QUALIFICATION SPECIFICATION								SECTION A
QUALIFICATION DEVELOPER	Ministry of Employment, Labour Productivity and Skills Development							
TITLE	Certificate IV in Refrigeration and Air Conditioning					**NCQF LEVEL**	4	
FIELD	Manufacturing, Engineering and Technology			**SUBFIELD**	Refrigeration and Air Conditioning			
New qualification	✓		Review of new qualification					
SUB-FRAMEWORK	General Education		TVET	✓	Higher Education			
QUALIFICATION TYPE	Certificate	✓	Diploma		Bachelor			
	Bachelor Honours		Master		Doctor			
CREDIT VALUE	**60**							

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) 1994, the National Development Plan 11, Vision 2036 and as well as the Millennium Development Goals. In particular, the ETSSP is intended to strengthen the match 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 Council (HRDC 2016) 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 the Certificate IV in Refrigeration and Air Conditioning qualification is to produce semi-skilled workers with competence to perform a range of functions including:

- Use of Information and Communication Technology (ICT).
- Perform minor Refrigeration, Ventilation and Air Conditioning.
- Basic Refrigeration wiring and Electrical application.
- Workshop practice.
- Installation of *Heating, Ventilation and Air Conditioning (HVAC)* and Car Air Conditioning 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 3 or equivalent shall be required for candidates to be accepted into Certificate IV in Automotive Engineering.

- **Recognition of Prior Learning (RPL) /Credit Accumulation Transfer (CAT)**

  Applicants who do not meet the above criterion but possess relevant industry experience may be considered using RPL and CATS policies for access.

QUALIFICATION	SECTION C
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
Use ICT for information retrieval, processing and management.	• Analyse data from a prepared data base. • Manipulate data using ICT tools. • Display data electronically through chats • Present information through the selection of appropriate spreadsheet tools
Apply basic entrepreneurial concepts associated with the establishment of a venture	• Identify entrepreneurship/business opportunities in a field of interest making use of brainstorming and environmental scanning techniques. • Compile documentation required for the establishment of a venture using support structures and policies available for entrepreneurs. • Assess the various investment strategies and risks associated with your identified business opportunity.
Demonstrate the basic vapor compression, components, the handling of refrigerants	• Interpret, with the aid of a block diagram, the operation of the vapor compression refrigeration system. • Analyze and indicate the components and pipes in the block diagrams drawn and indicate the direction of flow of refrigerant. • Discus the relationships between the pressure and the temperature of a refrigerant. • Practice safe handling and storage of refrigeration system components and accessories in line with ISO 9001.
Apply fundamentals of electricity in refrigeration and air conditioning and ventilation equipment.	• Perform circuit protection for single phase circuits. • Perform circuit protection, wiring and control systems in the field.
Demonstrate and maintain safety in the handling of group 1 and group 2 refrigerants.	• Describe refrigerant recovery and reclaming processess in the field of study. • Practice commisioning execises after installations in related

	field of study.
Examine, identify refrigerant containers, explaining handling procedures and discuss the use of refrigerants.	• Describe refrigerant handling safe practices. • Demonstrate proper handling and storage of refrigerant containers without endangering self, others, the plant or the environment. • Explain the use of refrigerant in cooling system.
Sketch and construct electrical circuit applicable to single phase refrigeration, air conditioning and ventilation installation.	• Design refrigeration single phase circuits and apply them into practice. • Various types of protective devices are identified, and their symbols drawn. • Interpret electrical diagrams, plans for various work-related systems.
Apply fundamentals of Refrigeration.	• Interpret,appreciate basic refrigeration priciples including schematic diagrams,plans,and theoratical knowledge. • Appreciate princeples of operation of refrigeration and air conditionig systems.
Service and maintain HVAC and refrigeration system.	• Demonstrate appropriate servicing, repairing, installation and maintenance of HVAC plant systems.
Read, interpret and draw Engineering Drawings for specific purpose.	• Analyze the drawings to be done to determine appropriate drawing equipment to be used. • Select the appropriate drawing equipment to be used. • Produce drawings according to task specification, adhere to health, safety and quality standard. • Clean tools and equipment and store in an appropriate place after use. • Prepare and carry out refrigeration and air conditioning maintenance work in accordance with job specifications and adhere to SHERQ.
Perform basic arc weld of metals as applicable to Refrigeration ventilation and air conditioning installation.	• Demonstrate how to perform arc welding,brazing and metal fabrication applicable in the field of refrigeration and air conditioning.
Check and maintain air conditioning in	• Demonstrate how to service, repair, install and maintain

vehicle.	vehicle air conditioning.
Join and install refrigerant piping	• Demonstrate how to join refrigeration/air conditioning pipes using compression, brazing or soldering methods.
Fault find on single phase alternating current (AC) systems	• Demonstrate how to perform diagnosis, servicing, repairing and installation of units on single phase alternating current (AC) systems.
Fault Find, Test and Repair Domestic Appliances	• Demonstrate how to perform diagnosis, servicing, repairing and installations of units in the related field of domestic applications.
Install, connect and maintain electrical cables and conductors as applied in air conditioning refrigeration and ventilation installation.	• Practice the following: Install, connect and maintain electrical cables and conductors as applied in air conditioning refrigeration and ventilation installation successfully.

QUALIFICATION STRUCTURE	SECTION C		
FUNDAMENTAL COMPONENT Subjects / Units / Modules /Courses	**Title**	**Level**	**Credits**
	Information and Communication Technology (ICT)	4	2
	Entrepreneurship	4	2
	TOTAL		**4**
CORE COMPONENT Subjects / Units / Modules /Courses	Basic Refrigeration Wiring and Electrical Application	4	2
	Refrigeration Ventilation and Air Conditioning Application	4	4
	Workshop Practice	4	5
	Mechanical controls (Domestic)	4	2
	Domestic Refrigeration and Air Conditioning	4	4
	Automotive Air conditioning	4	2
	Installation HVAC	4	3
	Car Air Conditioning Application	4	2
	Industrial Attachment	4	32
	TOTAL		**56**
ELECTIVE COMPONENT Subjects / Units / Modules /Courses	N/A		
	TOTAL		**60**

Rules of combination, credit distributions (where applicable**)**

A candidate is required to achieve a minimum of 60 credits for this qualification inclusive of 4 credits for fundamental units, 56 credits for core units. The candidate is also required to complete the required period of work-based learning/Projects and associated criteria to be eligible for the award for the qualification.

ASSESSMENTS AND MODERATION ARRANGEMENTS

ASSESSMENT ARRANGEMENTS

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 can include tests, assignments and projects as well as simulated and real clinical practice or care settings. The contribution of formative assessment to the final grade shall be **60%.**

Summative assessment

Learners may 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 be conducted in simulated or real work settings.

MODERATION ARRANGEMENTS

Internal Moderation

The internal moderation process shall be conducted by assessors who are accredited BQA in their specialist areas as assessors or moderators.

External Moderation

External moderation shall be performed by an examination unit or awarding body. The examination unit/awarding body shall also perform the quality assurance mandate and be responsible for identifying industry players, partnerships and experts to assist in the moderation processes.

RECOGNITION OF PRIOR LEARNING (RPL)

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 national-level policy and legislative framework for RPL.

QUALIFICATION AWARD AND CERTIFICATION

Minimum standards of achievement for the award of the qualification

A candidate is required to achieve the stipulated total credits inclusive of the fundamental, core and elective components, to be awarded the qualification.

Certification

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

REGIONAL AND INTERNATIONAL COMPARABILITY

a) **Namibia Training Authority Certificate** in Refrigeration and air Conditioning (***level 2***) with compulsory of units worth 42 credits. The main objective of level 2 is to develop competence in components servicing domestic refrigeration, automobile air conditioning, thermostatic expansion devices, basics of electrical and electronics, basic welding, engineering science, basic of key skills and, HIV and AIDS Awareness. Credit allocation varies according to unit standard including continuous assessment emphasis on practical demonstration of skills and knowledge-based assessment administered in writing or orally. Completion of level 2, learner's progress to level 3 or, may work in industries that do service and repair of refrigeration works under less supervision or be self-employed in the Refrigeration and Air Conditioning sector.

b) **New Zealand National Qualification Framework Certificate** in Refrigeration and Air Conditioning (***level 4***) Credits worth 210. The programme provides the Refrigeration and air conditioning industry with individuals who have attained the knowledge and skills required to: diagnose and repairing faults on automobile air conditioning vehicles, auto electrics/electronics, for air conditioning, maintain safely and effective workplace and appropriate high risk (heating, cooling and ventilation) systems. The programmes must be delivered in the context of a workshop operating at a commercially acceptable industry standard and assessed in the actual workplace or in a simulated workplace setting. Graduates for this qualification can lead to commercial and industrial Refrigeration (Level 5) or will be able to work in a range of workplaces in positions that involve service and repair of commercial and industrial refrigeration and air conditioning plants.

c) **South Africa Qualification Authority (code: 65509)**: Refrigeration, ventilation and air conditioning (***Level 4***) credits worth 135, aims to provides learners with the standards and the range of learning to work effectively in various industries. The primary skill in this qualification is to apply the theory of repair and maintenance in order to service air conditioning and refrigeration systems so that they perform work related to co-ordinate work activities in a HVAC context; mechanical systems, electronic systems, communicate and solve problems in a refrigeration workshop. Theoretical and Practical components should be assessed together and should make use of formative and summative assessment. Graduates who have for this qualification are normally employed in industries that do servicing and repair of domestic and commercial refrigerating units.

The comparison has indicated that the proposed Certificate IV in Refrigeration, and air conditioning (***NCQF Level 4***) worth 60 credits under the **Ministry of Employment, Labor productivity and Skills**

Development compares well in a significant grade of similarities of context. All units and modules are compulsory and continuous assessment contributing towards the award of certificates based on course outcomes as well as simulated and real clinical practice conducted in simulated or real work settings. What sets it apart from the foreign qualifications noted is that the proposed encompasses of Information and Communication Technology, Safety Health and Environmental Risk Quality (SHERQ), Engineering drawing, Maintenance schedules and Work based learning.

PROGRESSION PATHWAYS

Horizontal Articulation

This Qualification allows for both horizontal and vertical articulation.

Horizontal Articulation:

- Further Education and Training Certificate: Electro Mechanics, NQF Level 4.
- Further Education and Training Certificate: Automotive Repair and Maintenance, NQF Level 4.

Vertical Articulation:

- National Certificate: Generic Management, NQF Level 5.

Employment Pathways

Upon completion of the course the candidates can either get employed or become self-employed entrepreneur in any one of the following fields:

(a) Wage employment

- Spare Parts Sales Assistant
- Semi-skilled Artisan for either Refrigeration or Air-conditioning
- Workshop storekeeper

(b) Self-employment

- Spare Parts Dealer
- Spare Parts Salesman
- Semi Mechanics

REVIEW PERIOD

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