| SECTION A: | QUALIFICATION DETAILS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **QUALIFICATION DEVELOPER (S)** | Orapa Technical College | | | | | | | | | | | | | |
| **TITLE** | Certificate V in Electrical Engineering | | | | | | | | | **NCQF LEVEL** | 5 | | | |
| **STRANDS (where applicable)** | N/A | | | | | | | | | | | | | |
| **FIELD** | Manufacturing, Engineering and Technology | | | | | | | | | **CREDIT VALUE** | 375 | | | |
| **SUB FIELD** | Engineering & 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

The *Certificate V in Electrical Engineering* has been developed in response to a clearly identified national need for technically competent artisans capable of maintaining and optimising electrical systems and equipment in various industrial sectors. The HRDC Priority Skills Report of March 2025 highlights some electrical skills (Photovoltaic and Energy Management) as some of the critical skills for future job openings and energy sector. This also include Electrical Artisans in future job openings A robust maintenance workforce is pivotal in reducing equipment downtime, enhancing production efficiency, and improving occupational health and safety in the workplace. The demand for these skills

is driven by the increasing complexity of electrical systems, the shift towards preventative maintenance strategies, and the growing importance of sustainability and compliance with environmental and safety standards.

***PURPOSE: (itemise exit level outcomes)***

The purpose of this qualification is to produce graduates with broad technical knowledge, skills and competence to:

1. Apply knowledge of safety protocols to identify, control hazards and manage risks in an electrical environment
2. Create, interpret electrical schematics and wire circuits in accordance with electrical industry standards
3. Troubleshoot low, medium and high voltage electrical systems and equipment to improve system reliability and efficiency
4. Maintain and repair electrical machines, systems and equipment to optimise performance.
5. Manage the operation of electrical power systems and equipment to meet operational requirements.
6. Demonstrate entrepreneurial and communication skills relevant for starting and managing small technical enterprises or operating effectively in diverse team environment

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

Entry to this qualification is open to people who meet any **ONE** of the following requirements:

- Certificate IV, NCQF Level 4 or equivalent
- Certificate IV in Electrical Engineering or equivalent
- Recognition of Prior Learning (RPL) and Credit Accumulation Transfer (CAT) should be considered for entry into the qualification.

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**SECTION B QUALIFICATION SPECIFICATION**

| GRADUATE PROFILE (LEARNING OUTCOMES) | ASSESSMENT CRITERIA |
|---|---|
| 1. Execute health and safety measures to ensure compliance within the electrical environment | 1.1. Identify potential hazards to ascertain safety of the work environment<br>1.2. Evaluate identified hazards to determine risk level and potential impact<br>1.3. Implement controls to reduce and eliminate risks<br>1.4. Maintain safe working practices to ensure compliance. |
| 2. Troubleshoot electrical machines and equipment to improve efficiency. | 2.1. Apply diagnostic techniques in accordance with fault finding procedure<br>2.2. Identify faults to develop solutions<br>2.3. Develop solutions to rectify faults<br>2.4. Correct and rectify faults to the original operating status of the equipment.<br>2.5. Carry out functional and operational testing to verify performance |
| 3. Implement maintenance strategies on electrical equipment and systems to reduce equipment downtime and optimize performance. | 3.1. Perform routine inspections on electrical equipment to identify maintenance needs<br>3.2. Carry out performance and operational parameter assessment to identify deviations<br>3.3. Analyse data to identify potential issues and root cause<br>3.4. Schedule maintenance based on predictions to prevent equipment failure |
| 4. Draw, interpret and wire safe electrical circuits according to requirements | 4.1. Create schematics according to industry standards<br>4.2. Interpret electrical diagrams according to industry standards<br>4.3. Wire and configure electrical circuits according to project requirements |

| | |
|---|---|
| 5. Repair electrical equipment and systems in accordance with manufacturer's standards | 5.1. Isolate and lock-out equipment being withdrawn from service according to lock-out procedure<br>5.2. Evaluate the condition of electrical equipment according to equipment specifications<br>5.3. Carry out performance tests in accordance with operational standard<br>5.4. Maintain equipment within the limits specified in the work order<br>5.5. Document completed maintenance work in accordance with requirements |
| 6. Apply principles of electrical energy management to enhance reliability and effectively manage energy consumption | 6.1. Analyse electrical power usage to optimise energy consumption<br>6.2. Implement energy efficient measures to reduce power consumption<br>6.3. Evaluate and monitor progress to analyse energy usage trends and identify areas of improvement.<br>6.4. Monitor system performance to maintain optimal energy efficiency |
| 7. Demonstrate ability to manage small business venture and solve entrepreneurial problems | 7.1. Employ effective oral, written and electronic communication strategies to enhance all business operations.<br>7.2. Apply business principles according to Competency-based Economics through formation of Enterprises (CEFE) methodology to guide the Start – up and Management of a small business.<br>7.3. Apply accounting concepts and methods to evaluate the financial position and performance of the business.<br>7.4. Work with Computer Applications for creating documents, record business transactions and prepare documents for presentation |

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| SECTION C | QUALIFICATION STRUCTURE | | | | |
|---|---|---|---|---|---|
| COMPONENT | TITLE | Credits Per Relevant NCQF Level | | | Total Credits |
| | | Level [3] | Level [4] | Level [ 5] | |
| **FUNDAMENTAL COMPONENT** Subjects/ Courses/ Modules/Units | Safety, Health & Environment | | 2 | 3 | 5 |
| | Business Communication skills | | 3 | 5 | 8 |
| | Electrical Workshop Tools and Equipment | | 2 | | 2 |
| | Technical Maths | | | 15 | 15 |
| **CORE COMPONENT** Subjects/Courses/ Modules/Units | Electrical & Mechanical Technology | | 5 | | 5 |
| | Fundamentals of Electricity | | 8 | | 8 |
| | Electromagnetism | | 6 | | 6 |
| | Alternating Current Theory | | | 5 | 5 |
| | Direct Current Machines | | | 4 | 4 |
| | Three-phase Induction Motors | | | 5 | 5 |
| | Electrical Utility Power Systems | | | 8 | 8 |
| | Protection | | | 10 | 10 |
| | Measuring Instruments | | | 6 | 6 |

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|---|---|---|---|---|---|
| | Renewable Energy Sources and Energy Management | | | 5 | 5 |
| | Fundamental Elements of Electronics | | | 6 | 6 |
| | Workshop safety | | 4 | | 4 |
| | Three Phase Circuits | | | 8 | 8 |
| | Measurement of electrical quantities | | | 5 | 5 |
| | Single Phase motors | | | 10 | 10 |
| | Industrial motor control circuits | | | 10 | 10 |
| | Transformers | | | 15 | 15 |
| | Principles and Techniques of troubleshooting | | | 4 | 4 |
| | Test Instruments | | 6 | | 6 |
| | Motor Speed Control | | | 10 | 10 |
| | Principles of Maintenance | | | 5 | 5 |
| | Professional Business Practice | | | 15 | 15 |
| | Workplace Attachment | | | | 180 |
| | | | | | |
| **STRANDS/ SPECIALIZATION** | Subjects/ Courses/ Modules/Units | **Credits Per Relevant NCQF Level** | | | **Total Credits** |
| | | **Level [ ]** | **Level [ ]** | **Level [ ]** | |

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| **Electives** | Basic Instrumentation | | | 5 | |
| | Basic Welding | | | 5 | |
| | Fundamentals of Refrigeration and Air Conditioning | | | 5 | |

| **SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL** | |
|---|---|
| **TOTAL CREDITS PER NCQF LEVEL** | |
| **NCQF Level** | **Credit Value** |
| Level 4 | 36 |
| Level 5 | 159 |
| Workplace | 180 |
| **TOTAL CREDITS** | **375** |
| **Rules of Combination:**<br>**(Please Indicate combinations for the different constituent components of the qualification)** | |
| This qualification consists of the following:<br>• Fundamental Components | |

- Core Components
- Elective Components.

To be awarded with this Qualification, learners are required to obtain a minimum of **370** credits as detailed below:

**Fundamental Components:**
The Fundamental components consist of foundational knowledge in key skills modules to the value of **30** credits

**Core Components:**
The core components consist of modules containing applied knowledge, practical skills and workplace learning to the value of **340** credits.

**Elective Components:**

Learners are to choose one (1) elective to the credit value of **5** credits

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## ASSESSMENT ARRANGEMENTS

The qualification shall be assessed through a combination of both Continuous Assessments (Formative) and Final Examination (Summative).

- Formative assessment shall constitute a 60% of the final grade.
- Summative assessment shall constitute 40% of the final grade.

## MODERATION ARRANGEMENTS

Internal and external moderation shall be performed by qualified moderators in the same field

## RECOGNITION OF PRIOR LEARNING

There shall be provision of Recognition of Prior learning for awarding of the qualification using the ETP and National RPL policies.

## CREDIT ACCUMULATION AND TRANSFER

There shall be provision of Credit Accumulation Transfer for awarding of the qualification using the ETP and National CAT policies.

## PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

**Learning pathway**

**Vertical**

- Diploma in Electrical & Electronics Engineering
- Diploma in Electronics
- Diploma in Mechatronics
- Diploma in Control & Instrumentation

**Horizontal**

- Certificate V in Electronics
- Certificate V in Mechatronics
- Certificate V in Control & Instrumentation

**Diagonal**

- Diploma in vocational education and training

**Employment pathway**

- Maintenance Electrician

**Progression Occupation**

- Electrical Installation Inspector
- Electrical Engineering Technician
- Protection Technician

## QUALIFICATION AWARD AND CERTIFICATION

The candidate must have met the following requirements to be awarded the qualification:

- All exit level outcomes
- Minimum **370** credit requirements
- All qualification requirements including practical and workplace modules.

Upon completion of the qualification the graduate will be awarded and issued with a Certificate V in Electrical Engineering**.**

## SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

Similarity and differences with Occupational Certificate: Electrician Level 04 360 Credits **-** Development Quality Partner - LG SETA
**(South Africa)**

**Similarities**

- Both qualifications have compulsory structures consisting of knowledge modules, practical skill modules, and workplace learning modules.
- The qualifications are under the Manufacturing, Engineering and Technology field and specifically within Engineering and Engineering Trades.
- Both aim to develop competent electrical artisans capable of installing, testing, fault finding, maintaining, and repairing electrical equipment and control systems.
- The structure includes health, safety, quality, and legislation as fundamental knowledge components.
- Both qualifications emphasize adherence to industry standards, regulations, codes, and safety practices during all activities.
- The qualifications articulate with further learning pathways in electrical or related fields and provide employment outcomes in electrician and electrical artisan roles.
- Workplace learning and assessment criteria focus on practical application, risk management, use of tools and testing instruments, and reporting/documentation.
- The assessment strategy includes continuous formative assessment combined with summative assessment (not explicitly stated for the South African qualification but a common approach).

**Differences**

- The proposed Botswana qualification is at NCQF Level 5 while the South African Occupational Certificate is at NQF Level 4, indicating the Botswana qualification targets a higher level of complexity and depth.
- Botswana's qualification has a higher credit value of 370 or 448 credits, compared to South Africa's 360 credits, indicating more extensive or detailed learning requirements.
- The Botswana qualification entry requirements include NCQF Level 4 or equivalent certificates or recognition of prior learning (RPL), whereas South Africa's qualification starts at Level 1, including foundational skills in maths and science.
- Botswana's qualification places explicit emphasis on entrepreneurial and communication skills for artisan enterprise management, which is less emphasized in the South African version.
- The Botswana qualification includes specific modules on energy management and renewable energy sources, emphasizing sustainability, which is not explicitly highlighted in the South African framework.
- Botswana's qualification provides detailed progression pathways vertically to diplomas and horizontally to related certificate V qualifications, with explicit mention of diagonal pathways through vocational training diplomas.
- The Botswana qualification requires a significant workplace attachment component (180 credits), highlighting work experience and on-the-job training more explicitly.

Similarity and differences with New Zealand Certificate in Electrical Engineering Theory and Practice (Trade) (Level 4) - Waihanga Ara Rau Construction and Infrastructure Workforce Development Council **(New Zealand)**

**Similarities**

- Both qualifications aim to produce competent registered electricians or electrical artisans capable of installing, testing, commissioning, fault finding, maintaining, and servicing electrical systems and equipment.
- Safety and compliance with electricity industry legislation and standards are major components in both qualifications.
- Both emphasize the application of electrical and non-electrical legislation and workplace safety procedures.
- The qualifications include the ability to install and maintain electrical machines, control systems, and electrical equipment in various environments.
- Focus on professional and ethical work practices within the electrical industry and communication with relevant stakeholders is present.
- Competence in fault diagnosis, testing, and commissioning is central to both qualifications.

**Differences**

- The Botswana qualification is placed at NCQF Level 5, whereas the New Zealand Certificate is at Level 4, which means the Botswana qualification is pitched at a higher level, implying deeper knowledge and more complex learning outcomes.
- Credit values differ: Botswana's qualification requires 370, while the New Zealand qualification is smaller, with 250 credits, showing Botswana's qualification is more extensive.
- Botswana's qualification places emphasis on entrepreneurial skills and business management, aiming to develop artisans capable of starting and managing small technical enterprises, which is not explicitly specified in the New Zealand qualification.
- Botswana's qualification highlights emerging skills like photovoltaic and energy management in response to national skills priorities, reflecting a focus on sustainability and

energy efficiency. The New Zealand qualification, while including electrical protection and systems maintenance, does not explicitly mention these areas.

- Botswana's qualification has detailed progression pathways vertically (diplomas), horizontally (other certificates), and diagonally (vocational education diplomas), whereas the New Zealand qualification pathways are less detailed in the summary.
- The Botswana qualification includes a sizeable workplace attachment (180 credits) focused on practical experience, but this detail is not explicitly stated in the New Zealand certificate information.
- The New Zealand qualification is offered under the authority of the Construction and Infrastructure Workforce Development Council, linking it clearly to the construction industry sector, whereas Botswana's qualification is broader within manufacturing, engineering, and technology fields.

| **REVIEW PERIOD** |
|---|
| This qualification shall be reviewed after **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** | |
| | | | |