| SECTION A: | QUALIFICATION DETAILS | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QUALIFICATION DEVELOPER (S) | Construction Industry Trust Fund | | | | | | | | | | | | | | | | | |
| TITLE | Certificate IV in Electrical Installation and Maintenance | | | | | | | | | | | | | | NCQF LEVEL | 4 | | |
| FIELD | Manufacturing, Engineering and Technology | | SUB-FIELD | | Electrical Installation | | | | | | | | | | CREDIT VALUE | 63 | | |
| 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:

Government has identified high unemployment and poverty amongst youth as a national security risk, hence the need to train this section of the population in productive and income generating skills.

Despite the country continuing to receive investments, these investments are biased towards capital intensive ventures. This situation has the inherent risk of unemployment continuing to surge, and the government, through its vital development policy paper, National Development Plan 11 (NDP 11), has identified areas of potential high employment uptake such as Building Construction, and has made a commitment to give these sectors extensive support with a view to making meaningful contribution the growth of the economy.

Another policy document that make mention of skills development as a vehicle towards inclusivity and provision of opportunities for all, is the Vision 2036 document under the of Human and Social Development (Pillar 2) which states that" Botswana society will be knowledgeable with relevant quality education that is outcome based, with emphasis on technical and vocational skills as well as academic competencies."

The Electrical trades, of which this proposed qualification falls under, have been identified as some of the top occupations in demand for the future (HRDC, 2019).

This qualification provides qualifying learners with the underlying Electrical Installation knowledge, skills and values in order to become competent practitioners in the Construction, manufacturing, and engineering sectors; be employed or self-employed within the industry and pursue further learning in specific areas of electrical installation

***PURPOSE:***

The purpose of this qualification is to equip learners with knowledge, skills and competences to:

- Interpret and electrical engineering drawings, diagrams, and circuits.
- Apply electrical theory to solve various electrical problems
- Repair circuits in electrical machines and components,
- Install and connect electrical equipment and control circuits.
- Maintain and repair electrical equipment
- Commission electrical equipment, control circuits and installations.

***ENTRY REQUIREMENTS (including access and inclusion)***

- Certificate III Electrical Installation (NCQF Level 3) or equivalent.
- Certificate III in BGCSE
- There shall be access through RPL and CAT in line with the National RPL and CAT Policies

| ***SECTION B*** | ***QUALIFICATION SPECIFICATION*** |
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| **At the end of three months, learners undertaking this qualification should have completed the Learning Objectives below and been declared competent in their associated Assessment Criteria** | |
| ***GRADUATE PROFILE (LEARNING OUTCOMES)*** | ***ASSESSMENT CRITERIA*** |

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| 1. Interpret electrical drawings and sketches. | 1.1 Draw electrical installation circuits and diagram using electrical symbols.<br><br>1.2 Demonstrate the requirement of drawings and specification<br><br>1.3 Calculate electrical quantities using relevant formulae and SI units |
| 2. Apply electrical technology in installations | 2.1 Measure electrical quantities by using both analogue and digital electrical measuring instruments<br><br>2.2 Connect single-phase domestic installation<br><br>2.3 Perform an electrical tests on components using different testing instruments.<br><br>2.4 Connect both single and three-phase energy meters to electrical installation. |
| 3. Install electrical equipment and components for domestic and industrial use. | 3.1 Select tools, and equipment components for electrical installation work<br><br>3.2 Select different types of electrical cables and accessories.<br><br>3.3 Fix electrical components and accessories to building structures<br><br>3.4 Install cable support systems according to the drawings<br><br>3.5 Assemble distribution boards to installed structures<br><br>3.6 Wire cable to electrical lighting and socket outlets circuits<br><br>3.7 Earth and bond-building structures against lightning |
| 4. Commission electrical installations. | 4.1 Apply electrical installation risk management procedures and industry standards.<br><br>4.2 Isolate and test low-voltage electrical subcircuits according to specifications and industry standards.<br><br>4.3 Inspect and test electrical installations according to specifications and industry standards. |

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| | 4.4 Connect a single phase and three-phase motors to loads<br><br>4.5 Find faults and repair portable electrical tools and appliances<br><br>4.5 Complete electrical installations commissioning test report according to industry standards. |
| 5 Maintain electrical Installation and machines. | 5.1 Tests conductivity, resistance, voltage and components for functionality<br><br>5.2 Find faults in electrical circuits and machines using diagnostic procedures<br><br>5.3 Replace faulty components according manufacture specification |
| 6 Apply the principles of Occupational Health and Safety in the Work Environment | 6.1 Identify hazards in the Workplace<br><br>6.2 Asses possible risks in the workplace<br><br>6.3 Wear Appropriate Personal Protective Equipment |
| 7 Demonstrate knowledge of Entrepreneurial principles in the workplace | 7.1 Apply the basic business concepts in his/her daily operations.<br><br>7.2 Assess business ideas to improve the operations.<br><br>7.3 Adhere to business plans for purposes of monitoring and evaluation.<br><br>7.4 Create value through implementation of innovative ideas |

| ***SECTION C*** | ***QUALIFICATION STRUCTURE*** | | | | |
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| ***COMPONENT*** | ***TITLE*** | ***Credits Per Relevant NCQF Level*** | | | ***Total*** ***(Per** Subject/ Course/ Module/ Units)* |
| | | ***Level [ 4 ]*** | ***Level [ 5 ]*** | ***Level [ ]*** | |
| ***FUNDAMENTAL COMPONENT*** *Subjects/ Courses/ Modules/Units* | Safety, health and environmental protection | ***3*** | | | ***3*** |
| | Communications | ***2*** | | | ***2*** |
| | Working at heights | ***3*** | | | ***3*** |
| | Fundamental entrepreneurial principles | ***2*** | | | ***2*** |
| | ***TOTAL*** | ***10*** | | | ***10*** |
| ***CORE COMPONENT*** *Subjects/Courses/ Modules/Units* | Electrical Principles | ***4*** | | | |
| | Symbols and Components | ***2*** | | | |
| | Generator and Motor theory | ***3*** | | | |
| | Electrical Wiring Diagrams | ***3*** | | | |
| | Electrical Tools | ***3*** | | | |
| | Electrical safety, protection and Testing | ***4*** | | | |
| | Earth and Bonding | ***2*** | | | |

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| | Electrical Testing Instruments | ***3*** | | | |
| | Installation, Wiring and Testing of Electrical Installations | ***8*** | | | |
| | Trouble Shooting of Electrical Circuits | ***3*** | | | |
| | Maintenance of Electrical Equipment | ***3*** | | | |
| | Motor Control Wiring and Interpretation | ***4*** | | | |
| | Switchgears | | ***4*** | | |
| | Pre-commissioning, Inspection and Testing of Electrical Systems | | ***4*** | | |
| | Electrical machines | ***3*** | | | |
| | ***TOTAL*** | ***55*** | ***8*** | | ***63*** |
| ***ELECTIVE/ OPTIONAL COMPONENT***<br>*Subjects/Courses/ Modules/Units* | | | | | |
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| ***SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL*** | |
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| ***TOTAL CREDITS PER NCQF LEVEL*** | |
| ***NCQF Level*** | ***Credit Value*** |
| ***4*** | ***56*** |
| ***5*** | ***8*** |
| | |
| ***TOTAL CREDITS*** | ***64*** |

***Rules of Combination:***

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

The qualification consists of Fundamental and Core and Components.

To be awarded the Qualification learners are required to obtain a minimum of **64** credits as detailed below.

**Fundamental Components**:

The Fundamental components consist of foundational knowledge in Electrical Installation to the value of **10** credits all of which are compulsory

**Core Components:**

The core components consist of modules containing applied knowledge and practical skills to the value of **54** credits which are compulsory.

**Elective Components**:

There are no Elective Components for this qualification

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## *ASSESSMENT ARRANGEMENTS*

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

**1. Formative assessment**

Formative or continuous assessment would be conducted to inform teaching and learning and establish the learner's level of readiness for progression to the next learning unit or module.

Formative assessment shall constitute 60% of the Final Mark

**2. Summative assessment**

Internal summative assessments shall be carried out in accordance all applicable examination rules, and the weighting of the assessment shall constitute 40% of the Final Mark

All assessment shall be carried out by BQA registered and accredited Assessors

## *MODERATION ARRANGEMENTS*

There shall be internal and external moderation carried out by BQA registered and accredited Moderator

## *RECOGNITION OF PRIOR LEARNING*

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.

## *CREDIT ACCUMULATION AND TRANSFER*

Candidates would be allowed to accumulate enough credits that would warrant them the award of the qualification. This would include transfers of credits from previous learnings

## *PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)*

**Articulation and Education Pathways**

Horizontal Articulation:

Graduates of this qualification may consider pursuing to other qualifications on the same levels in the field of Electrical Engineering such as

- Certificate IV in Photovoltaic
- Certificate IV in PLC

**Vertical Articulation:**

Learners may progress to higher level in the same field such as

- Certificate V in Electrical Installation
- Certificate V in Solar Photovoltaic Electrician

## *QUALIFICATION AWARD AND CERTIFICATION*

To be awarded this qualification, the candidate must have met the following requirements:

- All exit level outcomes
- Minimum **64** credit requirements

Upon completion of the qualification, the candidate will be awarded a **CERTIFICATE IV IN ELECTRICAL INSTALLATION AND MAINTENANCE**

## *REGIONAL AND INTERNATIONAL COMPARABILITY*

This qualification is based on the NCQF Qualifications Development Guidelines. Whilst most of the modules and outcomes making up this qualification were adopted from previous qualifications in Botswana, further

benchmarking was done with the entities within the SADC region and beyond. The findings are as indicated below

The following Similarities and Differences of the qualifications examined were observed.

**Similarities**

All the qualifications place great importance on the underpinning knowledge of electrical principles, and have included a module on the same. The exit level outcomes of the 4 qualifications examined are similar and their scope covers Fundamentals of Electricity

Since the qualification is skills based, assessment is integrated, and competencies are achieved through the design and development of assessment activities that make use of a variety of assessment methods and tools that measure not only the learner's knowledge and ability to perform practical tasks and activities within a familiar context, but which also challenge learners to demonstrate their ability to deal with problem situations that might or can arise in the workplace from time and which require learners' to demonstrate their ability to adapt their performance to meet the requirements of changed circumstances and to reflect on what they are doing and why..

**Differences**

While all the four qualifications contain similar Electrical Installation modules and outcomes, there are slight variations when it comes to the peripheral outcomes. The Namibian qualification from Monitronic Success College have included Refrigeration and Air Conditioning Basic Skills, while the New Zealand one from Otago Polytechnic, have incorporated first aid, cardio-pulmonary resuscitation, safe-working practices, and safety testing

The qualifications studied have a great disparity of credit weighting as well as the duration. The South African qualification has a one tear duration, whilst the New Zealand one has a credit weighting of 149 credits. Credit weighting for Namibia have not been stated, but the one for the Laney College of Oakland, California, in the United States of America has only 30 credits, implying that it has a very short duration.

**Comparability and Articulation**

The proposed qualification compares well with those examined, especially in terms of exit level outcomes, modules, and assessment strategies. The South African qualification has included Manufacturing processes, which prepares learners in the production of electrical components such as distribution boards, whilst the Namibian qualification has included Refrigeration and Air Conditioning, which the proposed qualification has not included.

There is a disparity in the credit weighting, with the New Zealand qualification going up to 149 credits, and the Laney College qualification in the United States only requiring 30 credits. This is attributable to peculiarities of the different qualification frameworks.

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| All the examined qualifications place great emphasis on occupational health and safety. The proposed qualification has done the same and even gone further to offer a module on Working at Heights. To further empower the learners towards self-employment, modules on communications and entrepreneurship have also been included. |
| ***REVIEW PERIOD*** |
| This qualification will be reviewed every five (5) years |

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