BOTSWANA Qualifications Authority	**BQA NCQF QUALIFICATION TEMPLATE**

SECTION A:	**QUALIFICATION DETAILS**		
QUALIFICATION DEVELOPER (S)	Department of Teacher Training and Technical Education		
TITLE	Diploma in Heavy Equipment Engineering	**NCQF LEVEL**	6
STRANDS (where applicable)	N/A		
FIELD	Manufacturing, Engineering and Technology	**CREDIT VALUE**	380
SUB FIELD	Engineering and Engineering Trades		

New Qualification	✓	Legacy Qualification		Renewal Qualification	
				Registration Code	

SUB-FRAMEWORK	General Education		TVET	✓	Higher Education	

QUALIFICATION TYPE	Certificate	I		II		III		IV		V		Diploma	✓	Bachelor	
	Bachelor Honours		Post Graduate Certificate		Post Graduate Diploma										
	Masters		Doctorate/ PhD												

RATIONALE AND PURPOSE OF THE QUALIFICATION

RATIONALE:

Heavy Equipment has been identified as one of the occupations in high demand in Botswana and beyond. The occupations or skills are needed by energy, water, mining, transport management and logistics, fleet management, agriculture, construction, vocational and technical education sectors respectively sectors respectively. This is based on the Labour Market Analysis conducted by the HRDC.

The qualification Diploma in Heavy Equipment Engineering is developed as a response to the need established by Human Resource Development Council Report (HRDC 2023/24) of Priority Skills, which identified Heavy Equipment Technicians as one of the occupations in high demand in Botswana.

Heavy Equipment Occupation is one of the scare skills in the country where majority of the available technicians are employed by the private sector. There are few countries in the world that are offering

Heavy Equipment both at Diploma and Degree level such as Zambia, United States of America, United Kingdom, Australia and Indonesia.

This qualification has been developed in line with Botswana Government's Vision 2036 which acknowledges Technical and Vocational Education Training (TVET) as one of the key contributors to economic growth and employment creation (page 17) and NDP11 (page 71).

The Vision further emphasizes implementation of curriculum which is aligned to the needs of the economy, business, science, mathematics and technology (page 20). The Government of Botswana wants to enable Batswana through Vision 2036 to be independent, self-reliable and entrepreneurial in spirit. TVET is a field that produces graduates who are hundred percent hands on, and the graduates will be able contribute to the socio-economic landscape of the country. Technical Vocational Education and Training is for people who are more into hands on practical skills rather than academic or aiming for a blue-collar job.

NDP11 states that to ensure the readily available skills and expertise that are required to transform the country's economy, the government will be committed to building capacity in development of local content and applications. The caliber and expertise of human resources will be enhanced through knowledge sharing and transfer, targeted training and development. In addition, the Continental Education Strategy for Africa 2016 – 2025 stipulate that there is a need to expand TVET opportunities at both secondary and tertiary level and strengthen linkage between the world of work and education and training systems.

PURPOSE: (itemise exit level outcomes)

The purpose of this qualification is to produce graduates with advanced knowledge, skills and competencies to:

1. Performs tests and maintenance on heavy equipment and ensures proper functioning of equipment. Reads and interprets constructional and functional diagram to carry out repair work.
2. Produce reports and records of work perfumed as per the requirements
3. Troubleshoots mechanical heavy equipment systems according to the manufacture's specifications
4. Carry out preventative maintenance as per set down schedule adhering to the set standards

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

- Certificate IV, NCQF Level 4(General Education or TVET Intermediate Certificate)
- Applicants who do not meet minimum entry will be absorbed through RPL and CAT according to the ETP's policies aligned to BQA RPL and CAT policies

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SECTION B	QUALIFICATION SPECIFICATION
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
1 Apply technical skills in servicing heavy equipment machinery according to set out procedures	1.1 Develop service plans as per the set standards 1.2 Develop and maintain up to date service records as per manufacturer specifications 1.3 Carry out service on machinery according to the set standards
2 Carry out repair and maintenance of heavy equipment and machinery as per set out repair and maintenance procedures	2.1 Perform repair and maintenance risk assessment procedures as per laid down specifications 2.2 Plan and carry out maintenance on systems and components as per manufacturer's specifications 2.3 Carry out systems and component disassembly and assembly processes in accordance with manufacturers specifications 2.4 Use service equipment and tools to perform repairs on machines in accordance with laid down procedures 2.5 Use constructional arrangements, functions, and operations of systems and components to repair and service machine systems according to set standards
3 Diagnose heavy equipment machine systems to effect repairs	3.1 Carry out service and repairs using equipment manuals 3.2 Perform diagnostic tests using test equipment. 13.3 Carry out repair procedures in accordance with identified correctional measures
4 Execute health and safety measures to ensure a health and safety compliant environment	4.1 Adhere to health and safety regulations in the workplace to minimize risks and accidents

	4.2 Apply and monitor occupational, health and safety regulations, codes and practices in the workplace to ensure best safety practices 4.3 Report injuries and accidents in the workplace to comply with health and safety reporting procedures
5 Apply engineering mathematics skills to solve heavy equipment machine systems problems	5.1 Perform problem solving calculations to solve heavy equipment systems problems 5.2 Employ engineering mathematical concepts and principles in accordance with repair and maintenance procedures 5.3 Perform technological related mathematical calculations to solve heavy equipment system problems
6 Apply engineering drawing techniques to solve heavy equipment system constructional and functional problems	6.1 Develop, read, and interpret engineering drawings to solve machine systems problems 6.2Use engineering drawings to solve heavy equipment system problems 6.3 Diagnose constructional and functional problems using engineering drawing techniques
7 Execute professional skills applicable in heavy equipment engineering discipline	7. 1 Employ ICT skills in heavy equipment engineering to execute the assigned tasks 7.2 Use applicable skills to communicate effectively and efficiently in the heavy equipment field 7.3 Apply entrepreneurship practical skills in a business set up 7.4 Perform administrative duties within heavy equipment discipline 7.5 Employ professional skills to carryout research in heavy equipment discipline 7.6 Apply code of ethics for engineers in work environment

8 Address and control pollution in heavy equipment industry as per regulations	8.1 store used petroleum products according to the set standards 8.2 dispose used petroleum products according the set standards 8.3 Analyse air pollution to check adherence to heavy equipment industry control measures 8.4 Implement , monitor policies and procedures for environmentally sustainable work practices
9 Work as an individual, team, and collaborate in a multidisciplinary project in the workplace	9.1Adhere to personal development competency plan as per set standards 9.2 Works effectively and efficiently as a team member by contributing towards workplace set goals and objectives 9.3 Build and sustain an innovative work environment to enhance working relationship amongst different disciplines 9.4 Apply engineering code of ethics in work environment
10 Apply engineering management skills in the workplace	10.1 Adhere to continuous professional development schedule in the workplace 10.2 Use information management system according to workplace standards 10.3 Employ knowledge and understanding of engineering management principles and economic decision-making in Heavy Equipment discipline

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SECTION C	QUALIFICATION STRUCTURE				
COMPONENT	TITLE	Credits Per Relevant NCQF Level			Total Credits
		Level [ ]	Level [5]	Level [6]	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units	Introduction to Computing		*8*		***8***
	Communication Skills		*8*		***8***
	Entrepreneurship		*8*		***8***
	Occupational Health & Safety		*6*		***6***
	Introduction to Research Methods			*8*	***8***
	Finance for Non-Finance Managers			*8*	***8***
	Engineering Ethics			*8*	***8***
CORE COMPONENT Subjects/Courses/ Modules/Units	Engineering Drawing		*6*		***6***
	Engineering Mathematics		*18*	*18*	***36***
	Basic Metal		*16*		***16***
	Drives Systems , Transmissions & Undercarriage Systems		*13*		***130***
	Vehicle Electrics		*14*		***14***
	Brake Systems		*14*		***14***

	Engines		*14*		***14***
	Pneumatics			*14*	***14***
	Hydraulics			*14*	***14***
	Heavy Equipment Auto CAD			*20*	***20***
	Trouble Shooting Techniques			*16*	***16***
	Diagnostic Equipment			*9*	***9***
	Electro- Hydraulics			*9*	***9***
	Electro- Pneumatics			*9*	***9***
	Planned Maintenance			*8*	***8***
	Heavy Equipment Engine Management Systems			*16*	***16***

STRANDS/ SPECIALIZATION	Subjects/ Courses/ Modules/Units	**Credits Per Relevant NCQF Level**			**Total Credits**
		Level [ ]	**Level [ ]**	**Level [ ]**	
1.					
	N/A				

2.					
Electives	**N/A**				

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	**Credit Value**
Level 5	**125**
Level 6	**255**
TOTAL CREDITS	***380***

Rules of Combination:

(Please Indicate combinations for the different constituent components of the qualification)

Fundamentals NCQF 5= 30
Fundamental NCQF 6 = 24

Core NCQF 5 = 95
Core NCQF 6=231

Total Credits 380

The candidate has to pass all core modules and fundamentals modules.

N.B. There are no electives for this qualification

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ASSESSMENT ARRANGEMENTS

Formative (60%)
The contribution of formative assessment to the final grading shall be 60%

Summative Assessment (40%)
The contribution of summative assessment to the final grade shall be 40%

Assessment shall be carried out by BQA registered and accredited Assessors

MODERATION ARRANGEMENTS

Internal and external moderators to be engaged will be BQA accredited subject specialists in relevant fields with relevant industry experience and academic qualification. The moderators should be holders of Bachelor's Degree in Heavy Equipment or relevant/similar qualifications and industrial experience will be an added advantage

RECOGNITION OF PRIOR LEARNING

Recognition of Prior Learning (RPL) will be considered for the award of the credits according to applicable RPL policies

CREDIT ACCUMULATION AND TRANSFER

Credit Accumulation and Transfer will be considered for the award of the credits according to applicable RPL policies

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

LEARNING PATHWAYS

Horizontal Articulation(related qualifications of similar level that graduates may consider)

- Diploma in Automotive Engineering
- Diploma in Heating, Ventilation and Air conditioning Refrigeration (HVAC)
- Diploma in Mechanical Engineering
- Diploma in Heavy Plant Engineering

Vertical Articulation(qualifications to which the holder may progress to)

- Bachelor of Engineering in Heavy Equipment Engineering
- Bachelor of Engineering in Construction Heavy Plant Engineering

Employment Pathways

- On successful completion of this qualification the holder may be absorbed in the job market as:
- Service Technician
- Repair Technician

- Hydraulic and Pneumatic Technician
- Transmission Technician
- Truck Refrigeration & Air-conditioning Technician
- Heavy duty crane Technician
- Maintenance Technician
- Engine Technician
- Electronics Technician
- Product support Representative
- Field Service Technician
- Sales Representative
- Rebuild Technician
- Workshop foreman
- Workshop charge hand
- Diesel Technician

QUALIFICATION AWARD AND CERTIFICATION

Qualification Award

Candidate meeting the required minimum of 380 credits will be awarded Diploma in Heavy Equipment Engineering in accordance with the qualification composition rules and applicable policies.

Certification

There will be certification upon awarding of Diploma in Heavy Equipment Engineering qualification.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

Introduction

The Diploma in Heavy Equipment Engineering is a three year (National Credit Qualification Framework: NCQF Level 6) qualification which aims to produce a competent Heavy Equipment Technician. The qualification has been benchmarked with other qualifications from RC Mining and Grand Training College Ltd (Zambia) and Ferris State University (United States of America).

The proposed qualification entry levels are NCQF Level 4(minimum) and NCQF Level 5 for Artisans. RC Mining and Grand Training College Ltd qualification is at National Qualification Framework (ZQF) level 5 with two years' work experience and there is no direct entry. Ferris State University has direct entry.The proposed and RC Mining and Grand Training College Ltd qualifications NCQF and ZQF respectively maximum level is ten (10) whereas for Ferris State University (America) it is not specified but the content and depth is equivalent..

Title of Qualifications

The proposed qualification and RC Mining and Grand Training College Ltd qualification have same titles (Diploma in Heavy Equipment Engineering) whereas Ferris State University is Associate in Applied Science Degree in Heavy Equipment Technology. The naming for Ferris State University qualification is different but they also produce a Technician with similar competencies to the other two.

Duration and Level

The duration of the qualification for RC Mining and Grand Training College Ltd is 1 year 3 months (15 months) whereas for Ferris State University is two years and for the proposed qualification is 3 years. The proposed qualification has two entry levels which are at year 1(NCQF Level 4) and at year 2(NCQF Level 5). RC Mining and Grand Training College Ltd entry level is for graduates at ZQF level 5(Certificate V with two yeas work experience) with no direct entry whereas Ferris State University qualification entry is for college Learners with Recognition of Prior Learning.

Main Exit outcomes

The benchmarked qualifications and the proposed qualification have similar competencies such as carrying out maintenance, producing and interpreting engineering drawings, repair and service, trouble shooting of heavy equipment systems, diagnosing heavy equipment systems and others.

Modules

The proposed and the benchmarked qualification share some similar modules that covers content of communication, maintenance, brake systems, trouble shooting, engineering mathematics, occupational health and safety and others.

Assessment strategies and Weightings

The proposed and the benchmarked qualifications have formative and summative assessments.

Qualification rules and minimum Standards for the award of the qualification

The proposed and the benchmarked qualifications have stated that the candidate has to satisfy all the minimum set standards in order to be awarded the diploma.

Comparability and articulation

The Learners of the proposed qualification can articulate horizontally (ZQF Level 6) or transfer to institutions offering similar qualifications. Horizontal articulation qualifications include: but are not limited to Diploma in Heavy Equipment Engineering and Diploma in Heavy Equipment Technology, Diploma in Mechanical Engineering and Diploma in Heavy Plant Engineering

Learners can articulate vertically to ZQF Level 7(Bachelor's Degree) since the benchmarked institutions offers a degree qualification of Bachelors of Science in Heavy Equipment Service Engineering Technology. Other Vertical articulation qualifications include Bachelor's Degree in Construction Heavy Plant Engineering and Bachelor's Degree in Heavy Plant Engineering.

The graduates of the proposed qualification can be employed as Service Technicians, Engineering Associate, Repair Technician, Hydraulic and Pneumatic Technician, Transmission Technician, Heavy duty crane Technician, Maintenance Technician, Engine Technician and Field Service Technician.

Fields of employment include mining, agriculture, construction, defence, power, water, transport, vocational and technical education and others.

REVIEW PERIOD

The qualification will be reviewed every five (5) years or as and when required depending on the changing needs of the market**.**

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For Official Use Only:

CODE (ID)			
REGISTRATION STATUS	**BQA DECISION NO.**	**REGISTRATION START DATE**	**REGISTRATION END DATE**
LAST DATE FOR ENROLMENT		**LAST DATE FOR ACHIEVEMENT**	