait:

The National Aviation Services Academy offers IATA approved course in:

- > Travel and Tourism.
- > Cargo and Dangerous Goods.
- > Airport and Civil Aviation procedures.
- > Passenger Services.
- > Ground Handling Operations.

Sri Lanka:

Sri Lankan Airlines offers the following course:

Course Title:

Basic Ramp Handling Training.

Course Duration:

- > 13 days classroom training.
- > 5 days on the job training.

Course Contents:

- > Introductory Airline.
- > Team Building.
- > Basic Ramp Handling.
- > Introduction of Ramp.
- > Aircraft Types.
- > Aircraft Unit Load Device.
- > Aircraft Floor Loading Limitations.

- > Special Loads.
- > Introduction to Dangerous Goods Regulations.
- > Density Volumetric Limitations.
- > Restraining Principles.
- > Ramp Communication.
- > Ramp Safety.
- > Ramp Duties and Responsibilities.
- > Communication Skills.
- > Leadership Skills.
- > Customer Service Skills.

The United Kingdom:

Three qualifications from the UK closely match this Qualification in terms of scope and coverage of competencies.

Course 1: City and Guilds Level 2 Certificate in Aviation Operations on the Ground:

Qualification summary:

This Certificate will provide candidates with the relevant skills in Health, Safety, Security and Communications required to work within an Aviation Environment, plus will give candidate the option to choose one optional unit from a range of Aviation Operations functions, as listed below.

This qualification will also act as the required Technical Certificate for the Level 2 Ground Operations Apprenticeship Framework.

This certificate is required to have 4 Unit Standards; 3 mandatory and 1 optional.

The mandatory units are:

- > Health and Safety within Aviation.
- > Aviation Security.
- > Aviation Communications.

Optional units:

- > Airport Check in Services.
- > Aircraft Boarding and Arrival Services.
- > Airport Baggage Processing.
- > Loading and Unloading of Aircraft.
- > Airport Baggage Facilities.
- > Airport Special Status Passengers.
- > Aircraft Load Instruction Reports.
- > Aircraft Marshalling.
- > Support Flight Operations.
- > Aircraft Dispatch Process.

Course 2: Edexcel Level 3 BTEC National Award in Aviation Operations:

Qualification summary:

The BTEC National Award, Certificate and Diploma in Aviation Operations are designed to equip individuals with the skills, knowledge and understanding required for a range of roles in

organisations within the aviation sector including ground handling, cabin crew, airside operations and passenger services. The qualifications also enable progression to BTEC Higher Nationals or undergraduate degree qualifications and professional occupations in transport-related fields.

These qualifications will:

- > Develop a range of skills, knowledge and personal qualities essential for career development and progression within the aviation and related sectors.
- > Provide learners with the appropriate knowledge and skills including health and safety, passenger handling, and customer service.
- > Contribute towards the knowledge, understanding and skills requirements for a range of level 3 aviation NVQs.
- > Focus on the practical application of knowledge and the development of the work related skills required for employment in aviation and other related sectors.

Qualification structure:

- > A: Core Units:
 - > The Aviation Industry.
 - > Health, Safety and Security in the Aviation Industry.
 - > Meeting Customer Needs in the Aviation Industry.
 - > Air Travel Information.

- > B: Option Units:
 - > Airport Ramp Handling.
 - > Aircraft and Airfield Performance.
 - > Preparation for Working in the Aviation Industry.
 - > Airline and Airport Economics.
 - > Human Resources in the Aviation Industry.
 - > Airport Emergency Operations.
 - > Environmental Impacts of Aviation.
 - > Airport Operations.
 - > Team Leadership in the Aviation Industry.
 - > Conflict Management for Aviation.
 - > First Aid and Health for Aviation.
 - > Aircraft Operations.
 - > Marketing the Aviation Industry.
 - > E-Business for Airlines.
 - > Handling Air Passengers.
 - > Air Cargo Operations.

Africa:

A check of several African countries revealed that much of the training is conducted by international training agencies like Swissport International or Transaereo, which is a company based in Columbia.

The following airlines in Africa have been trained by Swissport International Limited:

- > Air Botswana.
- > Air Malawi.
- > Air Mauritius.
- > Air Seychelles.
- > Air Zimbabwe.
- > Cargo Iberia.

- > Congo Airlines.
- > Ethiopian Airlines.
- > Kenya Airways.
- > Swazi Express Airways.
- > Zambian Airways.

Zambia:

Transaereo offers the following training:

Ramp Handling:

- > Aircraft coordination.
- > Loading and unloading.
- > Baggage handling.
- > Pallet handling.
- > Cargo transfers.
- > Maintenance coordination.
- > Cleaning.
- > Security procedures.
- > Fueling coordination.

Cargo Handling:

- > Export handling.
- > Import handling.
- > Valuables handling.
- > Perishable handling.
- > DGR-handling.
- > Cooling facilities.
- > Security systems.
- > 24/7 warehouse service.
- > Cargo loading consulting.
- > Land transfers and trucking.

Nigeria:

The Nigerian Aviation Handling Company (NAHCo) offers the following courses but does not provide any training on these aspects:

- > Passenger and baggage handling.
- > Cargo handling through its customs bonded warehouses and mail handling through postal authorities.
- > Ramp and other ground handling services through the provision of ground support equipment.

The Nigerian College of Aviation Technology in Zaria offers courses to pilots, air traffic controllers and flight engineers but does not offer courses in ramp, cargo and passenger handling.

Kenya:

Kenyan Airways Ground Services offers the following training:

Crew Training and Transport:

- > Passenger AND baggage handling.
- > Aircraft handling: loading/unloading/pushback.
- > Warehouse and ramp GSE operation.
- > Cargo handling - basic, advanced, DGR.
- > Warehouse operations.
- > ICT/CBT self-training courses.
- > WABA/load control.
- > Admin functions including supervision and or/coordination of 3rd party contracted services.
- > Fully equipped training centre - Floor area, (Base-Nairobi Cargo Centre), Student seat capacity.
- > Computer based training modules for self training.

Egypt:

Training is done by IATA and Oman Air. Information on other training providers is not available.

Conclusion:

Most of the training in these countries is based on short courses in a variety of aviation-related activities performed at the airport. The courses are of varying duration. Some are graded into basic and advanced. It can be seen that the course content of these short courses closely match the Unit Standards developed to encompass those competencies. There are, as is expected, a few small differences in the way the short courses are designed and presented.

The three courses from the United Kingdom very closely resemble this Qualification. They have a generic core component that covers competencies like the aviation environment, occupational health and safety, aviation security and then they provide a range of options which the learners can pursue. Most of these aspects/options are covered by this Qualification and almost all will be addressed once all the specialisation streams have been developed.

While the United States and the United Kingdom are among the world leaders in the field of aviation, the International Comparability also looked at countries where the field is not as developed (Sri Lanka, for example). The reason for this is to illustrate that airline and training providers have to meet the international standards should they wish to be competitive and be accepted internationally.

ARTICULATION OPTIONS

Horizontal Articulation:

- > ID 49236: National Certificate: Rail Transport Passenger Service, NQF Level 3.
- > ID 57831: National Certificate: Freight Handling, NQF Level 3.

Vertical Articulation:

- > ID 57849: Further Education and Training Certificate: Dangerous Goods: Multi-modal Transport, NQF Level 4.
- > ID 59298: Further Education and Training Certificate: Freight Forwarding and Customs Compliance, NQF Level 4.

MODERATION OPTIONS

> Anyone moderating the assessment of a learner against this qualification must be appointed by the relevant Education and Training Quality Assurance body (ETQA) or by an ETQA that has a Memorandum of Understanding (MOU) with the relevant ETQA.

> Moderation of assessment will be overseen by the relevant ETQA according to the ETQA's policies and guidelines.

> 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.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

All assessors must:

- > Be registered as an assessor with the relevant ETQA.
- > Be in a possession of a relevant Qualification at NQF Level 4 or higher.
- > Have work experience in Aviation Support Operations.

NOTES

N/A

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	9010	Demonstrate an understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	Level 3	2
Fundamental	9013	Describe, apply, analyse and calculate shape and motion in 2-and 3-dimensional space in different contexts	Level 3	4
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	9012	Investigate life and work related problems using data and probabilities	Level 3	5
Fundamental	119467	Use language and communication in occupational learning programmes	Level 3	5
Fundamental	7456	Use mathematics to investigate and monitor the financial aspects of personal, business and national issues	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5
Core	12484	Perform basic fire fighting	Level 2	4
Core	244574	Apply knowledge of HIV/AIDS to a specific business sector and a workplace	Level 3	4
Core	13912	Apply knowledge of self and team in order to develop a plan to enhance team performance	Level 3	5
Core	261179	Demonstrate an understanding of concepts and geography pertaining to aviation	Level 3	7
Core	261180	Demonstrate and apply an understanding of relevant regulatory framework and regulatory bodies operating within the aviation industry	Level 3	6
Core	261197	Discuss aviation security at airports	Level 3	7
Core	261198	Explain aircraft orientation and related aspects	Level 3	9
Core	14927	Apply problem solving strategies	Level 4	4
Core	252170	Apply the principles of customer care in client interactions	Level 4	5
Core	120344	Demonstrate knowledge and understanding of relevant current occupational health and safety legislation	Level 4	4
Core	261181	Explain human factors in aviation	Level 4	8
Elective	113836	Apply basic computer technology	Level 3	11
Elective	252422	Calculate cost of airfreighting goods	Level 3	5
Elective	117731	Demonstrate an understanding of cultural awareness in the workplace	Level 3	4
Elective	261177	Demonstrate understanding of transportation and aircraft support servicing	Level 3	15
Elective	252436	Document and handle export airfreight general non-hazardous cargo	Level 3	6
Elective	242994	Handle and load dangerous goods for transportation by air	Level 3	2
Elective	261199	Handle and operate main deck freighter aircraft	Level 3	7

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	242814	Identify and explain the core and support functions of an organisation	Level 3	6
Elective	116490	Identify key ethical values for human conduct	Level 3	6
Elective	242820	Maintain records for a team	Level 3	4
Elective	113829	Operate within a logistics environment	Level 3	10
Elective	252427	Outline the structure of the airfreight forwarding environment	Level 3	4
Elective	244563	Perform work using a project approach	Level 3	8
Elective	252428	Secure cargo for airfreight	Level 3	6
Elective	242986	Accept and process dangerous goods for transportation by air	Level 4	6
Elective	242828	Apply passenger security assessment in a port environment	Level 4	2
Elective	113830	Conduct costing and budgeting	Level 4	9
Elective	261178	Discuss ground movement of aircraft by tow tractors	Level 4	14
Elective	261217	Explain the functions and responsibilities of a flight supervisor and/or ramp agent	Level 4	10
Elective	242835	Operate x-ray screening equipment within a security environment	Level 4	3

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION

None



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Demonstrate understanding of transportation and aircraft support servicing***

SAQA US ID	UNIT STANDARD TITLE		
261177	Demonstrate understanding of transportation and aircraft support servicing		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD	SUBFIELD		
10 - Physical, Mathematical, Computer and Life Sciences	Physical Sciences		
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	15

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

SPECIFIC OUTCOME 1

Comply with the safety and roadworthiness requirements of airport vehicles/specialised equipment.

SPECIFIC OUTCOME 2

Operate vehicles/specialised equipment at the airport.

SPECIFIC OUTCOME 3

Open and close aircraft doors and cargo holds.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	65010	National Certificate: Aviation Support Operations	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Discuss ground movement of aircraft by tow tractors***

SAQA US ID	UNIT STANDARD TITLE		
261178	Discuss ground movement of aircraft by tow tractors		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 4	14

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

SPECIFIC OUTCOME 1

Explain the responsibilities relating to aircraft movements.

SPECIFIC OUTCOME 2

Explain the safety precautions and preparations of aircraft before any movement takes place.

SPECIFIC OUTCOME 3

Demonstrate generic pushback and towing procedures.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	65010	National Certificate: Aviation Support Operations	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of concepts and geography pertaining to aviation

SAQA US ID	UNIT STANDARD TITLE		
261179	Demonstrate an understanding of concepts and geography pertaining to aviation		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	7

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

SPECIFIC OUTCOME 1

Explain and use terminology pertaining to aviation.

SPECIFIC OUTCOME 2

Differentiate between operator, city and airport codes.

SPECIFIC OUTCOME 3

Explain aviation concepts and the value of information on airline timetables/rosters.

SPECIFIC OUTCOME 4

Discuss aspects contributing to the overall services within aviation.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	65010	National Certificate: Aviation Support Operations	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate and apply an understanding of relevant regulatory framework and regulatory bodies operating within the aviation industry

SAQA US ID	UNIT STANDARD TITLE		
261180	Demonstrate and apply an understanding of relevant regulatory framework and regulatory bodies operating within the aviation industry		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	6

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

SPECIFIC OUTCOME 1

Explain the role and functions of international aviation regulatory bodies.

SPECIFIC OUTCOME 2

Explain the role and functions of regional and national aviation regulatory bodies.

SPECIFIC OUTCOME 3

Discuss South African legislation pertaining to aviation and airport operations.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	65010	National Certificate: Aviation Support Operations	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Explain human factors in aviation***

SAQA US ID	UNIT STANDARD TITLE		
261181	Explain human factors in aviation		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 4	8

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

SPECIFIC OUTCOME 1

Discuss general human factors in aviation.

SPECIFIC OUTCOME 2

Explain how flight affects human physiology.

SPECIFIC OUTCOME 3

Explain the human factors and environmental hazards affecting performance.

SPECIFIC OUTCOME 4

Demonstrate knowledge of human performance and limitations in the context of aviation support.

SPECIFIC OUTCOME 5

Discuss social psychology within the context of aviation support.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	65010	National Certificate: Aviation Support Operations	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Discuss aviation security at airports***

SAQA US ID	UNIT STANDARD TITLE		
261197	Discuss aviation security at airports		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	7

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

SPECIFIC OUTCOME 1

Demonstrate understanding of the legislation and regulation pertaining to airport security.

SPECIFIC OUTCOME 2

Describe aviation security at the airport.

SPECIFIC OUTCOME 3

Demonstrate an understanding of and explain violations of aviation security.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	65010	National Certificate: Aviation Support Operations	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Explain aircraft orientation and related aspects***

SAQA US ID	UNIT STANDARD TITLE		
261198	Explain aircraft orientation and related aspects		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	9

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

SPECIFIC OUTCOME 1

Demonstrate knowledge and understanding of the aircraft.

SPECIFIC OUTCOME 2

Explain the aerodynamics of flight.

SPECIFIC OUTCOME 3

Operate a radio.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	65010	National Certificate: Aviation Support Operations	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Handle and operate main deck freighter aircraft***

SAQA US ID	UNIT STANDARD TITLE		
261199	Handle and operate main deck freighter aircraft		
ORIGINATOR			PROVIDER
SGB Aerospace Operations			
FIELD			SUBFIELD
10 - Physical, Mathematical, Computer and Life Sciences			Physical Sciences
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	7

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

SPECIFIC OUTCOME 1

Demonstrate an understanding of the importance of loading and unloading sequencing.

SPECIFIC OUTCOME 2

Explain the function and programming of control panels inside the main deck.

SPECIFIC OUTCOME 3

Load and unload pallets.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	65010	National Certificate: Aviation Support Operations	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Explain the functions and responsibilities of a flight supervisor and/or ramp agent

SAQA US ID	UNIT STANDARD TITLE		
261217	Explain the functions and responsibilities of a flight supervisor and/or ramp agent		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 4	10

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

SPECIFIC OUTCOME 1

Interpret documentation for aircraft handling.

SPECIFIC OUTCOME 2

Receive the aircraft at the ramp.

SPECIFIC OUTCOME 3

Coordinate the loading and servicing of the aircraft.

SPECIFIC OUTCOME 4

Manage irregularities.

SPECIFIC OUTCOME 5

Explain ramp aircraft safety.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	65010	National Certificate: Aviation Support Operations	Level 3

No. 4

9 January 2009

**SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Task Team for

Radiography and Clinical Technology

registered by Organising Field 09: Health Sciences and Social Services 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.saqqa.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 9 February 2009**. All correspondence should be marked **Standards Setting – SGB for Radiography and Clinical Technology** and addressed to

The Director: Standards Setting and Development
SAQA

Attention: Mr. E. Brown

Postnet Suite 248

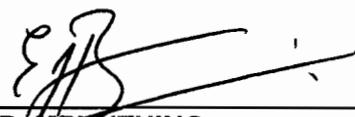
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e-mail: ebrown@saqa.org.za

pp 
D. MPHUTHING
ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION: *Doctor of Philosophy: Radiography*

SAQA QUAL ID	QUALIFICATION TITLE		
65115	Doctor of Philosophy: Radiography		
ORIGINATOR	PROVIDER		
TT - Radiography and Clinical Technology			
QUALIFICATION TYPE	FIELD	SUBFIELD	
Doctoral Degree	9 - Health Sciences and Social Services	Curative Health	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	360	Level 8 and above	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 learner who successfully completes this qualification will be able to apply high level problem-solving skills and critical, reflective thinking at the most advanced academic levels culminating in the production of a thesis that meets the accepted criteria and ethical principles of the academic institution. In this way they will make an original and meaningful contribution to the existing body of knowledge for science and technology and supervise lower level research students.

Rationale:

The South African government has expressed a need for radiographers who can make a significant and original contribution, through independent research in a specialised area of technology. This qualification has been structured to meet that need and provide for advanced research within technology through the inclusion of a research thesis that complies with the accepted norms, criteria and ethical principles for research at a doctorate level. Learners obtaining this qualification will be able to conduct original research within the field of technology and present their findings at local and international conferences/seminars as well as publish them in accredited publications. This is in keeping with the government's need for highly skilled people who can contribute to the development of science and technology.

RECOGNIZE PREVIOUS LEARNING?

Y

LEARNING ASSUMED IN PLACE

Learners accessing this Qualification must be in possession of a Masters Degree in Radiography or accepted equivalent. Recognition of Prior Learning may be recognized on submission of a suitable portfolio of published research material around a common theme and/or any other evidence deemed as necessary by the institution and/or the relevant ETQA.

Recognition of Prior Learning

Recognition of prior learning will be applied on an individual basis and will be conducted in accordance with the Institutional RPL policies. Providers are required to develop structured and

accredited means of the assessment of individual learners against the exit-level outcomes of the qualification on a case-by-case basis. Recognition of prior learning will be applied on an individual basis and will be conducted in accordance with the Institutions' accredited RPL policy and in agreement with the relevant ETQA. Such procedures and the assessment of individual cases are subject to moderation by independent accredited assessors.

Access to the Qualification:

Successful completion of a Master of Radiography or equivalent qualification in accordance with the selection protocol of the educational institution and the agreement of the relevant ETQA. Evidence of prior learning may be presented in a format agreed to by the institution and the relevant ETQA.

QUALIFICATION RULES

A learner undertaking this qualification will be able to demonstrate the following competencies for a total of 360 credits, at a NQF Level commensurate with that of a Doctoral Degree:

- > Apply concepts, knowledge, methods, ethics, theories and analytical processes in relation to a chosen focus area within radiography and associated fields.
- > Access, analyse, transform and critically evaluate existing knowledge in relation to the chosen area of radiography and associated fields.
- > Access, process, produce and communicate information effectively to colleagues and other groups.
- > Demonstrate specialist forefront knowledge and expertise in the chosen field of radiography and the competency to apply these creatively and innovatively within the chosen field.
- > Critically analyse and evaluate the outcomes of radiography interventions, techniques, strategies, or processes in the chosen field.
- > Demonstrate advanced understanding of radiography values, principles of human rights and social justice and competency in their application in the chosen focus field.

EXIT LEVEL OUTCOMES

1. Conduct independent research into the literature within the broader context of the field/area of investigation to synthesise and critically evaluate existing information and knowledge.
2. Plan, design, motivate, budget for, and conduct an original comprehensive scientific research project to increase the knowledge base of radiography.
3. Critically analyse, evaluate and interpret the findings.
4. Report the findings in a thesis, in a scientific format and publish and publish in an accredited literary format for international consumption.

Critical Cross-Field Outcomes:

These are achieved by the learner through:

- > Identifying, analysing and solving problems in the professional, individual and societal environments creatively by investigating and writing up a research proposal and thesis.
- > Working effectively with others as a member of a team, group, organisation and/or community in the health care and educational environment through utilising the skills and knowledge of peers and stakeholder during the investigative process.
- > Organising and managing oneself and one's activities responsibly and effectively by independently sourcing information and logically presenting a proposal and thesis in liaison with a designated mentor and supervisor.
- > Collating and critically evaluating information for developing a proposal and following the accepted research steps to achieve the completion of a thesis.

- > Using science and technology effectively and critically to contribute to new knowledge and understanding in the field of radiography.
- > Thinking critically and creatively in designing, executing and reporting on a specialised area of Radiography.
- > Demonstrating an understanding that problem-solving contexts do not exist in isolation by utilising the knowledge and skills of others and seeking assistance in achieving the intended outcome.

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

- > Evaluate, Analyse and justify the research topic in a research report.
- > Gather relevant and recent information on the research area from a wide variety of accredited sources.
- > Analyse, evaluate and discuss the research topic in a detailed literature review.

Associated Assessment Criteria for Exit Level Outcome 2:

- > Select, describe, justify and defend appropriate research design and methodology in terms of the research topic.
- > A research proposal is compiled and presented in accordance with the institutional research policies and procedural criteria.
- > Reflect on medical and research ethics pertinent to research in radiography, included in the proposal and adhered to during the research process.
- > Conduct the experimental research responsibly and ethically.

Associated Assessment Criteria for Exit Level Outcome 3:

- > Analyse data using the relevant statistical tools.
- > Interpret data to reflect clear understanding of the relationship between facts in the study and the ability to evaluate contradictory information.

Associated Assessment Criteria for Exit Level Outcome 4:

- > Write up the dissertation according to the institutional research policies and procedural criteria.
- > Apply information technology skills effectively in the production of the thesis.
- > Apply language and numerical skills effectively and correctly in clearly communicating the research problem, its investigation, the outcome, and the recommendations.
- > Publish new knowledge, or technology or solution to a problem in appropriate accredited journals and present these at appropriate conferences.

Integrated Assessment:

Continuous assessment will be used to assess the learner's performance. The learner will be afforded opportunities to improve performance through formative assessment before summative assessment is performed.

INTERNATIONAL COMPARABILITY

The Qualification has been designed to meet the needs of the South African population as well as international standards. The qualification has been compared with qualifications countries that are leaders in the field of radiography, such as the United Kingdom, Australia and Finland.

United Kingdom:

Sheffield Hallam University in London offers a Doctorate Professional Studies (Health and Social Care). The degree is open to senior practitioners and managers in the fields of nursing,

midwifery and therapist consultant roles. It is offered on a part-time basis and takes a minimum of four years. The course has been designed to focus on the workplace so that it can influence practice and service development in the context of organisational need. The course meets the professional development needs of senior practitioners or junior ones with an ambition to progress in their respective professions.

The first two years are taught and comprise three modules:

- > Review of learning and professional experience. This allows the students to evaluate their professional capabilities.
- > Research for the working world which focuses on designing and implementing work-based projects.
- > Project planning allows the students to develop a detailed plan for systematic work-based research that is academically valid and relevant to the professional field.

In addition to the taught modules, the students go through the seminar scheme which prepares them to carry out the work-based inquiry. This is done in the second year of study.

The last two years are mainly for the research project. This is equivalent to the standard research thesis. It is however termed a research project to emphasise the professionally orientated and practice-based nature of this professional doctorate qualification.

Entrance requirements:

A master's degree with a subject in health care sciences. Applications with Master's Degrees from other fields are considered individually. In addition, the learner, to be accepted into the Doctoral programme, should have at least three years of clinical experience post qualification.

Australia:

Monash University offers a PhD (Doctor of Philosophy) within the Faculty of Medicine, Nursing and Health Sciences. The course is presented over eight semesters as a full-time programme or 16 semesters for part-time. During this period, the learner is required to conduct a prescribed programme of research for a set period, under guidance and direct supervision. The outcome is a research thesis. This implies that this PhD is a research degree. The thesis submitted should have approximately 100,000 words.

Successful learners should present a high quality written work suitable for publication in accredited journals. They will also be able to critique their own work and the work of their colleagues or subordinates.

Finland:

Oulu University started with the doctoral programme in radiography in 2000. To date, more than seven radiographers have graduated with the qualification. The main focus of the qualification is research and professional development. The university or the professionals at this institution have seen the need to develop radiography as justifiable independent profession.

Candidates registering for the Doctorate in Radiography are encouraged to conduct research that focuses on foundations of a radiographer's work, patient care or treatment or more specifically, medical imaging of a patient. The course is offered in a way that separates it from other fields of radiography like ultrasound, radiation therapy and nuclear medicine. These fields are likely to develop separate doctoral programmes.

In comparing the above qualifications with what has been developed for SA, it can be seen that the Course Work doctoral programme offered in the UK differs greatly from that developed for

SA. In Australia, a full research doctoral programme is offered which is similar to that developed for SA. The main difference lies in the fact that the study time is prescribed in Australia. Neither the UK nor the Australian qualifications are offered by radiography departments. They are offered as a Doctor of Philosophy degree as is the case with SA and thus differs from the Doctorate of Radiography offered in Finland.

It may thus be concluded that this SA Doctoral qualification compares favourably with those existing internationally.

ARTICULATION OPTIONS

Any other related registered Doctoral degree within the medical or para-medical fields.

MODERATION OPTIONS

Assessment and moderation will be conducted by specifically appointed accredited internal/external assessors/moderators in accordance with institutional policy and procedures in agreement between the relevant Professional Council and ETQA.

NOTES

N/A

UNIT STANDARDS

This qualification is not based on Unit Standards.

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION

None

No. 5

9 January 2009

**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

Aerospace Operations

registered by Organising Field 10: Physical Mathematical, Computer and Life Sciences, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saqqa.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 9 February 2009**. All correspondence should be marked **Standards Setting – SGB for Aerospace Operations** and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. E. Brown
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Private Bag X06
Waterkloof
0145
or faxed to 012 – 431-5144
e-mail: ebrown@saqa.org.za


D. MPHUTHING
ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:**National Diploma: Aeronautical Surveillance Systems: Engineering Support**

SAQA QUAL ID	QUALIFICATION TITLE		
64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
QUALIFICATION TYPE	FIELD	SUBFIELD	
National Diploma	10 - Physical, Mathematical, Computer and Life Sciences	Physical Sciences	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	250	Level 6	Regular-Unit Stds Based

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

PURPOSE AND RATIONALE OF THE QUALIFICATION

Purpose:

The combination of learning outcomes that comprise this Qualification will provide the qualifying learner with vocational knowledge and skills appropriate to the context of Air Traffic Management Engineering Support Services. It will also equip learners with a foundation for further intellectual development, opportunities for gainful employment and reward for contributions to society.

The learner assessed as competent against this qualification will be able to:

- > Demonstrate a technical understanding of Aeronautical Radar Systems.
- > Demonstrate a technical understanding of Aeronautical Display Systems.
- > Provide engineering support and maintenance of Surveillance Radar Systems used in aviation.
- > Provide engineering support and maintenance of Surveillance Display Systems.

This Qualification will provide the Air Traffic Management profession with qualified Air Traffic Management Engineering Personnel, thereby facilitating social and economic transformation, empowerment, and upliftment in the Industry and country in general.

Rationale:

There is an urgent need to provide recognition to people who are able to conduct the essential operations associated with safe and efficient aviation surveillance systems.

The focus of this Qualification will be mainly on technical personnel who have been working within the Aviation Industry in Air Traffic Management (ATM) or for persons with relevant aviation skills, knowledge and experience who wish to pursue a career in ATM engineering support.

In the past many practitioners in the Air Traffic Management technical support area were denied career advancement and possible professional registration. The introduction of a unit standard based National Diploma in Aeronautical Surveillance Systems, will allow learners, mainly employed in the field for a long time, recognition for their knowledge and acquired competencies through the process of RPL. It will also allow them advancement in their professional careers through transfer of credits gained, to whatever further learning they wish to carry out in their related aviation fields.

This Qualification will facilitate the development of a professional community of Air Traffic Management. Technical Personnel will be able to contribute towards a safe and productive technical support environment through the application of enhanced knowledge and skills relating to the installation, operation, maintenance and engineering support of Aeronautical Surveillance Systems used within the Air Traffic Management environment.

The combination of learning outcomes will provide the qualifying learner with applied competence in the provision of engineering support for Radar and Display Systems used in the Aviation Environment.

This qualification lays down the basis for further learning towards a proposed 1st Degree at NQF Level 7 in ATM Systems Engineering.

RECOGNIZE PREVIOUS LEARNING?

Y

LEARNING ASSUMED IN PLACE

It would be desirable for learners wishing to access this qualification to be competent in the following:

> ID 57229: The National Certificate in Communication, Navigation and Surveillance Support, NQF Level 5.

Recognition of Prior Learning:

This Qualification and all the fundamental, core and elective unit standards associated with it, as described in the rules of combination, can be achieved by any learner through the recognition of prior learning, which includes learning outcomes achieved through formal, informal and non-formal learning and work experience. The exit-level outcomes and the related unit standards may also be achieved through the recognition of prior learning.

Access to the Qualification:

None.

QUALIFICATION RULES

The qualifying learner will achieve this Qualification by complying with the following rules of combination for the accumulation of credits:

Learning Component: Credits:

- > All Fundamental Unit Standards: 65 credits.
- > All Core Unit Standards: 165 credits.
- > Elective Unit Standards: Minimum 20 credits.

Total Credits: Minimum 250 credits.

EXIT LEVEL OUTCOMES

1. Demonstrate a technical understanding of Aeronautical Radar Systems.
2. Demonstrate a technical understanding of Aeronautical Display Systems.
3. Provide engineering support and maintenance of Aeronautical Surveillance Radar Systems.
4. Provide engineering support and maintenance of Aeronautical Surveillance Display Systems.
> Range of Surveillance Display Systems includes, but are not limited to:
> Radar tracking data processing, flight and surface data processing, Recording and Playback data processing, Human Machine Interface data processing, Digital Airfield Information Display Systems data processing and Support Suite Surveillance data processing systems [air and ground systems].

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

1.1 Radar engineering detection and transmission theories are explained in terms of principles, characteristics and functional application.

Range of radar engineering detection and transmission theories includes, but is not limited to:

> Radar Range Prediction theory, Radar Cross Section theory, Radar Ground Echo theory, Radar Receiver theory, Radar Transmitter theory and Radar Antenna theory.

1.2 Radar engineering processing theories are discussed in terms of principles, characteristics and functional application.

Range: Radar engineering processing theories includes, but are not limited to:

> Radar Automatic Detection, Tracking and Sensor Integration theory, Radar Pulse Compression theory, Radar Sea Clutter theory, CW and FM Radar theory, MTI Radar theory and Pulse Doppler Radar theory.

1.3 Radio engineering theories are described and explained in terms of principles, characteristics and functional application.

Range: Radio engineering theories includes, but is not limited to:

> Electromagnetic Wave theory, Transmission Line theory, Reception and Transmission theory and Digital Signal Processing theory.

Associated Assessment Criteria for Exit Level Outcome 2:

2.1 Data communication theory is examined and explained in terms of the principles, characteristics and functional application.

Range: Principles includes, but is not limited to:

> Data Transmission and Protocol Principles, Digital Communication Principles, Understanding Network Principles, Broadband, Wireless and Internet.

2.2 Surveillance Display Systems theory is discussed in terms of principles, characteristics and functional application.

Range: Surveillance Display Systems includes, but is not limited to:

> Air & Ground Surveillance Local Display System (Air-Traffic Control Centre [ATCC], Air Surveillance Remote Display System [Terminal Control Units], Air & Ground Surveillance Test and Evaluation Display System [Support Suite System] and Air & Ground Surveillance Fallback Display System.

Associated Assessment Criteria for Exit Level Outcome 3:

3.1 Corrective and preventative maintenance is performed on PSR and SSR transmitter and receiver systems according to manufacturer's specifications and organisational procedures.

3.2 Corrective and preventative maintenance is performed on PSR and SSR signal and data processors according to manufacturer's specifications and organisational procedures.

3.3 Corrective and preventative maintenance is performed on PSR and SSR antennae systems according to manufacturer's specifications and organisational procedures.

3.4 Performance of Surveillance Radar Systems are measured and analysed in accordance with technical manual procedures and specifications and technical reports are compiled according to organisational procedures.

Associated Assessment Criteria for Exit Level Outcome 4:

4.1 Corrective and preventive maintenance for Display Surveillance equipment is performed according to organisational standing instructions, equipment manufacturer's instructions and quality management system procedures.

4.2 Performance of Display Surveillance equipment is analysed and measured in accordance with technical manual procedures and specifications and technical reports are compiled according to organisational procedures.

4.3 Maintenance support is conducted for Display Surveillance equipment in accordance with organisational support service procedures.

Integrated Assessment:

Integrated assessment at the level of the qualification provides an opportunity for learners to show that they are able to integrate concepts, ideas and actions across unit standards to achieve competence that is grounded and coherent in relation to the purpose of the qualification. Integrated assessment should show how already demonstrated competence in individual areas can be linked and applied for the achievement of a holistic outcome as described in the exit level outcomes.

Integrated assessment must judge the quality of the observable performance, and also the quality of the thinking that lies behind it. Assessment tools must encourage learners to give an account of the thinking and decision-making that underpin their demonstrated performance. Some assessment practices will demand practical evidence while others may be more theoretical, depending on the type of outcomes to be assessed. The ratio between action and interpretation is not fixed, but varies according to the demands of the particular exit level outcome of the qualification.

While the generic components of this qualification at NQF Level 6 can be assessed through occupational contexts and activities relating to Air Traffic Management, care must be taken in both the learning programme and the assessment to ensure that these foundational skills are portable. The primary aim of this qualification is to ensure that learners have a sound general foundation to prepare them for further learning towards a specialised role in their chosen career path. Learners must be able to transfer generic skills across a number of different contexts, and apply them within a number of learning areas.

A broad range of task-orientated and theoretical assessment tools may be used, with the distinction between practical knowledge and disciplinary knowledge maintained so that each takes its rightful place.

INTERNATIONAL COMPARABILITY

The institutions responsible for the education and training of engineering personnel in the aviation industry of many countries contacted were unwilling to share information that would assist in making a comparison with this National Diploma in Surveillance Systems: Engineering Support.

Countries and institutions that were included in the search for similar qualifications are:

- > United States (Federal Aviation Association).
- > Canada (NAV Canada).
- > Tanzania Civil Aviation Authority.
- > Airports Authority of India.
- > Air Services Australia.
- > Airways New Zealand.
- > Brazilian Airports.
- > Egypt Ministry of Civil Aviation.
- > Singapore Aviation Academy.
- > Eurocontrol (European Union).
- > International Federation of Air Traffic Safety Electronic Personnel.

Useful and usable information was obtained from "Eurocontrol" and "International Federation of Air Traffic Safety Electronic Personnel" (IFATSEA). The guidance material for technical training as obtained from these two institutions is described below.

Eurocontrol:

Eurocontrol is the European Organisation for the Safety of Air Navigation. Created in 1963 by six founding members, this civil and military intergovernmental organisation now counts 38 Member States from across Europe. It is based in Belgium with specialised offices in six other European countries. The member countries include: Austria, Belarus, Belgium, Denmark, France, Germany, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Russian Federation, Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Bosnia and Herzegovina, Serbia and Montenegro, Cyprus, Estonia and Romania.

It is widely accepted that this career pathway of Engineering Support in the aviation industry comprises four learning areas, namely: Communication Systems, Navigation Systems, Display Systems and Radar Systems.

The European Organization for Safety in Air Navigation under its sub-division "European Air Traffic Management" has developed guidelines for a common qualification level for Technical Training for Air traffic Safety Electronics Personnel.

These guidelines refer to the following progression table for training of technical personnel:

- > Basic Training.
- > Qualification Training.
- > Type Rating.
- > Continuation Training or Refresher Training.
- > Development Training.

The "basic training" level compares closely in terms of the learning areas with the registered National Certificate in Communication, Navigation and Surveillance Support, NQF Level 5 (SAQA ID: 57229).

The "qualification training" and "type rating" training compares closely with the two National Diplomas in Communication & Navigation Systems and Surveillance Systems. The difference is that the "Type Rating" training focuses on only one of the four disciplines while each of the South African diplomas provides for two disciplines namely Communication and Navigation Systems in the one diploma and Surveillance (Radar and Display) Systems in the other diploma.

Furthermore, "Data Processing" is treated as a separate discipline in the Eurocontrol approach, while the South African approach is that it is a common thread that features in both the diplomas because data processing is viewed as being embedded in all aviation equipment.

The credit value for the European training of aviation technicians was not available for a direct comparison with the South African qualifications comprising this career pathway. The duration of the contact component of the European training compares closely with the South African diplomas.

The following reflects the comparison described above:

South African National Diploma's; European Air Traffic Management/IFATSEA:

- > Advanced Diploma in ATM Engineering (Proposed) Level 7; Continuation training and Development training.
- > National Diploma in Surveillance, Level 6, 250 credits; Type Rate Training in only one discipline i.e. Surveillance or Data Processing(credits unknown), Qualification Training in Surveillance and Data Processing, 124 credits.
- > National Certificate in CNS support, Level 5, 161 credits [SAQA ID: 57229]; Common Basic Level Training (approximately 150 to 170 credits).

International Federation of Air Traffic Safety Electronic Personnel (IFATSEA):

IFATSEA was founded in October 1972 by 11 countries; today member countries exceed 50 including: Canada, Greece, United Kingdom, Japan, Nigeria, Portugal, Belgium, Australia, Switzerland and Germany.

This institution has developed a Training Manual for Air Traffic Safety Electronic Personnel under supervision of the International Civil Aviation Organisation. This Training Manual follows very much the same profile as the Eurocontrol training progression model. The comparison is therefore similar to the comparison reflected in the table indicated above.

Zambia:

In 1999 a study of the National Airports Corporation Limited, Zambia, revealed that their Air Traffic Management Engineering Technicians are sent to the United Kingdom, Italy, United States of America and to South Africa for their ATM Engineering Technician training after having obtained an Electronic National Diploma Qualification in Zambia. Zambia does not present any qualification structure in place to give formal recognition to the ATM training received in these countries.

Conclusion:

This comparison reveals that there is a close similarity of the learning areas and duration of study between the eighty eight member states of Eurocontrol and IFATSEA programmes for training aviation technicians and this National Diploma in Surveillance. Students from other African States, following training courses in South Africa, will now be able to work toward being awarded this internationally benchmarked National Diploma qualification in Surveillance Systems.

ARTICULATION OPTIONS

The possibility exists for vertical articulation with this Qualification. The following qualifications serve as examples of vertical articulation (subject to institutional admission rules):

- > Bachelor of Engineering: Electronic Engineering at NQF Level 7.
- > Bachelor of Science: Engineering at NQF Level 7.

Examples of horizontal articulation with this Qualification:

- > Bachelor of Engineering Sciences: Electronic at NQF Level 6.

> ID 64089: National Diploma: Communication and Navigation: Engineering Support at NQF Level 6.

MODERATION OPTIONS

- > Any institution offering learning that will enable achievement of this Qualification must be accredited by the relevant ETQA.
- > External Moderation of assessment will be overseen by the relevant ETQA at its discretion.
- > The accredited Training Provider will oversee internal Moderation of assessment.
- > Moderation should encompass achievement of competence described in both individual Unit Standards as well as the integrated competence described in the qualification.
- > Moderation must also encompass achievement of the competencies described in the exit level outcomes described above.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

The following criteria are specified for assessors of this qualification:

- > Assessors registered with the relevant ETQA must carry out the assessment of the candidates for any of the unit standards that make up this qualification.
- > Be competent in the outcomes of this qualification or one in the same field at a higher level, and have a minimum of three years in the Air Traffic Management engineering field.

NOTES

N/A

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	259508	Demonstrate a technical understanding of Data Communication Theory	Level 6	15
Fundamental	260059	Demonstrate a technical understanding of Radar Engineering Detection and Transmission Theory	Level 6	10
Fundamental	260065	Demonstrate a technical understanding of Radar Engineering Processing Theory	Level 6	10
Fundamental	259501	Demonstrate a technical understanding of Radio Engineering Theory	Level 6	10
Fundamental	260062	Demonstrate a technical understanding of Surveillance Display Systems theory	Level 6	20
Core	15096	Demonstrate an understanding of stress in order to apply strategies to achieve optimal stress levels in personal and work situations	Level 5	5
Core	252038	Prepare and manage a budget	Level 5	5
Core	260061	Apply technical knowledge of Digital Airfield Information Display Systems data processing	Level 6	10
Core	260067	Apply technical knowledge of Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR) antenna systems	Level 6	15
Core	260068	Apply technical knowledge of Primary Surveillance Radar (PSR) signal and data processors	Level 6	15
Core	260058	Apply technical knowledge of Primary Surveillance Radar (PSR) transmitters and receivers equipment	Level 6	15
Core	259502	Apply technical knowledge of Recording and Playback Systems used in ground-based aviation environment	Level 6	10
Core	260069	Apply technical knowledge of Secondary Surveillance Radar (SSR) signal and data processors	Level 6	15
Core	260071	Apply technical knowledge of Secondary Surveillance Radar (SSR) transmitter and receiver equipment	Level 6	15
Core	260063	Apply technical knowledge of Support Suite Surveillance data processing systems (Air and Ground Systems)	Level 6	15

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	260072	Apply technical knowledge of Surveillance Display Systems Information Human Machine Interface data processing	Level 6	10
Core	260066	Apply technical knowledge of Surveillance Display Systems flight and surface data processing	Level 6	15
Core	260073	Apply technical knowledge of Surveillance Display Systems radar tracking data processing	Level 6	20
Elective	260060	Apply technical knowledge of Air-traffic Flow Management data processing	Level 6	10
Elective	260070	Apply technical knowledge of Display Systems Communication Interface data processing	Level 6	10
Elective	260057	Demonstrate and apply technical knowledge of Air-Ground data processing	Level 6	10

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION

None



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Demonstrate and apply technical knowledge of Air-Ground data processing***

SAQA US ID	UNIT STANDARD TITLE		
260057	Demonstrate and apply technical knowledge of Air-Ground data processing		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD	SUBFIELD		
10 - Physical, Mathematical, Computer and Life Sciences	Physical Sciences		
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	10

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

SPECIFIC OUTCOME 1

Demonstrate technical knowledge of Air-Ground data processing systems.

SPECIFIC OUTCOME 2

Perform routine preventive maintenance.

SPECIFIC OUTCOME 3

Perform corrective maintenance.

SPECIFIC OUTCOME 4

Analyse and monitor Air-Ground Data Processing performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply technical knowledge of Primary Surveillance Radar (PSR) transmitters and receivers equipment

SAQA US ID	UNIT STANDARD TITLE		
260058	Apply technical knowledge of Primary Surveillance Radar (PSR) transmitters and receivers equipment		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	15

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

SPECIFIC OUTCOME 1

Demonstrate technical knowledge of PSR transmitter equipment.

SPECIFIC OUTCOME 2

Demonstrate technical knowledge of PSR receiver equipment.

SPECIFIC OUTCOME 3

Perform routine preventive maintenance on PSR transmitter and receiver equipment.

SPECIFIC OUTCOME 4

Perform corrective maintenance on PSR transmitter and receiver equipment.

SPECIFIC OUTCOME 5

Analyse and measure PSR transmitter and receiver performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate a technical understanding of Radar Engineering Detection and Transmission Theory

SAQA US ID	UNIT STANDARD TITLE		
260059	Demonstrate a technical understanding of Radar Engineering Detection and Transmission Theory		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	10

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

SPECIFIC OUTCOME 1

Understand Radar Range Prediction theory.

SPECIFIC OUTCOME 2

Understand Radar Cross Section (RCS) theory.

SPECIFIC OUTCOME 3

Understand Radar Ground Echo theory.

SPECIFIC OUTCOME 4

Understand Radar Receiver theory.

SPECIFIC OUTCOME 5

Understand Radar Transmitter theory.

SPECIFIC OUTCOME 6

Understand Radar Antenna theory.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Fundamental	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Apply technical knowledge of Air-traffic Flow Management data processing***

SAQA US ID	UNIT STANDARD TITLE		
260060	Apply technical knowledge of Air-traffic Flow Management data processing		
ORIGINATOR	PROVIDER		
SGB Aerospace Operations			
FIELD	SUBFIELD		
10 - Physical, Mathematical, Computer and Life Sciences	Physical Sciences		
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	10

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

SPECIFIC OUTCOME 1

Demonstrate technical knowledge of Air-Traffic Flow Management data processing.

SPECIFIC OUTCOME 2

Perform routine preventive maintenance.

SPECIFIC OUTCOME 3

Perform corrective maintenance.

SPECIFIC OUTCOME 4

Analyse and monitor Air-Traffic Flow Management data processing performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply technical knowledge of Digital Airfield Information Display Systems data processing

SAQA US ID	UNIT STANDARD TITLE		
260061	Apply technical knowledge of Digital Airfield Information Display Systems data processing		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	10

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

SPECIFIC OUTCOME 1

Demonstrate technical knowledge of Airfield Information Display Systems.

SPECIFIC OUTCOME 2

Perform routine preventive maintenance.

SPECIFIC OUTCOME 3

Perform corrective maintenance.

SPECIFIC OUTCOME 4

Analyse and monitor Airfield Information Display Systems processing performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate a technical understanding of Surveillance Display Systems theory

SAQA US ID	UNIT STANDARD TITLE		
260062	Demonstrate a technical understanding of Surveillance Display Systems theory		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	20

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

SPECIFIC OUTCOME 1

Understand Air and Ground Surveillance Main Control Centre Display Systems.

SPECIFIC OUTCOME 2

Understand Air Surveillance Remote Terminal Control Display Systems.

SPECIFIC OUTCOME 3

Understand Air and Ground Surveillance Test and Evaluation Display Systems.

SPECIFIC OUTCOME 4

Demonstrate an understanding of Air and Ground Surveillance Fallback Display Systems.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Fundamental	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

**Apply technical knowledge of Support Suite Surveillance data processing systems
(Air and Ground Systems)**

SAQA US ID	UNIT STANDARD TITLE		
260063	Apply technical knowledge of Support Suite Surveillance data processing systems (Air and Ground Systems)		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	15

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

SPECIFIC OUTCOME 1

Demonstrate technical knowledge of System Support Suite Surveillance data processing.

SPECIFIC OUTCOME 2

Perform routine preventive maintenance.

SPECIFIC OUTCOME 3

Perform corrective maintenance.

SPECIFIC OUTCOME 4

Analyse and monitor System Support Suite Surveillance Data Processing performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Demonstrate a technical understanding of Radar Engineering Processing Theory***

SAQA US ID	UNIT STANDARD TITLE		
260065	Demonstrate a technical understanding of Radar Engineering Processing Theory		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	10

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

SPECIFIC OUTCOME 1

Understand Radar Automatic Detection, Tracking and Sensor Integration theory.

SPECIFIC OUTCOME 2

Understand Radar Pulse Compression theory.

SPECIFIC OUTCOME 3

Understand Radar Sea Clutter theory.

SPECIFIC OUTCOME 4

Understand Coded Waveform (CW) and Frequency Modulation (FM) Radar theory.

SPECIFIC OUTCOME 5

Understand Moving Target Indication (MTI) Radar theory.

SPECIFIC OUTCOME 6

Understand Pulse Doppler radar theory.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Fundamental	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply technical knowledge of Surveillance Display Systems flight and surface data processing

SAQA US ID	UNIT STANDARD TITLE		
260066	Apply technical knowledge of Surveillance Display Systems flight and surface data processing		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	15

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

SPECIFIC OUTCOME 1

Demonstrate technical knowledge of flight data processing.

SPECIFIC OUTCOME 2

Perform routine preventive maintenance.

SPECIFIC OUTCOME 3

Perform corrective maintenance.

SPECIFIC OUTCOME 4

Analyse and monitor Flight Data Processing performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply technical knowledge of Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR) antenna systems

SAQA US ID	UNIT STANDARD TITLE		
260067	Apply technical knowledge of Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR) antenna systems		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	15

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

SPECIFIC OUTCOME 1

Demonstrate knowledge of primary surveillance radar (PSR) Antenna systems.

SPECIFIC OUTCOME 2

Demonstrate knowledge of secondary surveillance radar (SSR) Antenna systems.

SPECIFIC OUTCOME 3

Perform routine preventive and corrective maintenance on primary surveillance radar (PSR) Antenna systems.

SPECIFIC OUTCOME 4

Perform routine preventive and corrective maintenance on secondary surveillance radar (SSR) Antenna systems.

SPECIFIC OUTCOME 5

Analyse and measure PSR and SSR antenna systems' performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply technical knowledge of Primary Surveillance Radar (PSR) signal and data processors

SAQA US ID	UNIT STANDARD TITLE		
260068	Apply technical knowledge of Primary Surveillance Radar (PSR) signal and data processors		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	15

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

SPECIFIC OUTCOME 1

Demonstrate technical knowledge of PSR signal and data processors.

SPECIFIC OUTCOME 2

Perform routine preventive maintenance on PSR signal and data processors.

SPECIFIC OUTCOME 3

Perform corrective maintenance on PSR signal and data processors.

SPECIFIC OUTCOME 4

Analyse and measure PSR signal and data processor performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply technical knowledge of Secondary Surveillance Radar (SSR) signal and data processors

SAQA US ID	UNIT STANDARD TITLE		
260069	Apply technical knowledge of Secondary Surveillance Radar (SSR) signal and data processors		
ORIGINATOR			PROVIDER
SGB Aerospace Operations			
FIELD			SUBFIELD
10 - Physical, Mathematical, Computer and Life Sciences			Physical Sciences
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	15

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

SPECIFIC OUTCOME 1

Demonstrate technical knowledge of SSR signal and data processors.

SPECIFIC OUTCOME 2

Perform routine preventive maintenance on SSR signal and data processors.

SPECIFIC OUTCOME 3

Perform corrective maintenance on SSR signal and data processors.

SPECIFIC OUTCOME 4

Analyse and measure SSR signal and data processor performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply technical knowledge of Display Systems Communication Interface data processing

SAQA US ID	UNIT STANDARD TITLE		
260070	Apply technical knowledge of Display Systems Communication Interface data processing		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD		SUBFIELD	
10 - Physical, Mathematical, Computer and Life Sciences		Physical Sciences	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	10

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

SPECIFIC OUTCOME 1

Demonstrate knowledge of Display Systems Communication Interface data processing.

SPECIFIC OUTCOME 2

Perform routine preventive maintenance.

SPECIFIC OUTCOME 3

Perform corrective maintenance.

SPECIFIC OUTCOME 4

Analyse and monitor Display Systems Communication Interface Data Processing performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply technical knowledge of Secondary Surveillance Radar (SSR) transmitter and receiver equipment

SAQA US ID	UNIT STANDARD TITLE		
260071	Apply technical knowledge of Secondary Surveillance Radar (SSR) transmitter and receiver equipment		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD	SUBFIELD		
10 - Physical, Mathematical, Computer and Life Sciences	Physical Sciences		
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	15

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

SPECIFIC OUTCOME 1

Demonstrate technical knowledge of SSR transmitter equipment.

SPECIFIC OUTCOME 2

Demonstrate technical knowledge of SSR receiver equipment.

SPECIFIC OUTCOME 3

Perform routine preventive maintenance on SSR transmitter and receiver equipment.

SPECIFIC OUTCOME 4

Perform corrective maintenance on SSR transmitter and receiver equipment.

SPECIFIC OUTCOME 5

Analyse and measure SSR transmitter and receiver performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply technical knowledge of Surveillance Display Systems Information Human Machine Interface data processing

SAQA US ID	UNIT STANDARD TITLE		
260072	Apply technical knowledge of Surveillance Display Systems Information Human Machine Interface data processing		
ORIGINATOR			PROVIDER
SGB Aerospace Operations			
FIELD			SUBFIELD
10 - Physical, Mathematical, Computer and Life Sciences			Physical Sciences
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	10

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

SPECIFIC OUTCOME 1

Demonstrate technical knowledge of Surveillance Information Human Machine Interface.

SPECIFIC OUTCOME 2

Perform routine preventive maintenance.

SPECIFIC OUTCOME 3

Perform corrective maintenance.

SPECIFIC OUTCOME 4

Analyse and monitor Surveillance Information Human Machine Interface performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Apply technical knowledge of Surveillance Display Systems radar tracking data processing

SAQA US ID	UNIT STANDARD TITLE		
260073	Apply technical knowledge of Surveillance Display Systems radar tracking data processing		
ORIGINATOR		PROVIDER	
SGB Aerospace Operations			
FIELD	SUBFIELD		
10 - Physical, Mathematical, Computer and Life Sciences	Physical Sciences		
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 6	20

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

SPECIFIC OUTCOME 1

Demonstrate knowledge of radar tracking data processing.

SPECIFIC OUTCOME 2

Perform routine preventive maintenance.

SPECIFIC OUTCOME 3

Perform corrective maintenance.

SPECIFIC OUTCOME 4

Analyse and monitor Radar Data Processing performance.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	64349	National Diploma: Aeronautical Surveillance Systems: Engineering Support	Level 6

**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

Pharmacy

registered by Organising Field 09 – Health Sciences and Social Services, 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.saga.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification should reach SAQA at the address below and **no later than 9 February 2009**. All correspondence should be marked **Standards Setting – SGB for Pharmacy** and addressed to

The Director: Standards Setting and Development
SAQA

Attention: Mr. E. Brown

Postnet Suite 248

Private Bag X06

Waterkloof

0145

or faxed to 012 – 431-5144

e-mail: ebrown@saqa.org.za

P.P. 
D. MPHUTHING
ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
Bachelor of Pharmacy

SAQA QUAL ID	QUALIFICATION TITLE		
65130	Bachelor of Pharmacy		
ORIGINATOR	PROVIDER		
SGB Pharmacy			
QUALIFICATION TYPE	FIELD	SUBFIELD	
National First Degree	9 - Health Sciences and Social Services	Curative Health	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	480	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:

This qualification is for those learners who wish to practise in the field of pharmacy. The purpose of the Qualification is to prepare students to practise as entry level generalist pharmacists and to practise in any of the recognised fields of pharmacy.

Pharmacists in South Africa practice in a multidisciplinary health care service environment. The basic education programme (First Degree) for pharmacy is designed to provide graduates with a sound and balanced grounding in the natural, pharmaceutical and health care sciences. It thus forms the required foundation for the practice of their chosen profession in all the relevant pharmacy sectors. This includes community, institutional, industrial and academic pharmacy. Practical skills, knowledge and training are balanced with a comprehensive theoretical background.

The diversity and complexity of medicines requires pharmacists to pay particular attention to patient counselling and advice to ensure that medicine is taken correctly. In many practice settings, pharmacists take responsibility for the management of patients' medicine usage, including medicines used for chronic diseases and those for both ambulatory and hospitalised patients. In addition, the profession has been transformed from one that mainly supplies products, to one that, in co-operation with other health care providers, also provides other health care services. It is therefore critically important to health care in this country to produce pharmacists who are able to satisfy the need for comprehensive pharmaceutical services.

All outcomes must incorporate current legal and ethical requirements pertaining to pharmacy practice.

Qualifying learners will be able to:

- > Integrate and apply foundational scientific knowledge and principles to pharmaceutical sciences.
- > Apply integrated knowledge of product development and formulation in the compounding, manufacturing, distribution and dispensing of pharmaceutical products.
- > Compound, manipulate and prepare medication in compliance with Good Pharmacy Practice (GPP) rules and/or Good Manufacturing Practice (GMP) guidelines, where applicable.

- > Manage and control the development, manufacture, packaging and registration of pharmaceutical products.
- > Manage the logistics of the selection, procurement, storage, distribution and disposal of pharmaceutical products.
- > Dispense medication and ensure optimal pharmaceutical care for a patient in compliance with Good Pharmacy Practice rules (GPP).
- > Apply a pharmaceutical care management approach to ensure rational medicine use.
- > Initiate therapy, where appropriate, within the scope of practice of a pharmacist.
- > Promote public health.
- > Integrate and apply management principles in the practice of pharmacy.
- > Participate in research.

Rationale:

The National Master Scarce Skills List for South Africa, issued by the Ministry of Labour, reflects the skills that are most needed in South Africa, and on which efforts to acquire and develop skills must be focussed. The 2007 list names pharmacy as a scarce skill, and gives as the reason for its inclusion on the list that pharmacists ensure safe and quality use of medicines and optimise health outcomes by contributing to selecting, prescribing, monitoring and evaluating medicine therapy, and researching, testing and developing pharmaceuticals and medical products.

In the past two decades, the role of the community pharmacist has changed and developed to meet the needs of the rapidly changing health care environment. The dispensing of prescribed medicines and the provision of advice and self-medication remain vitally important parts of the service provided by pharmacists. An equally important role however, is to advise other health care professionals on the rational and safe use of medicines. They also accept the responsibility for ensuring that medicines are safely and effectively used by patients for optimal therapeutic outcome of the treatment. This applies to both the well-being of the individual and the overall improvement of community health. The changing role thus requires practising pharmacists to make a contribution to appropriate prescribing of medicines and to advise patients on how to use medicines effectively, as well as to educate the community on disease prevention measures and health promotion in general. The implementation of pharmaceutical care principles requires the pharmacist to use a range of processes to facilitate the responsible provision of medicinal treatment and to monitor the progress of the patient until a measurable result is achieved, thus improving the patient's quality of life.

The role of the industrial pharmacist is to ensure that all medicines available in South Africa are of the required quality, safety and efficacy.

The Degree programme for entry level pharmacists has been designed to ensure that the graduate has the necessary skills, knowledge, principles and values to meet the requirements, including the ethical and legal demands, of the profession. A commitment to lifelong continuing professional development must be engendered in every pharmacist to produce a professional competent to deal with the complexity and ever-changing challenges of the healthcare environment.

Pharmacists are required to provide the services in diverse settings in response to a changing set of mainly local health care priorities and needs. Developments in pharmacy practice are also dictated by regional, national and international policies and factors and pharmacists must recognise and respond to these.

RECOGNIZE PREVIOUS LEARNING?

Y

LEARNING ASSUMED IN PLACE

- > Mathematics at NQF Level 4 or recognised equivalent.
- > Physical Science at NQF Level 4 or recognised equivalent.

Life Sciences at NQF Level 4 or recognised equivalent and Computer literacy at NQF Level 3 are strongly recommended.

It is also strongly recommended that all learners accessing this qualification are able to read, write and communicate in English as most learning material is available only in the English medium.

Recognition of Prior Learning:

This qualification may be achieved in whole or in part through the process of recognition of prior learning at the request of the learner and the discretion of the education and training institution and in agreement with the relevant ETQA.

Access to the Qualification:

Learners who wish to enter into study towards achieving this Qualification, in addition to fulfilling the requirements indicated under the learning assumed to be in place, must be in possession of a Senior Certificate with Matriculation Exemption or equivalent NQF Level 4 qualification and must comply with the Institutional requirements for entry into this Qualification.

QUALIFICATION RULES

In order to be credited with this Qualification, the learner is required to achieve the following combination of credits:

- > Fundamental Component: 120 Credits are compulsory.
- > Core component: 330 Credits are compulsory.
- > Elective component: a minimum of 30 Credits are required.

EXIT LEVEL OUTCOMES

1. Integrate and apply foundational scientific principles and knowledge to pharmaceutical sciences (120 Credits).
 - > Range of scientific principles and knowledge includes, but is not limited to:
 - > Chemistry, microbiology, biochemistry, mathematics, physics, physiology, pathophysiology, anatomy, social and behavioural sciences, including biomedical ethics.
2. Apply integrated knowledge of product development and formulation in the compounding, manufacturing, distribution and dispensing of pharmaceutical products (80 Credits).
3. Compound, manipulate and prepare medication for individual patients (50 Credits).
4. Manage the manufacture, packaging and registration of pharmaceutical products (30 Credits).
 - > Range of pharmaceutical products includes, but is not limited to:
 - > Medicines, veterinary products, biological products.
5. Manage the logistics of the selection, procurement, storage, distribution and disposal of pharmaceutical products (20 Credits).
6. Dispense medication and ensure optimal pharmaceutical care for the patient in compliance with Good Pharmacy Practice (GPP) (40 Credits).
 - > Range of dispensing process includes, but is not limited to:
 - > Interpretation and evaluation, preparation and labelling, provision of information and instructions, therapeutic intervention and supply of medicines to the patient.

7. Apply a pharmaceutical care management approach to ensure rational medicine use (45 Credits).
8. Initiate therapy, where appropriate, within the scope of practice of a pharmacist (25 Credits).
9. Promote public health (20 Credits).
10. Integrate and apply management principles in the practice of pharmacy (20 Credits).
11. Participate in research (30 Credits).

Critical Cross-field Outcomes:

- > Identify, analyse and solve problems related to the provision of pharmaceutical care using creative approaches.
- > Work effectively with others as a member of a team of health care professionals in applying pharmaceutical care management principles.
- > Organise and manage activities responsibly and effectively in contributing to the institution and broader community.
- > Collect, analyse, organise and critically evaluate information in a chosen topic to develop a pharmaceutical product or enhance pharmaceutical care programmes and services.
- > Communicate effectively using visual, mathematical and/or language skills in the modes of oral, written and/or practical presentation in a sustained discourse.
- > Use science and technology in pharmacy effectively and critically, showing responsibility towards the environment and health of others by promoting ethical conduct in all contexts.
- > Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.

ASSOCIATED ASSESSMENT CRITERIA

Assessment Criteria for Exit Level Outcome 1:

- 1.1 Physical, chemical and biological principles are integrated and applied in the development, formulation, compounding, manufacturing, drug supply management and dispensing of pharmaceutical products.
- 1.2 Anatomical, physiological, biochemical and pathophysiological principles and knowledge are integrated and applied in the initiation of therapy and provision of pharmaceutical care.
- 1.3 Social and behavioural principles and knowledge are integrated and applied in the initiation of therapy and provision of pharmaceutical care.

Assessment Criteria for Exit Level Outcome 2:

- 2.1 Physicochemical and biopharmaceutical principles are applied in the formulation and development of pharmaceutical products.
- 2.2 Physical, chemical and biological principles are applied in the manufacturing, compounding and quality assurance of pharmaceutical products.
- 2.3 Physicochemical and biopharmaceutical principles are applied in compounding and dispensing of pharmaceutical products.
- 2.4 Pharmaceutical product integrity is maintained during storage and distribution according to GPP.

Assessment Criteria for Exit Level Outcome 3:

- 3.1 Standard Operating Procedures (SOPs) are generated and implemented in compliance with GPP.
- 3.2 Pharmaceutical preparations are compounded in accordance with GMP.

3.3 Sterile admixtures are produced in accordance with aseptic techniques and principles of GMP and GPP.

3.4 Records are generated for each of the preparations produced according to organisational procedures and legal requirements.

Assessment Criteria for Exit Level Outcome 4:

4.1 Medicines registration dossiers for pharmaceutical products using the supplied data and documentation are compiled in accordance with the current relevant legislation.

4.2 Master production documentation for the manufacture of pharmaceutical products is interpreted in terms of GMP.

4.3 The GMP requirements for generation and reconciliation of batch manufacturing documents are described.

4.4 Dosage forms are manufactured on a laboratory scale according to plan and standard operating procedures.

> Range of dosage forms includes, but is not limited to:

> Solid, liquid, semi-solid, sterile and non-sterile.

4.5 Packaging labelling and package inserts are contextualised according to the product, GMP and the current relevant legislation.

4.6 A Quality Management System (QMS) is critically evaluated in accordance with GMP.

> Range aspects of QMS includes, but is not limited to:

> Quality assurance (QA) and quality control procedures, in-process controls, validation, qualification and Good Laboratory Practice (GLP).

Assessment Criteria for Exit Level Outcome 5:

5.1 The selection of medicines and related products is managed according to rational scientific and evidence-based principles and patient needs.

> Range of selection criteria includes, but is not limited to:

> Morbidity, pharmaco-epidemiological data, quality medicine products, bioavailability, therapeutic equivalence, generic equivalence and pharmaco-economic data and availability.

5.2 The quantity of medicines needed is identified according to standard methods.

> Range of methods includes, but is not limited to:

> Patient morbidity, standard treatment guidelines and the adjusted consumption method.

5.3 The procurement of medicines and related products is managed according to organisational policies and procedures.

> Range of procurement criteria include, but is not limited to:

> Vendor qualification, reliability and cost effectiveness.

5.4 Pharmaco-economic knowledge, principles, models and theories are applied in the provision of cost-effective therapy and pharmaceutical services.

5.5 The storage and distribution of medicines and related products is managed according to Good Pharmacy Practice (GPP), Good Distribution Practice (GDP) and Good Wholesaling Practice (GWP).

> Range of storage and distribution considerations includes, but is not limited to:

> Storage conditions, security, pest control and storage space.

5.6 Disposal of expired and unwanted pharmaceutical products is managed according current relevant legislation and guidelines.

Assessment Criteria for Exit Level Outcome 6:

6.1 The prescription is evaluated in terms of the appropriateness of the prescribed medication according to GPP.

> Range of evaluation criteria includes, but is not limited to:

> Indications, safety, possible contra-indications, interactions, treatment duplication, legal and economic implications.

- 6.2 Medicines are prepared and labelled in accordance with GPP and current legislative requirements.
- 6.3 Appropriate drug information sources and information systems are accessed and the relevant information communicated to the patient in order to optimise therapeutic outcomes.
- 6.4 A pharmaceutical care plan, including design, implementation and monitoring, is developed in collaboration with other health care professionals and the patient.
- 6.5 Records are kept in accordance with the GPP and current legislative requirements.

Assessment Criteria for Exit Level Outcome 7:

- 7.1 The philosophy and principles of pharmaceutical care are demonstrated in terms of optimising therapeutic outcomes for a specific patient.
- 7.2 A pharmaceutical care management approach is applied in collaboration with other health care professionals and the patient.
- 7.3 Rational drug use is facilitated by applying pharmaceutical care, medicine utilisation reviews and the principles of pharmaco-economics.
- 7.4 Pharmacovigilance is practised and Adverse Drug Events are reported.

Assessment Criteria for Exit Level Outcome 8:

- 8.1 Relevant clinical information and history is obtained from the patient.
- 8.2 Appropriate advice, including referral, and/or medicines are supplied for specific symptoms according to GPP and principles of pharmaceutical care.
- 8.3 Appropriate records are kept and therapeutic outcomes monitored in accordance with GPP and principles of pharmaceutical care.

Assessment Criteria for Exit Level Outcome 9:

- 9.1 Advice on disease management is provided in terms of use of medicinal and non-medicinal options.
- 9.2 Tools are designed to inform the public on health care and lifestyle, in health promotion, disease prevention, disease management and medicine usage, in addition to enabling the recognition and management of risk factors.
- 9.3 Promotive health services are offered in terms of current health policy, epidemiological information and current legislative requirements.
- 9.4 The public are assisted to recognise and manage health risk factors in terms of medication and disease states.
- 9.5 Screening tests are used to assist in counselling, therapeutic intervention, referral and early detection of disease.
- 9.6 Appropriate records are kept and therapeutic outcomes monitored in accordance with GPP and pharmaceutical care principles.

Assessment Criteria for Exit Level Outcome 10:

- 10.1 Basic financial management principles are applied in the practice of pharmacy.
- 10.2 Human resource management principles are applied in the practice of pharmacy.
- 10.3 Strategic management principles are applied in the practice of pharmacy.
- 10.4 Marketing management and change management principles are applied in the practice of pharmacy.
- 10.5 Logistics management principles are applied throughout in the medicines supply chain.
- 10.6 Relationships with patients, caregivers and other health professionals and workers are managed in accordance with professional practice standards.

Assessment Criteria for Exit Level Outcome 11:

- 11.1 The principles of qualitative and qualitative research are explained.

11.2 A research proposal is formulated.

> Range of formulation requirements includes, but is not limited to:

> Delineating the problem selecting the research methodology, conducting literature review and structure.

11.3 Research is conducted ethically in accordance with established research methodology practice.

> Range of research conduct includes, but is not limited to:

> Gathering and processing, capturing, and interpreting information.

11.4 Findings and conclusions are presented in oral and written formats in accordance with established research practice.

Integrated Assessment:

Integrated assessment at the level of the qualification provides an opportunity for learners to show that they are able to integrate concepts, ideas and actions across exit level outcomes to achieve competence that is grounded and coherent in relation to the purpose of the qualification. Integrated assessment should show how already demonstrated competence in individual areas can be linked and applied for the achievement of a holistic outcome as described in the exit level outcomes. Both formative and summative forms of assessment should be applied appropriately throughout the assessment process.

Integrated assessment must judge the quality of the observable performance, and also the quality of the thinking that lies behind it. Assessment tools must encourage learners to give an account of the thinking and decision-making that underpin their demonstrated performance. Some assessment practices will demand practical evidence while others may be more theoretical, depending on the type of outcomes to be assessed. The ratio between action and interpretation is not fixed, but varies according to the demands of the particular exit level outcome of the qualification. A broad range of task-orientated and theoretical assessment tools may be used, with the distinction between practical knowledge and disciplinary knowledge maintained so that each takes its rightful place.

INTERNATIONAL COMPARABILITY

The global Federation of Pharmacists and Pharmaceutical Scientists (FIP) represent two million pharmacists around the world through Member Organisations and Individual Members. FIP sets global pharmacy standards through professional and scientific guidelines, policy statements and declarations, as well as through its collaboration with other international organisations, including the World Health Organization (WHO) and other United Nations (UN) agencies. As a member organisation, The South African Pharmacy Council ensures that approved pharmacy schools embed these standards and guidelines in their learning programmes. The South African Bachelor of Pharmacy has been designed and generated with these standards and guidelines in mind.

Although all member countries offer pharmacy training in line with FIP and their offerings are therefore comparable, institutions from the following countries were considered for the purpose of identifying best practice: Australia, Egypt, India, the United States of America and the United Kingdom.

Australia:

The University of South Australia offers a four year programme requiring students to complete a total of 144 units of study. The first two years of the program provide a comprehensive coverage of biological and chemical sciences, followed in the third and fourth years by instruction and practical experience in the major disciplines of pharmacotherapeutics and pharmacology. The requirements for professional recognition are similar to the South African context. The programme comprises the following modules:

First Year:

- > Chemistry 100.
- > Mathematics 100.
- > Biological Science 100.
- > Communication in Health 100.
- > Pharmaceutical Chemistry 101.
- > Statistics and Research Methods.
- > Biological Science 101.
- > Pharmaceutics P 101.

Second Year:

- > Biochemistry P 200.
- > Physiology N 200.
- > Pharmaceutical Chemistry 200.
- > Pharmaceutics 200.
- > Molecular and Chemical Basis of Therapeutics 201.
- > Microbiology and Immunology P 201.
- > Pharmaceutics P 201.
- > Pharmacokinetics and Biopharmaceutics P 201.

Third Year:

- > Pharmaceutics 300.
- > Applied Pharmacotherapeutics 300.
- > Pharmacology 300.
- > Molecular and Chemical Basis of Therapeutics 300.
- > Applied Pharmacotherapeutics 301.
- > Pharmacology 301.
- > Molecular and Chemical Basis of Therapeutics 301.

Fourth Year:

- > Applied Pharmacotherapeutics 400 - Theory.
 - > Applied Pharmacotherapeutics 400 - Professional Practice.
 - > Ethics in Pharmacy.
 - > Pharmacy Elective 400
- OR
- > Pharmacy Honours Thesis 400.
 - > Applied Pharmacotherapeutics 401 - Theory.
 - > Applied Pharmacotherapeutics 401 - Professional Practice.
 - > Pharmacy Elective 401.
- OR
- > Pharmacy Honours Thesis 401.
 - > BUGE Elective.

Egypt:

The Faculty of Pharmacy at the Ain Shams University offers the Bachelor Degree in Pharmaceutical Sciences over five years, comprising the following modules:

Preparatory year:

- > Inorganic Chemistry.

- > Physics.
- > Zoology.
- > Botany.
- > English Language.
- > Mathematics in Pharmacy.
- > Medical Terminology & Pharmacy Orientation.
- > Physical Chemistry.
- > Biophysics.
- > Organic Chemistry.
- > Botany.
- > Anatomy & Histology.
- > Computer Science and Biostatistics.

First year:

- > Pharmaceutical organic chemistry.
- > Pharmaceutics.
- > Analytical pharmaceutical chemistry.
- > Pharmacognosy.
- > Physiology.
- > Psychology & Sociology.
- > Analytical Pharmaceutical chemistry.
- > Physical Pharmacy.
- > General microbiology & Immunology.

Second year:

- > Pharmaceutical organic chemistry & Spectroscopy.
- > Pharmaceutical microbiology.
- > Pharmaceutics.
- > Biochemistry.
- > Parasitology.
- > Instrumental analysis.
- > Pharmaceutics.
- > Medical microbiology.
- > Biochemistry.
- > Chemistry of Natural Products.
- > Pathology.
- > Pharmacy Administration.

Third year:

- > Drug Design.
- > Pharmacology (2).
- > Clinical Biochemistry.
- > Toxicology.
- > Clinical Pharmacy (1).
- > Pharmacokinetics.
- > Industrial Pharmacy (2).
- > Clinical Pharmacy (2).
- > Clinical Pharmacology.
- > Pharmacy Practice.
- > Clinical Toxicology.
- > Biotechnology.

- > Pharmaceutical Chemistry.
- > Pharmacy Law.
- > First aid.

Fourth year:

- > Dosage form design.
- > Public Health.
- > Analysis of food and cosmetics.
- > Good Manufacturing Practice.
- > Drug & Poison information.
- > Quality Control of herbal products.
- > Elective course (1).
- > Elective course (2).

Elective Courses:

- > Chemistry & Analysis of drugs.
- > Chemotherapy.
- > Planning, Marketing and Economics of Drugs.
- > Clinical Pharmacy.
- > Cosmetics.
- > Hospital Pharmacy.
- > Drug Interactions.
- > Clinical Pharmacy Practice.
- > Dosage Form Design.
- > Clinical Pharmacokinetics.
- > Drug Stability.
- > Drugs of abuse & addiction.
- > Nonprescription drugs (OTC).
- > Communications in Pharmacy.
- > Drugs spectrophotometric Quality Control.
- > Microbiological Quality Control.
- > Clinical Nutrition.
- > Production of medicinal & aromatic plants.
- > Tissue Culture.
- > Industrial Microbiology.

India:

The Al-Ameen College of Pharmacy offers a Bachelor of Pharmacy over a period of four academic years comprising the following modules of study:

First year:

- > Human Anatomy and Physiology.
- > Pharmaceutics (Dispensing and General Pharmacy).
- > Pharmacognosy.
- > Pharmaceutical Organic Chemistry.
- > Pharmaceutical Inorganic Chemistry.
- > Mathematics or Biology.
- > Computer Sciences.

Second year:

- > Physical Pharmaceutics.
- > Pharmaceutical Microbiology and Biotechnology.
- > Pathophysiology.
- > Applied Biochemistry.
- > Pharmaceutical Organic Chemistry.

Third year:

- > Medicinal Chemistry.
- > Pharmaceutical Jurisprudence.
- > Pharmacognosy and Pathochemistry.
- > Pharmaceutical Engineering.
- > Pharmacology.

Fourth year:

- > Pharmacology and Biopharmaceutics.
- > Instrumental and Biomedical Analysis.
- > Pharmacology and Toxicology.
- > Medicinal Chemistry.
- > Industrial Pharmacognosy.

Electives:

- > Industrial Pharmacy.
- > Advanced Industrial Pharmacy.
- > Pharmaceutical Production Management or Total Quality Management or Pharmaceutical Management and Marketing or Herbal Drug Technology.
- > Pharmacy Practice.
- > Pharmacokinetics and Therapeutic drug monitoring.
- > Hospital and Community Pharmacy or Clinical Pharmacy and Therapeutics.

United States of America (USA):

The Accreditation Council for Pharmacy Education stipulates that in addition to a first professional degree, which prepares the pharmacist for practice in the field, pharmacists may also choose to complete postgraduate study, which may consist of a non-degree residency experience, a graduate degree programme, or both.

A license to practice pharmacy in the USA is required in all states and territories of the USA. Each state has its own licensure procedure. To obtain a license, one must graduate from an accredited college of pharmacy with a Doctor of Pharmacy degree (Pharm.D), pass a state examination, and serve an internship under a licensed pharmacist. Many pharmacists are licensed to practice in more than one state and most states require continuing education for license renewal.

In the USA, few colleges of pharmacy admit students directly from high school. Most require one or two years of university level pre-pharmacy or pre-professional education. Pre-professional courses can be taken at any regionally accredited university, college, or junior college in the USA that offers a pre-pharmacy programme.

At least 5 years of study beyond secondary school are required to graduate from programmes accredited by the American Council on Pharmaceutical Education. A Bachelor of Science (BS) in Pharmacy, the degree traditionally received by most graduates, takes 5 years. The curriculum for the BS includes courses on:

- > Pharmaceutical chemistry.
- > Pharmacognosy.
- > Pharmacology.
- > Clinical pharmacy.
- > Pharmacy administration.
- > Pharmacy practice in the workplace.

United Kingdom (UK):

The School of Pharmacy at the University of London offers the Master of Pharmacy which is a 4 year undergraduate degree that leads, after a further year of paid pre-registration training, to registration as a pharmacist in Great Britain and is accredited by the Royal Pharmaceutical Society of Great Britain (RPSGB). British registration is recognised in other member states of the European Union.

The M Pharm degree is structured into two courses each year, with option modules and a project in the third and fourth years. The first year covers core concepts in:

- > Chemistry.
- > Biochemistry.
- > Physiology.
- > Pharmacy practice.

The second year covers:

- > The science that underpins the delivery of drug molecules to their sites of action in the body.
- > The discovery, synthesis and analysis of drugs, which includes those obtained from plants or by genetic technology.
- > The mechanisms of action of drugs, which includes the study of physiology, cell biology and biochemistry.

The specialist options offered are in the disciplines of:

- > Biochemistry.
- > Chemistry.
- > Drug delivery.
- > Microbiology.
- > Natural products.
- > Pharmaceutics.
- > Pharmacology.
- > Pharmacy practice and toxicology.
- > All students undertake a research project under the supervision of a member of academic staff.

Year One:

- > Fundamentals of Pharmaceutical Science.
- > Scientific Basis of Pharmacy.

Two:

- > Pharmaceutical & Pharmacological Approaches to Therapeutics.
- > Drug Development: From Design to Client.

Three:

Pharmaceutical & Biomedical Aspects of Cell & Molecular Biology:

- > Research Project.
- OR
- > Extramural Placement in the UK or abroad.

Four:

- > Research Project.
- > Preparation for Practice.

The programme also covers the social and behavioural concepts of pharmacy practice, including the roles and responsibilities of the pharmacist in the provision of health care, prescription interpretation, dispensing and clinical pharmacy, and the law and ethics of pharmacy.

Conclusion:

Although this Qualification is geared towards meeting the specific needs of South Africa, it can be seen that it compares favourably with similar qualifications offered throughout the world and is in keeping with international best practice as advocated in particular by the FIP through the WHO.

ARTICULATION OPTIONS

This Qualification articulates horizontally with:

- > Bachelor of Pharmaceutical Sciences, NQF Level 7.

This Qualification articulates vertically with:

- > Master of Pharmacy, NQF Level 8.

MODERATION OPTIONS

> Any institution offering learning that will enable achievement of this qualification must be accredited by the relevant ETQA.

> External moderation of assessment will take place.

> The accredited training provider will oversee internal and external moderation of assessment in agreement with the relevant EQTA.

> Moderation should encompass achievement of competence described in exit level outcomes, critical cross-field outcomes and the integrated competence described in the qualification.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

> Assessors and moderators must be registered as assessors and/or moderators with the relevant ETQA or an ETQA that has a Memorandum of Understanding with the relevant ETQA.

> Assessors and/or moderators must be in possession of a qualification at a minimum of one level above that of this Qualification in a relevant field of study and must have experience in pharmacy practice.

NOTES

> All learners must be registered as learners with the South African Pharmacy Council (SAPC) for the duration of the period of learning as specified current relevant legislation and in agreement with the relevant ETQA.

> In addition, once they have successfully completed the Qualification, those learners who wish to practise as Pharmacists will be required to register with the SAPC as pharmacy interns and carry out the duties of a pharmacist intern as defined in the relevant Scope of Practice. Upon completion of the internship and satisfying the pre-registration requirements of the SAPC, they will register as Pharmacists with the SAPC. For the first year after registration they are required to perform pharmaceutical service, as defined in the relevant Regulations of the current Pharmacy Act.

> The range of elective learning areas offered will be dependent on the approval of the provider and the relevant ETQA, in agreement with the SAPC.

> Credit values reflected for each exit level outcome should be regarded as a guideline only.

UNIT STANDARDS

This qualification is not based on Unit Standards.

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION

None

No. 7

9 January 2009

**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.saqqa.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 9 February 2009**. All correspondence should be marked **Standards Setting – SGB for Engineering** and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. E. Brown
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 – 431-5144
e-mail: ebrown@saqa.org.za


PP **D. MPHUTHING**
ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
Bachelor of Engineering

SAQA QUAL ID	QUALIFICATION TITLE		
64429	Bachelor of Engineering		
ORIGINATOR		PROVIDER	
SGB Engineering			
QUALIFICATION TYPE	FIELD	SUBFIELD	
National First Degree	6 - Manufacturing, Engineering and Technology	Engineering and Related Design	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	560	Level 7	Regular-ELOAC

This qualification replaces:

Qual ID	Qualification Title	NQF Level	Min Credits	Replacement Status
48694	Bachelor of Science: Engineering	Level 7	560	Will occur as soon as 64429 is registered

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

The purpose of the qualification is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing engineer. The recognized purpose of this bachelor's degree in engineering will be to provide graduates with:

- > A thorough grounding in mathematics, basic sciences, engineering sciences, engineering modeling, engineering design and the abilities to enable applications in fields of emerging knowledge together with an appreciation for the world and society in which engineering is practiced.
- > Preparation for careers in engineering itself and related areas, for achieving technological leadership and to make a contribution to the economy and national development.
- > The educational requirement towards registration as a Professional Engineer with the Engineering Council of South Africa, as well as to allow the graduate to make careers in engineering and related fields.
- > The ability to proceed to postgraduate studies in both course-based and research masters programmes for graduates with an appropriate level of achievement in the programme.

The particular engineering learner completing this qualification will be competent and able to display the following learning outcomes on:

- > Solving complex problems.
- > Applying of scientific and engineering knowledge.
- > Performing Engineering designs.
- > Conduct investigations, experiments and collate data analysis.
- > Using appropriate Engineering methods, skills and tools, including the use of Information Technology equipment.
- > Communicating technical information in a professional manner.
- > Demonstrating critical awareness of the impact of the engineering activity.

- > Effectively working with individuals and teams in a multi-disciplinary working environment.
- > Engaging in independent learning.
- > Acting professionally and ethically at all times.

Rationale:

Engineering is an activity that is best defined by five distinguishing characteristics. First, it encompasses initiatives, services and the solution of problems that are of importance to society and the economy.

Second, engineering activity brings benefits through exploiting natural resources, harnessing energy, using materials with beneficial properties, using machinery and equipment, transferring, storing and processing information, constructing, operating and maintaining infrastructure and plant, and the organisation and control of systems or processes. These actions involve risks, requiring engineering activity to be conducted with due regard to safety, health, environmental and sustainability considerations.

Third, engineering functions 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 or operating plant and processes; managing implementation or construction projects; implementing designs or solutions; research, development and commercialization of products.

Fourth, engineering activity requires a body of knowledge and distinctive competencies. The body of knowledge is based on mathematics, basic sciences, engineering sciences, information technology and contextual knowledge including legal, financial and regulatory aspects. Distinctive competencies include identifying problems and designing solutions, managing activities, addressing impacts of solutions and activities and acting ethically, applying judgement and taking responsibility.

Fifth, the practice of Engineering activities at professional level involves a number of roles, recognized in categories of registration under the Engineering Profession Act: Professional Engineer, Professional Engineering Technologist, Professional Engineering Technician, and Professional Certificated Engineer. This qualification is intended to provide the educational base for the development of a Professional Engineer with the following profile.

Professional Engineers are characterised by the ability to solve problems, develop components, systems, services and processes through creativity, innovation and the application of fundamental and engineering principles. They provide technical and commercial leadership through well-developed interpersonal skills. They work independently and responsibly, applying original thought and judgement to technical and risk-based decisions in complex situations. Professional Engineers must therefore have a broad, fundamentals-based appreciation of engineering sciences, with depth in specific areas, together with knowledge of financial, commercial, legal, social and health, safety and environmental matters.

The process of professional development of a Professional Engineer starts with the attainment of a qualification that meets this standard. After graduation a programme of training and experience is completed to attain the competencies for Stage 2, namely professional registration. The programme defined in this standard therefore has the following purpose.

The examples of development paths to occupations that can be supported by this qualification are as follows:

- > Aeronautical Engineer.
- > Agricultural Engineer.
- > Chemical Engineer.

- > Civil Engineer.
- > Electrical Engineer.
- > Industrial Engineer.
- > Mechanical Engineer.
- > Mining Engineer and
- > Metallurgical Engineer.

It is envisaged that the Higher Education training providers will use this generic engineering qualification to develop appropriate learning programmes for the specific occupation content and skills.

RECOGNIZE PREVIOUS LEARNING?

N

LEARNING ASSUMED IN PLACE

It is assumed that learners are already competent in Mathematics, Physical Science and the language of teaching and learning at NQF Level 4 at levels determined by the higher education provider.

Note: that the qualification may have a disciplinary or cross-disciplinary qualifier (discipline, branch, option or endorsement) defined in the provider's rules for the degree that is reflected on the academic transcript and degree certificate, subject to the following:

- > There must be at least one qualifier which contains the word Engineering together with a disciplinary description such as: Agricultural, Aeronautical, Chemical, Civil, Computer, Electrical, Electro-mechanical, Electronic, Environmental, Industrial, Extractive Metallurgical, Information, Materials, Mechanical, Mechatronic, Metallurgical, Mineral(s) Processing, Physical Metallurgical and Mining. Qualifiers are not restricted to this list.
- > A second qualifier, if present, must indicate a focus area within the field of the first qualifier.
- > The qualifier(s) must:
 - > Clearly indicate the purpose of the programme and the discipline or practice area served.
 - > Must be consistent with the fundamental engineering science content on the programme.
 - > Be comparable with typical programmes within Washington Accord signatories.
- > The target market indicated by the qualifier(s) may be a traditional discipline or a branch of engineering or a substantial industry area. Formal education for niche markets should be satisfied by broad undergraduate programmes such as specified in this standard followed by specialized course-based programmes.

Recognition of Prior Learning:

- > This qualification may be achieved in part or wholly through recognition of prior learning (RPL) processes.
- > 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 RPL possible, if the learner is able to demonstrate competence in the knowledge, skills, values and attitudes implicit in this first 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 the qualification is open bearing in mind learning assumed to be place.

QUALIFICATION RULES

The programme leading to the qualification shall be a four-year full-time equivalent programme with a minimum of 560 credits. Not less than 120 Credits shall be at NQF Level 7 (HEQF Level 8).

Fundamentals; Credits:

> Mathematical Sciences; 56 Credits.

> Basic Sciences; 56 Credits.

Totals: 112 Credits.

Core; Credits:

> Computing and IT; 20 Credits.

> Engineering Sciences; 168 Credits.

> Engineering Design and Synthesis; 67 Credits.

Totals: 255 Credits.

Electives; Credits:

> Complementary Studies; 56 Credits.

> Discretionary studies; 137 Credits.

Totals: 193 Credits.

The discretionary studies component shall be taken up by allocating knowledge to the six areas, to form a coherent, balanced programme. However, if the training service provider chooses to include work integrated learning in the programme, credits shall not be included in the knowledge breakdown if the work is not quality assured by the same provider or does not comprehensively assess the student's performance against defined outcomes and is not documented and presented in the accreditation process.

Core and Specialist Requirements:

The programme shall have a core of mathematics, natural sciences and fundamental engineering sciences that provides a viable platform for further studies and lifelong learning. The core must enable development in a traditional discipline or in an emerging field. The core embraces both fundamental and core elements as defined.

A programme shall contain specialist engineering study at the exit level. Specialist study may lead to elective or compulsory credits. Specialist study may take on many forms including further deepening of a theme in the core, a new sub-discipline, or a specialist topic building on the core. It is recognized that the extent of specialist study is of necessity limited in view of the need to provide a substantial coherent core. Specialist study may take the form of compulsory or elective credits.

Underpinning Complementary Studies knowledge must be sufficient and appropriate to support the student in satisfying Exit Level Outcomes 7 and 10.

Curriculum Content:

This standard does not specify detailed curriculum content and the fundamental and specialist engineering science content must be consistent with the designation of the degree.

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 0-56 provided the total credits for the complete qualification is not less than a 560 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 are relevant to the practice of engineering in 2 ways: (a) principles, results and methods are applied in the practice of engineering, including engineering economics, the impact of technology on society and effective communication and (b) (for Levels 7 and above) study broadens 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 Sciences:** Have roots in the mathematical and physical 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.

> **Engineering Design and Synthesis:** Is the systematic process of conceiving and developing materials, components, systems and processes to serve useful purposes. Design may be procedural, creative or open-ended and requires application of engineering sciences, working under constraints, and taking into account economic, health and safety, social and environmental factors, codes of practice and applicable laws.

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

Exit Level Outcomes defined below are stated generically and may be assessed in various engineering disciplinary or cross-disciplinary contexts in a provider-based or simulated practice environment. Words shown in italics have specific meanings as defined in ECSA documentation that training providers must take cognizance of:

General Range Statement: The competencies defined in the ten exit level outcomes may be demonstrated in a university-based, simulated workplace context. Competencies stated generically may be assessed in various engineering disciplinary or cross-disciplinary contexts.

1. Problem solving:

Learning Outcome: Formulate and solve complex engineering problems creatively and innovatively.

Range Statement: Complex engineering problems are characterized by some or all of the following attributes:

- > Problems require identification and analysis, and may be concrete or abstract, may be divergent and may involve significant uncertainty.
- > Problems may be infrequently encountered types and occur in unfamiliar contexts.
- > Approach to problem solving needs to be found, is creative and innovative.
- > Information is complex and possibly incomplete, requiring validation and critical analysis.
- > Solutions are based on theory, use of first-principles and evidence, (which may be incomplete) together with judgement where necessary.
- > Involves a variety of interactions which may impose conflicting constraints.

2. Application of scientific and engineering knowledge.

Learning Outcome: Demonstrate competence to apply knowledge of mathematics, basic science and engineering sciences from first principles to solve complex engineering problems.

Range Statement: Knowledge of mathematics, basic science and engineering sciences is characterized by:

- > Knowledge of mathematics using formalism, and oriented toward engineering analysis and modeling. deep knowledge of basic sciences: both as relevant to discipline.
- > Deep knowledge of broad, range of fundamental principles and engineering sciences of an engineering discipline or cross-disciplinary field that is coherently and systematically organized.
- > In-depth, theoretically based knowledge in limited specialist area(s), informed by current developments, and emerging issues.
- > Use Mathematics, basics science and engineering sciences in formal analysis and modeling of engineering situations, for reasoning about and conceptualizing engineering problems.

Note: Problems used for assessment may provide evidence in the application of one, two or all three categories of knowledge listed above.

3. Engineering Design.

Learning Outcome: Demonstrate competence to perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes of a complex nature.

Range Statement: Design problems used in assessment must conform to the definition of a complex engineering problem. A major design problem should be used to provide evidence. The problem would be typical of that which the graduate would participate in a typical employment situation shortly after graduation. The selection of components, systems, engineering works, products or processes to be designed is dependent on the discipline or sub-discipline.

4. Investigations, experiments and data analysis.

Learning Outcome: Demonstrate competence to conduct investigations of complex engineering problems including engagement with the research literature and use of research methods including of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

Range Statement: The balance of investigation and experiment should be appropriate to the discipline. An investigation or experimental study should be typical of those in which the graduate would participate in an employment situation shortly after graduation.

Note: An investigation differs from a design in that the objective is to produce knowledge and understanding of a phenomenon.

5. Engineering methods, skills and tools, including Information Technology.

Learning Outcome: Demonstrate competence to use appropriate techniques, resources and modern engineering tools, including information technology, prediction and modeling for the solution of complex engineering activities, with an understanding of the limitations, restrictions, premises, assumptions and constraints.

Range Statement: A range of methods, skills and tools appropriate to the disciplinary designation of the program including:

- > Discipline-specific tools, processes or procedures.
- > Computer packages for computation, modeling, simulation, and information handling.
- > Computers and networks and information infrastructures for accessing, processing, managing, and storing information to enhance personal productivity and teamwork.
- > Techniques from socio-economic, management, health and safety, and environmental protection.

6. Professional and technical communication.

Learning Outcome: Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.

Range Statement: Material to be communicated is in an academic or simulated professional context. Audiences range from engineering peers, academic personnel and lay persons. Appropriate academic or professional discourse is used. Written reports range from short (300-1000 word plus tables and diagrams) to research, design or investigative reports (10 000 to 15 000 words plus tables, diagrams and appendices), covering material at the exit level. Methods of providing information include the conventional methods of the discipline, for example engineering drawings, as well as subject-specific methods.

7. Impact of Engineering activity.

Learning Outcome: Demonstrate critical awareness of the impact of engineering activity on the socio-economic, industrial and physical environment and of the need to act professionally within own limits of competence.

Range Statement: The combination of social, workplace (industrial) and physical environmental factor must be appropriate to the discipline or other designation of the qualification. Evidence may include case studies typical of engineering practice situations in which the graduate is likely to participate. The range of the candidates activity:

- > Is generally outside of standards and codes of practice.
- > Involves a diverse group of stakeholders with widely varying needs.
- > Has significant consequences that are far ranging.
- > Is complex, possibly including many component parts or sub-systems.

8. Individual, team and multidisciplinary working.

Learning Outcome: Demonstrate competence to work effectively as an individual, as a member or leader in diverse teams and in multidisciplinary environments.

Range Statement: Tasks require co-operation across at least one disciplinary boundary. Co-operating disciplines may be engineering disciplines other than that of the programme or may be outside engineering.

9. Independent learning ability.

Learning Outcome: Demonstrate competence to engage in independent learning through well developed learning skills.

Range Statement: The learning context is complex and ill defined. Some information is drawn from the research literature.

10. Engineering Professionalism.

Learning Outcome: Comprehend and apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

Range Statement: Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate. The range of the learners activity:

- > Is generally outside of standards and codes of practice.
- > Involves a diverse group of stakeholders with widely varying needs.
- > Has significant consequences that are far ranging.
- > Is complex, possibly including many component parts or sub-systems.

Critical Cross-Field Outcomes:

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.

Organizing 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, analyzing, organizing 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:

- > Interpreting 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

Associated Assessment Criteria for Exit Level Outcome 1:

- 1.1 The problem is analysed and defined in terms of criteria for an acceptable solution.
- 1.2 Relevant information and engineering knowledge and skills are identified in formulating the problem.
- 1.3 Possible approaches are generated and formulated that would lead to a workable solution for the problem.
- 1.4 Solutions provided are creative and innovative, but clearly focused on the problem at hand.
- 1.5 Possible solutions are modelled and analysed in terms of strengths and weaknesses for the overall solution.
- 1.6 Possible solutions are prioritised in order of suitability to the overall problem and budget constraints.
- 1.7 The solution is formulated and presented in an appropriate form to final decision makers.

Associated Assessment Criteria for Exit Level Outcome 2:

- 2.1 Analysis and modelling of problems includes mathematical, numerical analysis and statistical knowledge within the principles of the basic sciences.
- 2.2 Concepts, ideas and theories are communicated with the aid of mathematics.
- 2.3 Mathematical concepts are implemented in reasoning about and conceptualising engineering components, systems or processes.
- 2.4 Uncertainty and risk is described through the use of probability and statistics.
- 2.5 Physical laws and knowledge of the physical world are used as a foundation for the solution of engineering problems.
- 2.6 Principles of the basic sciences are adhered to in reasoning about and conceptualising engineering problems, components, systems or processes.
- 2.7 Open-ended engineering problems are identified and solved using techniques, principles and laws of engineering science at a fundamental level in at least one specialist area.
- 2.8 Engineering applications are identified and pursued using techniques, principles and laws of engineering science at a fundamental level in at least one specialist area.
- 2.9 Work is conducted across engineering disciplinary boundaries through cross disciplinary literacy and shared fundamental knowledge using techniques, principles and laws of engineering science.

Associated Assessment Criteria for Exit Level Outcome 3:

- 3.1 The design problem is formulated to satisfy user needs, applicable standards, codes of practice and legislation.

- 3.2 The design process focuses on important issues, recognises and deals with relevant constraints.
- 3.3 Knowledge, information and resources are acquired and evaluated in order to apply appropriate principles and design tools to provide a workable solution.
- 3.4 Design tasks performed include analysis, quantitative modelling and optimisation of the product, system or process.
- 3.5 Alternatives are evaluated for implementation and a preferred solution is selected based on techno-economic analysis.
- 3.6 The selected design is assessed in terms of the impact and benefits.
> Range: Social, economic, legal, health, safety, and environmental.
- 3.7 The design logic and relevant information is communicated to relevant personnel in accordance with organisational requirements.

Associated Assessment Criteria for Exit Level Outcome 4:

- 4.1 Investigations and experiments are planned and conducted within an appropriate discipline.
- 4.2 Available literature and material is critically evaluated for suitability to the investigation or experiment.
- 4.3 Analysis is performed as necessary to ensure suitability of the investigation or experiment.
- 4.4 Equipment or software is selected and used as appropriate for the relevant application in the investigations and experiments.
- 4.5 Information is analysed, interpreted and derived from available data.
- 4.6 Conclusions are drawn from an analysis of all available evidence.
- 4.7 The purpose, process and outcomes of the investigation and experiment are recorded in a technical report and distributed to relevant personnel in accordance with organisational procedures.

Associated Assessment Criteria for Exit Level Outcome 5:

- 5.1 The method, skill or tool is assessed for applicability and limitations against the required result.
- 5.2 The method, skill or tool is applied correctly to achieve the required result.
- 5.3 Results produced by the method, skill or tool are tested and assessed against required results.
- 5.4 Computer applications are created as required by the discipline.

Associated Assessment Criteria for Exit Level Outcome 6:

- 6.1 The structure, style and language of written and oral communication is appropriate for the purpose of the communication and the target audience.
- 6.2 Graphics used are effective in enhancing the meaning of the text.
- 6.3 Visual materials used enhance oral communications.
- 6.4 Information is provided in a format that can be used by others involved in the engineering activity.
- 6.5 Oral communication is delivered fluently with the intended meaning being apparent.

Associated Assessment Criteria for Exit Level Outcome 7:

- 7.1 The impact of technology is explained in terms of the benefits and limitations to society.
- 7.2 The engineering activity is analysed in terms of the impact on occupational and public health and safety.
- 7.3 The engineering activity is analysed in terms of the impact on the physical environment.
- 7.4 Personal, social, economic, cultural values and requirements are taken into consideration for those who are affected by the engineering activity.

Associated Assessment Criteria for Exit Level Outcome 8:

- 8.1 Individual objectives are identified and focused on in conducting work tasks.
- 8.2 Work is conducted strategically to ensure quality outputs.
- 8.3 Individual work tasks are executed effectively to meet organisational requirements.
- 8.4 Work conducted is of an acceptable quality and is delivered in an acceptable time frame.
- 8.5 Individual contributions made to team activities support the output of the team as a whole.
- 8.6 Critical functions are performed to facilitate effective team work.
- 8.7 Activities are conducted to enhance the work efforts of fellow team members.
- 8.8 Support of team members is capitalised on to obtain maximum benefit within the team.
- 8.9 Working knowledge of other team members' disciplines is acquired in order to capitalise on strengths of the workforce.
- 8.10 A systems approach is used to streamline work activities.
- 8.11 Communication is effective across disciplinary boundaries and enhances team output.

Associated Assessment Criteria for Exit Level Outcome 9:

- 9.1 Learning undertaken is reflected on and own learning requirements and strategies are determined to suit personal learning style and preferences.
- 9.2 Relevant information is sourced and evaluated in terms of applicability to the learning context.
- 9.3 Knowledge acquired from outside of formal instruction is applied in relevant learning contexts as necessary.
- 9.4 Assumptions proposed are critically challenged and learning activities embrace new thinking styles.

Associated Assessment Criteria for Exit Level Outcome 10:

- 10.1 The nature and complexity of ethical dilemmas is described in terms of required practices and limitations of authority.
- 10.2 The ethical implications of decisions made are described in terms of the impact on the business and trustworthiness.
- 10.3 Engineering solutions are evaluated in terms of ethical and financial aspects.
- 10.4 The approach to dealing with ethical problems is developed and justified in terms of legislation and costs.
- 10.5 Continued competence is maintained through keeping abreast of up-to-date tools and techniques available in the workplace.
- 10.6 The system of continuing professional development is embraced and endorsed as an ongoing process.
- 10.7 Responsibility is accepted for consequences stemming from own actions or inaction.
- 10.8 Judgements in decision making during problem solving and design are ethical and within acceptable boundaries of competence.
- 10.9 Decision making is limited to area of current competence.

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 the whole qualification standard is ensured through the Washington Accord. The standards are comparable with those for professionally-oriented bachelor's degrees in engineering in countries having comparable engineering education systems to South Africa:

Australia, Canada, Chinese Taipei, Hong Kong, Ireland, Japan, Korea, New Zealand, India, Malaysia, Germany, Russia, Sri Lanka, Singapore, United Kingdom, and the United States of America. Comparability is audited on a six yearly cycle by a visiting Washington Accord team.

International comparability of this qualification and standards was done against qualifications that is offered in the 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, 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 degrees, diplomas and certificates' in engineering in countries having comparable engineering education systems to South Africa of 2-4 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 recognizes substantial equivalence in the accreditation of qualifications in professional engineering, normally of four years duration. It recognizes the substantial equivalency of programs 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 national engineering organizations Australia, Canada, Ireland, New Zealand, South Africa, United Kingdom, United States, Chinese Taipei represented by Institute of Engineering Education Taiwan, Korea represented by Accreditation Board for Engineering Education of Korea, Singapore represented by Institution of Engineers Singapore and Hong Kong represented by The Hong Kong Institution of Engineers signed an agreement mutually recognizing the qualifications which underpin the granting of Professional Engineer titles in the eleven countries.

Since then, five further economies have attained provisional membership, and are working towards signatory status and they are Germany represented by German Accreditation Agency for Study Programme and Informatics, India represented by National Board of Accreditation of all India Council for Education, Malaysia represented by Board of Engineers Malaysia, Russia represented by Russian Association for Engineering Education and Sri Lanka represented by Institution of Engineers Sri Lanka.

The Sydney Accord commenced in 2001 and recognizes 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 programs 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 national engineering organizations of Australia, Canada, Ireland, New Zealand, South Africa, United Kingdom and Hong Kong signed an agreement mutually recognizing the qualifications which underpin the granting of Engineering Technologist titles in the seven countries. Since then, another economy has attained provisional membership, and are working towards signatory status and they are the United States.

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 organizations of the United Kingdom represented by Engineering Council UK, Republic of Ireland represented by Engineers Ireland, South Africa represented by Engineering Council of South Africa and Canada represented by Canadian Council of Technicians and Technologists signed an agreement mutually recognizing 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 and they are New Zealand represented by Institution of Professional Engineers NZ and the United States represented by Accreditation Board for Engineering and Technicians.

Agreements covering competence standards and qualifications for practicing engineers:

The other three agreements cover recognition of equivalence at the practicing 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 recognized 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 recognized as meeting the generic international standard. Other economies should give credit when such an engineer seeks to have his or her competence recognized. 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.

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 Akreditasi Negara, but only gives details of engineering qualifications that could be compared with Washington Accord signatory countries, 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 only gives details of engineering qualifications that could be compared with Washington Accord signatory countries, 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:

This qualification has generic competencies equivalent to a Professional Engineer, 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, Sydney, and Dublin Accords and the Engineers Mobility Forum (EMF) agreement, Engineering Technologist Mobility Forum and the Asia-Pacific Economic Cooperation (APEC) Engineer agreement. Engineering Industry specific practices and standards are internationally compared and benchmarked by the various employers to these international accords, agreements and forums.

ARTICULATION OPTIONS

The Exit Level Outcomes ensure that a graduate of a programme meeting these standards would meet requirements for entry to a number of programmes including:

- > A candidacy programme toward registration as a Professional Engineer.
- > A Learnership programme directed at becoming registered as a Professional Engineer or meeting other industry requirements.
- > Formal specialist study toward the Postgraduate Diplomas.
- > A postgraduate Bachelor of Laws (LLB) programme.
- > Specialist coursework masters programmes, for example M.Eng.
- > Research masters programmes leading to the M.Sc(Eng), with or without coursework Components.
- > With appropriate work experience, the Master of Business Administration or similar.

> In certain disciplines, progression toward the Government Certificate of Competency.

However, this qualification also provides for both horizontal and vertical articulation.

Horizontal Articulation is possible with:

> Bachelors Degree in Technology (B.Tech): Engineering, NQF Level 7.

Vertical Articulation is possible with:

> Bachelor of Honours Degree in Science (BSc): Engineering, NQF Level 8.

MODERATION OPTIONS

It is likely that candidates will offer a single body of work-based evidence for assessment against the ten 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 Engineers registered with ECSA and fully trained in the methods of assessment.

The assessor for this qualification must:

Have a similar qualification that is at least one level higher than this qualification.

> Meet the requirements of National Assessor Unit Standards.

> Be registered as an assessor with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

> Have a minimum of 1 year on the job relevant experience.

NOTES

This qualification replaces qualification 48694, "Bachelor of Science: Engineering", Level 7, 560 credits.

Abbreviations:

BSc (Eng), BScEng, BEng, BIng.

BSc(Eng)/BEng/BIng Qualification:

In the case of a provider offering programmes with the same first-level qualifier and different second-level qualifiers but with insufficiently differentiated purpose or content, only one programme should be accredited.

Examples of acceptable designations in accordance with HEQF policy are:

- > Bachelor of Engineering in Civil Engineering, abbreviated BEng (Civil Engineering).
- > Bachelor of Engineering in Civil Engineering, Environmental Engineering Option abbreviated BEng (Civil Engineering)(Environmental).

This qualification has been revised, with its previous identity number being 48694 and had an estimated learner uptake of 70 candidates for the 7 engineering universities per annum of the 4 year duration of the degree programme. The changes made to the qualification were primarily concerned with enhancing the Purpose, Rationale, RPL, Qualification Rules, some of the ELOs and AACs and Range Statements, International Comparability, CCFOs, etc in order to comply with SAQA requirements for qualification format.

Method of Calculation of SAQA Credits and Allocation to Knowledge Area.

The method of calculation assumes that certain activities are scheduled on a regular weekly basis while others can only be quantified as a total activity over the duration of a course or module. This calculation makes the following assumptions:

- > Classroom or other scheduled contact activity generates notional hours of the student's own time for each hour of scheduled contact. The total is given by a multiplier applied to the contact time.
- > Two weeks of full-time activity accounts for assessment in a semester.
- > Assigned work generates only the notional hours judged to be necessary for completion of the work and is not multiplied.

Define for each course or module identified in the rules for the degree:

Type of Activity Time Unit in Hours Contact Time Multiplier:

- > L = Number of lectures per week.
- > TL = Duration of a lecture period.
- > ML = Total work per lecture period.
- > T = Number of tutorial per week.
- > TT = Duration of a tutorial period.
- > MT = Total work per tutorial period
- > P = Total practical periods.
- > TP = Duration of a practical period.
- > MP = Total work per practical period.
- > X = Total other contact periods.
- > TX = Duration of other period.
- > MX = Total work per other period.
- > A = Total assignment non-contact Hours.
- > TA = 1 hour.
- > W = Number of weeks the course lasts (actual + 2 week per semester for examinations, if applicable to the course or module).
- > The credit for the course is: $C = \{W (LTL ML + TTT MT) + PTP MP + XTX MX + ATA \} / 10$.

The resulting credit for a course or value may be divided between more than one knowledge area. In allocating the credit for a course to multiple knowledge areas, only new knowledge or skills in a particular area may be counted. Knowledge and skills developed in other courses and used in the course in question shall not be counted. Such knowledge is classified by the nature of the area in which it is applied. In summary, no knowledge is counted more than once as being new.

UNIT STANDARDS

This qualification is not based on Unit Standards.

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION

None