QUALIFICATION SPECIFICATION							
							SECTION A
QUALIFICATION DEVELOPER	Ministry of Employment, Labour Productivity and Skills Development						
TITLE	Certificate III in Refrigeration and Air Conditioning				**NCQF LEVEL**	**3**	
FIELD	Manufacturing, Engineering and Technology		**SUBFIELD**	Refrigeration and Air Conditioning			
New qualification	√	Review of existing qualification					
SUB-FRAMEWORK	General Education		TVET	√	Higher Education		
QUALIFICATION TYPE	Certificate	√	Diploma		Bachelor		
	Bachelor Honours		Master		Doctorate/ PhD		
CREDIT VALUE					**40 Credits**		

RATIONALE AND PURPOSE OF THE QUALIFICATION

RATIONALE

The Botswana Vision 2036 states that development of the human capital and the informal sector and the micro and small enterprises (MSES) are essential in achieving the VISION 2036 pillars, in particular Sustainable Economic Development and Human and Social Development. Although Botswana has been fortunate to experience unprecedented economic growth since independence, this has not generated enough jobs to reduce unemployment. The most severely hit group amongst the unemployed is the youth, who account for about 51.7 % of the total unemployed, with the 15-19 age group most affected.

The Botswana Education and Training Sector Strategic Plan (ETSSP 2015-2020) marks a significant milestone in our collective efforts as a nation to bring about a more diversified, knowledge-based economy. Through a planned and careful development of human capital, the ETSSP seeks to refocus our education and training towards fulfillment of social and economic aspirations identified in our Revised National Policy on Education (RNPE) of (1994), the National Development Plan 11, Vision 2036 and as well as the Millennium Development Goals (MDG). In particular, the ETSSP is intended to strengthen the link between qualifications and labour market requirements, thereby ensuring that education and training outputs are more closely aligned to socio economic development needs of the country. In line with this strategic goal, the Human Resource Development Committee (HRDC) 2016 report on top occupations in demand has identified Refrigeration and Air Conditioning as one of the priority skills under Mining Mineral Energy and Water Resources Sector. Therefore, this strategic goal of the the Human Resource Development Council (HRDC 2016 page 5 derived from Statistics Botswana (2015) Botswana Standard Classification of Occupations) report has identified inclusive of Refrigeration,

Ventilation & Air Conditioning, Electrical, and Instrumentation as some of the priority skills for Transport and Logistics and Mining Mineral Resource.

Based on the above-mentioned reports and wider stakeholder consultation held, whereby industry was engaged; the feedback from the industry was for the review of the old curriculum so as to address the knowledge, skills and attributes in this area. Furthermore, due to shortage of competent artisans/graduate in the sector as evidenced by the high number of foreigners employed. Locals at these establishments are always not trained or available to carry out installations, maintenance and repairs of Refrigeration Ventilation and Air Conditioning equipment. Therefore, it is important to develop a national qualification to address the mismatch within the industry, employability skills and competent graduate who could compete locally and international.

PURPOSE

The purpose of this qualification is to produce semi-skilled workers with competence to perform a range of functions including:

- Communication skills,
- Use of ICT,
- Use of tools and equipment,
- Perform minor repairs, fault on domestic refrigeration and air conditioning,
- Perform basic fastening and joining techniques,
- Interpret and produce engineering drawings for specific purposes,
- Apply knowledge of metallic and non-metallic materials in the selection of materials in accordance with established codes of practice and relevant legislation.

People holding this qualification should be able to perform routine work under supervision and take some responsibility for own learning and completion of work.

ENTRY REQUIREMENTS (including access and inclusion)

Minimum Entry Requirements

NCQF Level 2, Certificate II or equivalent shall be required for candidates to be accepted into Certificate III in Automotive Engineering.

RPL and CAT

Applicants who do not meet the above criterion but possess relevant industry experience may be considered using RPL for access. Those who may have accumulated relevant credits for a component of this qualification may also be considered for access through CATS in accordance with relevant national and ETP policies.

QUALIFICATION SPECIFICATION SECTION B	
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
Communicate with clients, colleagues and others using appropriate forms of communication techniques.	• Use written, verbal, non-verbal communication appropriate to the target audience. • Interpret stipulated instructions or requirements. • Apply information acquired in the performance of tasks or discussions with other people. • Apply relevant definitions, terminology, abbreviations and language. • Present information using appropriate language and formats. • Construct clear sentences to produce a written logical and coherent piece of writing. • Use appropriate presentation formats and styles of writing to produce error free business documents.
Use ICT for information retrieval and processing as well as communication and collaboration with others	• Use ICT responsibly and ethically. • Manage information using ICT. • Organize and synthesize information using ICT. • Implement data loss prevention strategies using ICT. • Present information in a variety of formats using ICT.
Select and use appropriate tools and equipment for an engineering application in accordance with job specification.	• Examine job specification to determine the tools and equipment to be used in relation to occupation safety code. • Select appropriate tools and equipment to be used in line with the job requirements. • Carry out tasks as per job specification, adhering to health, safety and quality standard. • Service and maintain tools and equipment in accordance with Original Manufacturers Specification (OMS) where applicable.

	• Perform quality checks on work done and make improvements where needed. • Perform quality checks on the job done and make improvements as needed. • Clean tools and equipment and store them in an appropriate place after use. • Clean/tidy up the work area in accordance with organizational requirements.
Perform measurements on the components according to job specifications in line with adopted International System Organization (ISO).	• Examine job specification to determine the tools and equipment to be used. • Select appropriate measuring instruments according to specified limits, fits and tolerance on the job. • Plan and prepare work in accordance with job specification and organizational requirements. • Measure all dimensions in accordance with standard specifications and tolerances by using various precision measuring instruments adhering to health, safety and quality standard. • Record, compare and confirm measurements results in line with standard specifications. • Clean tools and equipment and store in an appropriate place after use. • Clean or tidy work area in accordance with organizational requirements
Perform basic metal removal processes in engineering workshops.	• Examine the nature of work to be done inclusive of material to be worked on to determine tools and measuring instruments to be used. • Select and use tools and equipment in line with job specification. • Carry out tasks as per job specification, adhering to health, safety and quality standard.

	• Perform quality checks on the job done and make improvements as needed. • Clean tools and equipment and store them in an appropriate place after use. • Clean/tidy up the work area in accordance with organizational requirements.
Apply basic mathematical problem-solving techniques to perform work related calculations.	• Use number operations to carry out work related calculations. • Determine ratios, proportions and percentages as needed for specific purposes. • Apply measurement techniques for length, area, perimeter, volume and mass when performing work related culculations. • Determine the cost of production in relation to labour, materials and overheads in project undertakings. • Identify the main features of work related data and use suitable summary statistics (mean, mode and median) to interpret the data. • Solve work related methametical problems through simple algebraic expressions
Perform basic fastening and joining techniques in a specified job	• Examine the nature of work to be done inclusive of material to be worked on to determine fasteners, tools, equipment to be used and joining techniques to be applied. • Select and use appropriate fasteners and joining techniques for specific purposes. • Carry out tasks as per job specification, adhering to health, safety and quality standard. • Perform quality checks on the job done and make improvements as needed. • Clean tools and equipment and store them in an appropriate place after use.

	• Clean/tidy up the work area in accordance with organizational requirements.
Maintain basic electrical circuits.	• Examine the job specification to determine materials, tools and equipment to be used. • Select appropriate materials, tools and equipment to be used to design and build the circuit according to the job specification. • Construct electrical circuits on panel board according to established codes of practice and job specification. • Use an appropriate electrical tester and measuring instruments to test electrical circuits on panel board according to job specification. • Perform fault finding and rectify faults accordingly in electrical circuits. • Clean tools and equipment and store them in an appropriate place after use. • Clean and tidy up the work area in accordance with organizational requirements
Perform removal, assembling and alignment of cold room panels and pulleys on machinery and equipment.	• Examine the work to be done to determine tools and equipment to be used. • Select tools and equipment to be used in line with the nature of work to be done. • Perform tasks as per job specification adhering to SHER and quality standard. • Perform quality checks on the work done in line with job specification and make improvements where necessary. • Clean tools and equipment and store them in an appropriate place after use. • Clean and tidy up the work area in accordance with organizational requirements

Implement maintenance schedule in accordnance with orgnaisational requirements.	• Examine the nature of maintenance work to be carried out to determine the materials, tools and equipment to be used. • Obtain the required materials, tools and equipment in line with the job requirements. • Prepare for and carry out maintenance work in accordance with stipulated specifications. • Perform quality checks on work done and make improvements where needed. • Perform necessary tests to confirm functionality. • Clean tools and equipment and store them in appropriate places after use. • Keep records and report to immediate supervisor as needed.
Interpret and Produce engineering drawings for specific purposes.	• Examine the nature of work to be carried out to determine the drawing tools and equipment to be used. • Select engineering drawing equipment in line with the job specification. • Produce drawings and orthographic representations for specified projects in accordance with established codes of engineering drawing practice and associated conventions. • Perform quality checks on work done and make improvements where needed. • Clean tools and equipment and store them in appropriate places after use.
Apply knowledge of metallic and non-metallic materials in the selection of materials for specific projects.	• Examine the nature of work to be carried out • Carry out simple tests to distinguish between metallic and non-metallic materials where applicable. • Apply knowledge of characteristics/properties of metallic and non-metallic materials to select materials for specific projects. • Carry out tasks as per job specification, adhering to health, safety and quality standard.

	• Perform quality checks on the job done and make improvements as needed. • Clean tools and equipment and store them in an appropriate place after use. • Clean/tidy up the work area in accordance with organizational requirements.
Carry out basic servicing and maintenance of domestic refrigeration, Ventilation and Air Conditioning systems and components in accordance with established codes of practice.	• Demonstrate and explain the operation of refrigeration and Air Conditioning system main components and accessories. • Study the performance of a compression refrigeration cycle, • Apply the use of measuring and testing instruments and work with gas/refrigerants, refrigeration oils and single-phase domestic compressors used on refrigeration. • Test, evacuate and charge a domestic refrigeration system. • Identify and select different types of compressors. • Carry out minor service and repair on domestic refrigeration. • Prepare a job card in accordance with organizational requirements. • Obtain materials, components, tools and equipment to be used for the job. • Produce a record of work done in accordance with organizational requirements. • Clean tools and equipment and store them in an appropriate place after use. • Clean or tidy up the work area in accordance with organizational requirements.

QUALIFICATION STRUCTURE

SECTION C

FUNDAMENTAL COMPONENT Subjects/Units/Modules/Courses	**Title**	**Level**	**Credits**
	Communication Skills	3	3
	Information and Communication Technology I (ICT I)	3	3
CORE COMPONENT Subjects / Units / Modules /Courses	Basic Engineering drawing	3	6
	Basic metal work	3	14
	Domestic Refrigeration and Air Conditioning Practice	3	12
	Engineering Mathematics	3	2
ELECTIVE COMPONENT Subjects / Units / Modules /Courses	NOT APPLICABLE		

Rules of combinations, Credit distribution (where applicable):

A candidate to achieve a maximum of **40** credits inclusive of **6** credits for fundamental and **34** credits core.

ASSESSMENT AND MODERATION ARRANGEMENTS

ASSESSMENTS

All assessments, formative and summative, leading/contributing to the award of credits or a qualification should be based on learning outcomes and/or sub-outcomes.

Formative assessment

Formative assessment or continuous assessment contributing towards the award of credits should be based on course outcomes. This may include tests, assignments and projects as well as simulated and or real work settings. The contribution of formative assessment to the final grade shall be **60%**.

Summative assessment

Candidates shall undergo assessment including written and practical and simulated projects. The final examination for each course contributes **40%** of the final mark for that course. All summative practical assessments must, as far as possible, be conducted in real work settings.

MODERATION ARRANGEMENTS

There will be internal and external moderation undertaken by moderators registered and accredited by BQA or any other recognized Authority. All processes and procedures will be in line with NCQF requirements. This will be conducted in reference to the institution's moderation policy and procedures.

RECOGNITION OF PRIOR LEARNING (RPL) if applicable

Candidates may submit evidence of prior learning and current competence and/or undergo appropriate forms of RPL assessment for the award of credits towards the qualification in accordance with applicable RPL policies and relevant national-level policy and legislative framework. Implementation of RPL shall also be consistent with requirements, if any, prescribed for the field or sub-field of study by relevant national, regional or international professional bodies.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning Pathways:

Horizontal Articulation

Graduates in this qualification can pursue the following: -

- Foundation certificate in machine fitting-NCQF level 3
- Foundation certificate in auto mechanics-NCQF level 3
- Foundation certificate in maintenance fitting-NCQF level 3

Vertical Articulation

Graduates of this program can progress in the following:

- Certificate IV in Machine Fitting
- Certificate IV in Auto Mechanics
- Certificate IV in Maintenance fitting

Employment Pathways

Holders of this qualification may work as:

- Refrigeration and Air Conditioning Assistant
- General Electrical Operators
- Store Personnel
- Workshop Assistant
- Refrigeration and Air Conditioning Salesperson
- Semi-skilled Refrigeration and Air Conditioning

QUALIFICATION AWARD AND CERTIFICATION

Minimum standards of achievement for the award of the qualification

A candidate is required to achieve the stipulated minimum of 40 credits Inclusive of 6 credits Fundamental and 34 credits of Core components to be awarded the qualification.

Certification

Candidates meeting prescribed requirements will be awarded a certificate in accordance with standards prescribed for the award of the qualification and applicable policies.

REGIONAL AND INTERNATIONAL COMPARABILITY

South Africa Qualifications Authority Institutions (SAQA) Occupational- Air-conditioning, Refrigeration and Ventilation **NQF Level 2 and 147 Credits**

This qualification is intended to develop knowledge, skills and competence in operation of mechanical equipment, installation, servicing and repair of mechanical equipment used in the air conditioning, refrigeration and ventilation industry, occupational health, safety and environmental practices. Assessment strategies include demonstration, oral and written responses, both summative and formative, and portfolios and projects. The summative assessments emphasize alignment to exit Level outcomes and associated assessment criteria. Candidates are required to achieve a minimum of 147 credits Fundamental component: 36 credits. Core component: 78 credits. A minimum total of 19 credits are required in the elective component. A learner may select any combination of credits adding up to a minimum of 19 credits. Holders of this qualification may pursue other qualifications at NQF Level 3 in cognate areas but not limited to: processing and warehousing,

food transportation, distribution and retailing, deep level mining and industrial process, high rise and retail property, specialized medical care, automotive and mass transport, tourism and hospitality. They may also pursue qualifications at NQF level 4 for upgrading purposes. Employment pathways for the qualification holders include working as Assistant Mechanic - Level 2 (Technical competence - Has a basic understanding of equipment and is able to carry out technical work under supervision).

Nelson Marlborough Institute of Technology (New Zealand) New Zealand Qualification Authority National Certificate-Refrigeration and Air-conditioning NQF Level 3,120 Credits.

This qualification is intended to develop knowledge, skills and competence in assembly, installation and maintenance of basic refrigeration and/or air conditioning plant and equipment, brazing , test basic electrical circuitry ,recover refrigerant into a cylinder and charge refrigeration systems in accordance with legislative and customer requirements. Assessment strategies employed for this qualification include theory and Practice for candidates to attain a New Zealand Certificate in Refrigeration and Air Conditioning (RAC). Candidates are required to achieve a minimum of 120 credits inclusive of credits for fundamental units, credits for core and credits for elective units. The candidates are also required to complete a work experience and or industrial attachment. Employment pathways for the qualification holders include working as Trade Assistants in the RAC or related industries such as refrigerated shipping containers; domestic air conditioning; transport refrigeration and air conditioning; commercial and industrial refrigeration, and the Mechanical Building Services sector (formerly HVAC sector). Graduates may progress to higher level qualifications within the Refrigeration, Ventilation and Air Conditioning industry Trade Level 4.

A direct comparison with these international qualifications indicates that the education and training focus of all the qualifications is basically the same. However, it was noted that the method of assessment is more or less the same: Generally, assessments are normally through on-the-job observation and questioning which actually confirms learners can demonstrate competence in the workplace. Candidates are assessed to underpin knowledge, understanding and work-based performance.

Comparability and articulation of the proposed qualification with the ones examined

New Zealand NQF framework compare relatively favourable with those of the South African NQF with levels. All qualifications require the learners to master skills of a specific nature. However, while the unit standards

from New Zealand are much more specific, the South African unit standards are generic (fundamentals, core and electives). The applied competence in the South African technical skills required for this purpose are scarce and there is a growing demand for technicians skilled in the mechanical, electrical and thermal sciences qualifications focussing on achieving a specific level of competence by a person working in a real-world context, in which a particular specialisation, experience and problem-solving ability is required.

REVIEW PERIOD

This qualification will be reviewed every five (5) years.