BQA NCQF QUALIFICATION TEMPLATE

SECTION A:	QUALIFICATION DETAILS		
QUALIFICATION DEVELOPER (S)	Roads Training Centre		
TITLE	Diploma in Highway Engineering	**NCQF LEVEL**	6
STRANDS (where applicable)	N/A		
FIELD	Manufacturing Engineering and Technology	**CREDIT VALUE**	360
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:

The Agenda 2063 of the African Union emphasis on Integration of African countries to develop and maintain highways to build missing links in connecting Africa through highways and rail. In order to achieve this, there is need to develop competent highway engineering manpower to build and maintain highways. Moreover, it calls for quality of highways which is also out lined in SADC strategic plan 2020-2030.

The SADC regional infrastructure development master plan (2012-2027) has identified that, most rural areas in SADC struggle with accessibility due to poor highway infrastructure. Therefore, there is emphasis to develop highway infrastructure to help with accessibility to link the region with infrastructure like Platjaan and Kazungula Bridges which connect Botswana - South Africa and Botswana - Zambia respectively. Hence there is need to develop highway engineering technical manpower. Furthermore, the Government of Botswana as per the Vision 2036 intends to develop the

country into a transport corridor for the region. It is clear that without these technical manpower Botswana will struggle to meet her goals

The Botswana Education and Training Sector Strategic Plan (ETSSP 2015-2020) marked a Significant milestone in our collective efforts as a nation to bring about a more diversified, knowledge-based economy. In particular, the ETSSP 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.

According to Technical and Vocational Education and Training (TVET) Pitso Action Plan Implementation through HRDC, outlines the contribution of TVET to the development of the national economy particularly in the sectors, construction, and manufacturing has proven that opportunities for employment creation are abound. Hence we aim to produce competent Highway Technicians to raise the economy of the country.

PURPOSE: (itemise exit level outcomes)

The purpose of the qualification is to produce graduates with advanced knowledge, skills, and competences to:

- Apply advanced highway engineering aspects, principles and philosophies of highway maintenance and allied works to prolong the highway life span
- Use construction contracts used in highway engineering for administration of highway projects.
- Design of a road and allied works ensuring compliance to designs and controls.
- Apply basic entrepreneurial concepts associated with business establishment for business awareness.
- Apply Information and Communication Technology (ICT) skills in highway construction for planning and management.
- Adhere to Safety, Health and Environment measures on highway construction and maintenance areas to minimise accidents.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

1. *NCQF Level 5 Certificate V (TVET) acceptable to the Institution.*
2. *Recognition of Prior Learning (RPL) and Credit Accumulative Transfer (CAT) will be considered for admission in accordance with applicable policies.*

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SECTION B ***QUALIFICATION SPECIFICATION***

GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1. Identify and analyse well-defined engineering problems, reaching substantiated conclusions using codified methods of analysis specific to Highway engineering	1.1. Identify roads components and their construction or maintenance systems 1.2. Plan a pre design consideration for construction or maintenance 1.3. Identify various highway related problems and recommend for remedy 1.4. Formulate various remedial solutions of various highway related problems 1.5. Analyse solutions suggested to come up with final solution to the identified problem
2. Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified to wide practical procedures and practices in Highway engineering	2.1. Quantify materials for use in maintenance and construction of highways 2.2. Select materials for use in highway construction and maintenance 2.3. Deduce from drawings the required planning to implement the project 2.4. Perform a traffic analysis to predict future trends 2.5. Analyze a traffic count for development of the built up environment
3. Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified highway engineering needs	3.1. Design components of a highway as per given specification 3.2. Follow specifications to design and maintain highways 3.3. Produce drawings for purposes of design, construction and maintenance 3.4. Design drainage components for solving existing problems in Highways and local roads
4. Conduct investigations of well-defined problems, locate and search relevant codes and catalogues and conduct standard tests and measurements in a highway system.	4.1. Conduct preliminary investigation and experiments for purposes of informing a highway design 4.2. Collect data for design, construction and maintenance of highways 4.3. Analyse data collected for purposes of planning for maintenance and construction 4.4. Design a vertical and horizontal alignment of a road using Botswana design system
5. Use appropriate techniques, resources, and modern computing, engineering and IT tools to well-defined highway engineering problems, with an awareness of the limitations	5.1. Use appropriate standards and specifications to do highway elements as required 5.2. Use appropriate IT methods to solve highway related engineering problems 5.3. Model highway components using IT methods like Auto CAD and Civil Designer

	5.4. Plan resources for a soil laboratory for testing highway materials 5.5. Use equipments in a highway laboratory for testing road building materials 5.6. Calibrate minor equipment before use in a highway setup 5.7. Integrate various Microsoft packages 5.8. Use ICT to capture and analyse data for use in a highway engineering projects
6. Communicate effectively and inclusively on well-defined highway engineering activities, both orally and in writing, with the engineering community and society at large, by being able to comprehend the work of others, document own work and give and receive clear instructions.	6.1. Effectively communicate using oral communication 6.2. Effectively write instructions or respond to communication in the highway sector 6.3. Communicate and interpret graphical information to implement project components 6.4. Able to communicate effectively with other audiences outside the roads sector
7. Apply critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment as required by the highway engineering codes of practices.	7.1. Plan for highways and civil engineering works taking into cognisant to the physical environment 7.2. Use available statutory instruments available to ensure social and industrial and physical environment are not impacted by highway construction and maintenance 7.3. Use modern methods to develop or maintain roads in a sustainable manner safeguarding flora and Fiona 7.4. Carry out an Environmental impact assessment for preparation of a road construction or maintenance 7.5. Apply the method of approach for road related problems or methods so that social impact is preserved
8. Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.	8.1. Able to work with multidisciplinary teams in an engineering setup 8.2. Able to adhere to time management when working with others 8.3. Present an engineering interdisciplinary report to a panel of experts/fellows 8.4. Execute independently functions or tasks given.
9. Engage in independent learning through well-developed learning skills.	9.1. Write a comprehensive report for a given task independently 9.2. Present an engineering report to a panel 9.3. Carry an independent research to solve highway related problems 9.4. Able to independently use engineering methods and ethics to unravel roads component's shortcomings.

10. Commit to professional ethics and norms of technician practice, including compliance with relevant laws.	10.1. Able to use various design and maintenance manuals used in Botswana 10.2. Use effectively the codes of design and maintenance of roads. 10.3. Apply the codes to tasks outside the roads sector like buildings 10.4. Able to analyse a cost benefit analysis for a project
11. Use Highway engineering management principles for effective administration of projects.	11.1. Estimate project costs of a highway construction and maintenance 11.2. Use the Critical Path Method to manage a project 11.3. Produce a Work Breakdown Structure of a project 11.4. Track a project using IT solutions of project management 11.5. Apply skill in solving engineering conflict 11.6. Use various engineering contracts to run a project
12. Use workplace practices to solve advanced highway engineering problems consistent with academic learning achieved.	12.1. Apply general knowledge to perform work given in the workplace 12.2. Apply skills learnt and integrating it with professional knowledge to perform work given in the workplace 12.3. Produce a highway section design as a team 12.4. Apply workplace practices in a site or laboratory
13. Apply basic entrepreneurial concepts associated with business establishment for business awareness.	13.1. Identify a venture of interest in order to develop an entrepreneurial attitude 13.2. Conduct a market survey to assess the viability of the project. 13.3. Prepare a business plan for the chosen venture providing all standard requirement for a business plan 13.4. Implement a business plan 13.5. Monitor a business plan

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SECTION C	***QUALIFICATION STRUCTURE***		
	TITLE		

COMPONENT		Credits Per Relevant NCQF Level			Total Credits
		Level [V]	Level [VI]	Level [VII]	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units	Basic Entrepreneurship	14	-	-	14
	Computer studies	14	-	-	14
	Communication and study skills	15	-	-	15
	Technical Mathematics	-	15	-	15
	Safety and Health	20	-	-	20
	Environmental studies	15			15
CORE COMPONENT Subjects/Courses/ Modules/Units	Engineering Surveying	-	20	-	20
	Road Construction	-	20	-	20
	Road Maintenance	-	20	-	20
	Properties of materials & Geology	-	20	-	20
	Statics	-	10	-	10
	Applied Mechanics	-	14	-	14
	Structural Engineering and Design	-	15	-	15
	Economics	-	10	-	10
	Soil Mechanics	-	15	-	15
	Measurements and Specifications	-	15	-	15
	Estimating & Costing	-	15	-	15

	Road Design	***-***	*20*	***-***	***20***
	Principles of Auto CAD	***-***	*15*	***-***	***15***
	Project Management	***-***	*7*	***-***	***7***
	Industrial Training (work based)	***-***	*15*	***-***	***15***
	Project Work (Group work)	***-***	***-***	*15*	***15***
	Hydraulics & Hydrology	***-***	*14*	***-***	***14***
	Traffic and Transport	***-***	*7*	***-***	***7***
STRANDS/ SPECIALIZATION	*Subjects/ Courses/ Modules/Units*	***Credits Per Relevant NCQF Level***			***Total Credits***
		Level []	***Level []***	***Level [ ]***	
1.	***No strands***	***-***	***-***	***-***	***-***
2.	***No strands***	***-***	***-***	***-***	***-***
Electives	***No electives***	***-***	***-***	***-***	***-***

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL
TOTAL CREDITS PER NCQF LEVEL

NCQF Level	*Credit Value*
Level (V)	*78*
Level (VI)	*267*
Level (VII)	*15*
TOTAL CREDITS	*360*

Rules of Combination:

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

In order to be awarded with a Diploma in Highway Engineering, a candidate must accumulate 360 credits and qualifying the below set credit accumulation scheme. The composition of the qualification credits scheme is that a student must accumulate:

1. **78 credits *from level V***
2. ***267 credits from level VI and***
3. ***15 credits from level VII***

The institution shall award a DIPLOMA IN HIGHWAY ENGINEERING (NCQF Level 6) certificate to all students who meet the above rules of combination.

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ASSESSMENT ARRANGEMENTS
Summative Assessment 60 % **Formative Assessment 40%**
MODERATION ARRANGEMENTS
• Internal and External moderation would be applied to all subjects. • All moderators shall be required to be accredited with the Botswana Qualifications Authority (BQA) or be Accredited by an equivalent body to BQA or be recognized by BQA
RECOGNITION OF PRIOR LEARNING
This qualification is designed to allow award through RPL assessment, in accordance with Institutional and National RPL policy.
CREDIT ACCUMULATION AND TRANSFER (CAT)
This qualification is designed to allow award through CAT assessment, in accordance with Institutional and National CAT policy.
PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)
1) Learning-Vertical • Bachelor of Engineering in Civil Engineering • Bachelor of Engineering in Transportation Engineering • Bachelor of Engineering in Highway Engineering • Bachelor of Engineering in Project Management • Bachelor of Engineering in Construction Engineering • Bachelor of Engineering in Geomatics • Any Higher National Diploma in construction related programmes **2) Learning-Horizontal** • Diploma in Civil Engineering • Diploma in Highway Engineering • Diploma in Transportation Engineering • Diploma in Project Management • Diploma in Construction Engineering • Diploma in Geomatics

3) **Employment opportunity**

- Clerks of works-highways/Highway
- Clerk of works civil engineering
- Highway Technician
- Civil Engineering Technician
- Soil Laboratory technician
- Self-employment

QUALIFICATION AWARD AND CERTIFICATION

A candidate shall qualify for certification for the Diploma in Highway Engineering after completion of 360 Credits.

Certification

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

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

The Diploma in Highway engineering was compared with similar qualifications in other countries in terms of scope, level and curriculum content. The purpose of this study was to compare the qualification against existing regional and international practice. The Diploma in Civil Engineering and Diploma in Engineering (Civil Engineering) are offered in South-Africa and New Zealand respectively.

Similarities

Exit outcomes, modules, credits, level, Education and Employment Pathways, Assessment strategies and Weightings

The developed qualification has 360 credits which are similar to that of Diploma in Civil Engineering offered by UNISA. The qualifications are all at level 6 and have similar modules. The exit outcomes for the Developed qualification (Diploma in Highway Engineering) are similar to learning outcomes of the Diploma in Civil Engineering and Diploma in Engineering (Civil Engineering) since are developed from engineering standards (ECSA and Dublin). The developed qualification has similar Education and Employment Pathways, assessment strategies and weightings with compared qualifications.

Differences

Title, modules, credits,

The developed qualification and the Diploma in Civil Engineering and Diploma in Engineering (Civil Engineering) have different names while they are all developed under civil engineering. The developed qualification has 360 credits while the Diploma in Engineering (Civil Engineering) offered by Otago Polytechnic has 240 credits because they do not have work based learning and modules like Entrepreneurship, computer studies, environmental studies, economics, estimating & costing and quantities as standalone modules.

Conclusion

The developed qualification compares well with benchmarked qualifications looking at the credits value, level and learning outcomes therefore the developed qualification is appropriate to construction industry, despite different names of qualifications.
REVIEW PERIOD
This qualification shall be reviewed every 5 years.

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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**	