SECTION A:	***QUALIFICATION DETAILS***															
QUALIFICATION DEVELOPER (S)	New Era College of Arts, Science & Technology															
TITLE	Diploma in Construction Engineering													***NCQF LEVEL***	*6*	
FIELD	Physical Planning and Construction		*SUB-FIELD*		Construction Engineering									***CREDIT VALUE***	*383*	
New Qualification						√	*Review of Existing Qualification*									
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

The development of the qualification in Construction Engineering was guided by the findings from the market survey innovations which highlighted the need for this qualification from industry experts, Construction company employees, current and prospective students. Most of the respondents agreed that "the qualification meets with the skills demanded in the industry and also supports infrastructural development projects". (Refer to **Appendix 1**).

Also, the National Development Plan 11 (2017-2023) on infrastructure development projects identifies, that the Construction sector, amongst other sectors, plays a high impact in driving domestic economic growth. Further, NPD 11 asserts that infrastructure development will facilitate increased and inclusive beneficiation and access to the other sectors. For the years 2019/20 and 2020/21, NDP 11 expects the Construction sector growth to be at 4.0 percent and 3.7 percent, respectively. To achieve this growth rate or more beyond 2021 the sector will

require skilled construction technicians, artisans and engineers to manage the infrastructure construction projects, hence the development of the Construction Engineering qualification.

According to HRDC priority occupations list of 2019; the occupations of manufacturing, construction and distribution forecast indicates an increasing deficiency in this occupation. This deficiency projection is from 2019 to 2028. Therefore, the Diploma Construction Engineering qualification would strive to address the country's lagging occupation.

The HRDC- Top occupations in high demand of December 2016 also lists the construction sector as one of the occupations in demand. The construction sector's high demand was informed by its potential to create employment, contributing 6% of total employment, as third largest employer during NDP 10. It has a second highest work permit holders, a significant number of foreign nationals working in this sector. Hence the Diploma in Construction Engineering qualification will go a long way to create and contribute a skilled labour force in Botswana. It will also assist to reduce over reliance on foreign materials on skills provision, by increasing the quality and numbers of personnel trained in the sector.

PURPOSE:

Diploma in Construction Engineering was developed to equip candidates with knowledge, skills and competences to:

- Apply knowledge and understanding of the use and properties of materials in construction.
- Demonstrate knowledge of health and safety methodologies in the working environment.
- Apply basic drawing skills in the production of graphical information using manual and computer aided draughting techniques.
- Demonstrate skills in the use of various surveying equipment.
- Conduct construction engineering research project.
- Demonstrate a range of interpersonal and transferable communication skills.
- Apply the principles of management, law and contract administration in the construction industry.
- Carry out quantity surveying works in construction works.

ENTRY REQUIREMENTS (including access and inclusion)

- NCQF Level 4- Botswana General Certificate of Secondary Education (BGCSE) or its equivalent.

- NCQF level 5-Certificate V in Construction or equivalent and work experience may be admitted through recognition of prior learning as per the ETP and national policies.

SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1. Demonstrate knowledge of health and safety methodologies in the working environment.	1.1 Promote Essentials of Health & Safety Management to conform with the SHE. 1.2 Conform to working Practices relating to hazards and Control measures. 1.3 Apply simulation of Accident & Emergency Procedures.
2. Apply basic drawing skills in the production of graphical information using manual and computer aided draughting techniques.	2.1 Interpret the drawings used in the design and construction process. 2.2 Produce a drawing that display appropriate industry standards in 2D and 3D. 2.3 Demonstrate techniques of architectural drawings and enhance the visual skills.
3. Demonstrate knowledge and understanding of use and properties of materials in construction. .	3.1 Identify materials and their behaviours that are relevant to technological processes involved in the construction project. 3,2 Apply relevant building technologies in addressing work related situations.
4. Demonstrate masonry work.	4.1 Apply bricklaying, plastering and concreting skills. 4.2 Set out roof structures as per specifications. 4.3 Construct and erect specialist site-made trusses.
5 Demonstrate skills in the use of various surveying equipment.	5.1 Interpret measurements from maps, layout and engineering plan. 5.2 Demonstrate the methods of linear and angular measurements.

	5.3 Apply the principles of survey computations and plotting.
6 Carry out quantity surveying works.	6.1 Measure building work. *6.2* Use of modern techniques in quantity surveying practice.
7 Apply the principles of management, law and contract administration in the construction industry.	7.1 Apply knowledge of contract administration for conventional and design of building contracts. 7.2 Analyse contract administration for different phases of the project. *7.3* Develop an overview of certain general conditions of contract; the relevance of legal concepts including unjust enrichment, frustration, and specific performance.
8 Apply entrepreneurships skills to be able to deal with challenges and uncertainty of a start-up business.	8.1 Identify the characteristics of successful and effective entrepreneurs and innovators. 8.2 Analyse the general external environment about entrepreneurial opportunities and research on their feasibility. 8.3 Develop business ideas. 8.4 Present the Business Plan with Confidence.
9 Conduct Construction engineering research project.	9.1 Identify a research problem/ topic. 9.2 Conduct research. *9.3* Report writing and presentation.
10 Apply knowledge, skills and competencies gained from real work situations (industrial Attachment).	10.1 Demonstrate ability to work with teams. 10.2 Demonstrate acquisition of practical skills on the job.
11 Demonstrate a range of interpersonal and transferable communication skills.	11.1 Apply critical reasoning and thinking to a range of problem-solving scenarios. 11.2 Express complex ideas accurately in written and spoken formats suited to the workplace contexts.

12 Apply concepts of mechanics to solve engineering problems.	12.1 Acknowledge how the core scientific concepts of this course apply to their degree of choice. 12.2 Describe about the behaviour of materials under simple stresses and strains.
13 Demonstrate through the use of advanced simulation tools for environmental performance analyses and identify the correct energy system to use in a specific building.	13.1 Identify and develop technologies for optimizing the building's environmental performance. 13.2 Recognize materials not only for their aesthetic qualities but also in relation to their potential for environmental performance and impact on the environment.
14 Demonstrate confidence and capacity to lead and manage change through collaboration with others.	14.1 Relate and use research findings to advance education theory and practice. 14.2 Grasp the importance of analyse data and synthesize research findings.

SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total (Per** Subject/ Course/ Module/ Units)*
		Level [ ]	***Level [5]***	***Level [6]***	***Credits***
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Information and Computing Skills		***12***		***12***
	Professional Practice and Communication Skills		***10***		***10***
	Health and safety		***10***		***10***
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Building Construction and Workshop Practice I		**14**		**14**
	Engineering Mathematics I		**10**		**10**
	Building Construction and Workshop Practice II		**14**		**14**
	Surveying I		**14**		**14**
	Engineering Mathematics II		**10**		**10**
	Technical Drawing		**10**		**10**
	Engineering Science & Mechanics			**14**	**14**
	CAD for Civil Engineers			**13**	**13**

	Surveying II			**14**	**14**
	Engineering Mathematics III			**10**	**10**
	Science and Materials for Construction and the Built Environment			**13**	**13**
	Building Technology			**14**	**14**
	Construction Plant and Equipment			**12**	**12**
	Quantity Surveying			**14**	**14**
	Engineering Mathematics IV			**10**	**10**
	Hydraulics & Soil mechanics			**14**	**14**
	Structural Mechanics			**12**	**12**
	Building Services in Construction			**10**	**10**
	Sustainable Engineering Practice			**12**	**12**
	Construction Management			**10**	**10**
	Construction law and Contract			**12**	**12**
	INDUSTRIAL ATTACHMENT			**60**	**60**
	Entrepreneurship Development			**10**	**10**
	Project			**25**	**25**

	TOTAL				**383**
ELECTIVE/ OPTIONAL COMPONENT *Subjects/Courses/ Modules/Units*					

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
Level 5	104
Level 6	279
TOTAL CREDITS	***383***

Rules of Combination:

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

No	***Component***	***Modules***	***Credits***
1	*Fundamental Component*	*3*	*32*
2	*Core Component*	*22*	*351*
3	*Optional / Elective Component Choose 2 Modules*		
	Total	***25***	***383***

ASSESSMENT ARRANGEMENTS

Formative Assessment

Formative assessment or continuous assessment (Course work) include:

These forms of assessments contribute to 40% of the final course grade.

Summative Assessment

i. The Final Examination **60%** of the final course grade.

Final Examinations are written at the end of each semester.

Industrial Attachment and Project

Each of these are assessed at **100%** point

MODERATION ARRANGEMENTS

MODERATION REQUIRENTS

It is conducted internally and externally by professionals registered an accredited by BQA as Assessors and Moderators.

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RECOGNITION OF PRIOR LEARNING

There will provision for recognition of Prior Learning (RPL) is related to prospective students who had on-the-job Training and assessed in accordance with the EPT policy for purposes of exemption.

CREDIT ACCUMULATION AND TRANSFER

Learners who have accrued credits from a recognised EPT may be exempted from the credits already earned.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal Progression

Graduates of this qualification may consider pursuing related qualification for the purpose of multiskilling, retooling and gain expert knowledge in the Construction Engineering field. Credit transfer, module mapping and exemptions can be exercised in the following programmes:

- Diploma in Geomatics
- Diploma in Surveying
- Diploma in Civil Engineering

- Diploma in Quantity Surveying
- Diploma in Architectural Design
- Diploma in Building and Civil Engineering
- Diploma in Mechanical Engineering

Vertical Progression

Graduates may progress to qualifications such as:

- Bachelor of Science in Civil Engineering.
- Bachelor of science in Civil and Environmental Engineering.
- Bachelor of science in Construction Engineering.
- Bachelor of Science in Quantity Surveying.
- Bachelor of science in Architecture

Diagonal Progression

Graduates may progress to qualifications such as:

- Post graduate Diploma in Education.
- Post graduate Diploma in Project Management if want to manage projects.

Research work for those with passion for research in Construction Engineering field.

Employment Pathways

Graduates from the Diploma in Construction Engineering will have requisite competencies and attributes to work as:

- Site Agent.
- Construction Engineering Technician / Technical Officer.
- Assistant Construction Project Manager.
- Construction Supervisor/ Foreman.
- Construction Sales Representative
- Construction Procurement Officer.
- Assistant Building Plan Designers.
- Building Contractor.
- Construction Architecture.
- Building Inspector.

- Building maintenance Officer.

QUALIFICATION AWARD AND CERTIFICATION

Minimum Standard of achievement for the award of the qualification.

To be awarded the qualification the graduate, must complete 32 Credits of the Fundamental Component, 351 Credits of the Core component which makes a total credit of 383.

Certification

Candidates should pass all modules for the Diploma in Construction Engineering to be awarded the qualification according to the standards prescribed for the award of the qualification and applicable policies.

Candidates who do not meet the stipulated minimum requirements are not awarded the Certificate but are required to re-sit the failed modules until they pass to be awarded a qualification.

REGIONAL AND INTERNATIONAL COMPARABILITY

Summary of Similarities and Differences Observed

1. **University of Johannesburg**'s Diploma in Construction and Quantity Surveying, NQF Level 6, with 360 Credits provides the qualification that focuses on Construction Engineering as two interrelated areas of study intended to develop human capital for the Construction industry by exposing learners to an up-to-date Construction Engineering curriculum and students go for attachment in the construction Industry Companies for real life situations in Construction.

2. **University of Southampton in United Kingdom (UK**), Diploma in Construction and Architectural Engineering, NQF Level 5, with 260 Credits, provides candidates with competence to Interpret and evaluate construction as a phenomenon and as a business system. Explain the diverse nature of Construction and Architect, including Building Science and Properties Material, Architectural Design and Structural Design for best skills and competence. Identify and assess relationships and networks relative to building Construction and Architectural capacity. Apply problem solving and critical analysis within diverse contexts.

Other Qualifications offered in countries such as New Zealand and United States of America generally emphasis on development of competencies in local and global Construction and Architecture and how these can be synthesized to bring the best of Construction Engineering. Market trends signify that Construction Industry has high skills demand; labour market Observatory confirms the same through HRDC Sector committees on Occupations on demand. Although the qualifications examined generally follow similar structures and standards, there are differences, though not significant, in that their niche market and qualification layout are focusing in certain sectors of the economy which is different from the other.

The proposed qualification generally compares well with the other qualifications reviewed since the exit outcomes cover similar scope and depth and are aligned to exit-level descriptors typical to NCQF level 6 at a minimum of 360 credits. Qualification provides competencies required for registration and accreditation with professional bodies such as ERB – Engineering Registration Board, and BIE- Botswana and Botswana Institution of Engineers and other professional bodies in the region and beyond.

REVIEW PERIOD
The review period shall be 5 years or as and when the need arises.