

BQA NCQF QUALIFICATION TEMPLATE

| SECTION A: QUALIFICATION DETAILS | | | | | | | | | | | | | |
|--|---|---|----------------------|-----|---------------------------|---|-----------------------|----------------|-----------------------|-------------------|-----|--|--|
| QUALIFICATION DEVELOPER (S) | Botswana Railways Training Institute | | | | | | | | | | | | |
| TITLE | Certificate V In Locomotive Fitting | | | | | | NCQF LEVEL | | | | 5 | | |
| STRANDS (where applicable) | N/A | | | | | | | | | | | | |
| FIELD | Manufacturing, Engineering and Technology | | | | | | CREDIT VALUE | | | | 120 | | |
| 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 | ✓ | | Diplo ma | Bachelor | | | |
| | | | Bachelor Honours | | Post Graduate Certificate | | | | Post Graduate Diploma | | | | |
| | | | | | Masters | | | Doctorate/ PhD | | | | | |
| RATIONALE AND PURPOSE OF THE QUALIFICATION | | | | | | | | | | | | | |
| <p>RATIONALE:</p> <p>In line with National Development Plan (NDP) 11, the Government of Botswana, in partnership with the private sector, has established infrastructure to open export corridors to seaports, enabling the transportation of coal and other bulk commodities to markets in Asia and Europe through projects such as the Trans Kalahari Railway, which links to Namibian ports and the wider SADC rail network.</p> | | | | | | | | | | | | | |

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Aligned to this national agenda, Botswana Railways anticipates increased rail traffic volumes arising from strategic projects including the Mmamabula–Lephalale, Trans Kalahari, and Moseitse–Kazungula rail lines, creating demand for specialised railway occupations, particularly Locomotive Fitters.

The March 2025 Human Resource Development Council Priority Skills Report, under the National Transformation Strategy (2023–2030), identifies rail-related occupations within the transport and logistics sector as priority and future skills for upcoming mega projects, including the Transport Special Economic Zones.

Consequently, this qualification is designed to address the growing demand for Locomotive Fitters by producing competent artisans capable of maintaining locomotives in railway environments, in compliance with applicable legislative, regulatory, and occupational health and safety frameworks.

PURPOSE: (itemise exit level outcomes)

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

1. Inspect, maintain, repair, and integrate locomotive systems in accordance with OEM and organisational procedures.
2. Diagnose and rectify locomotive faults using structured troubleshooting methods.
3. Apply safety, quality, and ethical standards during locomotive maintenance activities.
4. Communicate effectively, work collaboratively, and use ICT systems to support maintenance operations.
5. Engage in continuous learning to adapt to changing railway technologies and workplace requirements.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

- Certificate IV, NCQF level 4 mechanical/ Electrical Engineering or National Craft Certificate in Mechanical, Diesel, or Fitter (Level IV) or equivalent qualification.
- Access to the qualification through RPL will be applicable in line with ETP policies

| SECTION B QUALIFICATION SPECIFICATION | |
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| GRADUATE PROFILE (LEARNING OUTCOMES) | ASSESSMENT CRITERIA |
| LO1: Apply Mechanical and Electrical Engineering Principles in Locomotive Systems in Accordance with | 1.1 Demonstrate broad technical knowledge of the functions, components, and interrelationships of major locomotive systems, including powertrain, braking, traction, cooling, lubrication, fuel, and electrical power/control |

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| <p>Original equipment Manufacturer Standards.</p> | <p>systems to ensure effective diagnosing of complex issues, effective maintenance, and the safe operation of the locomotive.</p> <ol style="list-style-type: none"> 1.2 Describe energy conversion processes within diesel engines, including fuel combustion, heat generation, expansion, and work output. 1.3 Perform troubleshooting using locomotive engineering drawings, wiring diagrams, schematics, and technical specifications for mechanical and electrical subsystems in accordance with OEM and Botswana Railways requirements. 1.4 Perform engineering calculations involving torque, pressure, temperature, current, voltage, and power output. 1.5 Identify and explain the mechanical, electrical, and electronic functions of locomotive components and systems. 1.6 Use basic diagnostic instruments and measuring tools to monitor mechanical and electrical system performance. 1.7 Apply integrated mechanical and electrical engineering principles to routine maintenance, diagnostics, and performance evaluation of locomotive systems. 1.8 Interpret test data and technical specifications to analyse system efficiency and identify performance deviations. 1.9 Demonstrate compliance with safety standards and engineering procedures when working with mechanical and electrical systems. |
| <p>LO2: Diagnose, Service and Repair Locomotive Mechanical and Electrical Systems in line with Manufacturer troubleshooting and maintenance instructions.</p> | <ol style="list-style-type: none"> 2.1 Adhere to principles of fault diagnosis, including failure modes and cause– effect relationships when working on locomotive systems. 2.2 Maintain Standard servicing and repair procedures, including interpretation and use of technical documentation and manufacturer specifications. 2.3 Comply with operational requirements for testing, calibration, and verification of system performance parameters (efficiency, power, and fuel consumption). 2.4 Use diagnostic tools, instruments, and test equipment to identify and analyse electrical and mechanical faults. 2.5 Carry out component repairs or replacements according to manufacturer standards and specifications. 2.6 Measure, calibrate, and record system performance parameters to ensure operational accuracy. 2.7 Verify and document system performance following maintenance or repair activities. 2.8 Select diagnostic methods and maintenance strategies appropriate for different locomotive systems. 2.9 Plan and perform servicing tasks safely and efficiently, selecting appropriate tools, spares, and resources in compliance with technical and safety standards. |

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| | <p>2.10 Apply structured fault-finding and recovery procedures to restore locomotive functionality, analysing test data to identify root causes and corrective actions.</p> |
| <p>LO3: Maintain and overhaul locomotive components by applying approved maintenance procedures in line with railway safety and operational requirements.</p> | <p>3.1 Adhere to and demonstrate understanding of types and principles of locomotive maintenance, including preventive, predictive, and corrective approaches.</p> <p>3.2 Adhere to Procedures and standards for dismantling, inspecting, measuring, and reassembling locomotive assemblies.</p> <p>3.3 Technical and safety requirements governing overhaul operations and documentation.</p> <p>3.4 Use appropriate hand tools, lifting equipment, and measuring instruments safely during dismantling and reassembly.</p> <p>3.5 Dismantle assemblies, inspect and measure components, and determine suitability for reuse or replacement.</p> <p>3.6 Assemble and adjust systems to manufacturer specifications, replacing worn or defective parts where necessary.</p> <p>3.7 Record and validate overhaul results, ensuring documentation is complete and accurate.</p> <p>3.8 Organize and execute overhaul and maintenance activities with minimal supervision, meeting set schedules.</p> <p>3.9 Ensure all overhaul procedures comply with technical, quality, and safety standards.</p> <p>3.10 Verify the accuracy of inspection findings, component replacement decisions, and maintenance documentation.</p> |
| <p>LO4: Integrate Electrical, Pneumatic, and Hydraulic systems with Mechanical systems operation safely.</p> | <p>4.1 Apply knowledge of the interaction and independence of electrical controls, pneumatic braking, mechanical drive systems in locomotive operation for safe operation of rail transport.</p> <p>4.2 Adhere to 601 maintenance instruction, Task code M945, M000-M006 to identify Control signal pathways and data interfaces between sensors, controllers, and actuators in the engine, transmission, braking, and auxiliary systems.</p> <p>4.3 Apply correct sequence and coordination when operating interdependent systems, ensuring system compatibility and performance in compliance with OEM specifications and Botswana Railways maintenance standards.</p> <p>4.4 Diagnose integration issues arising from electrical, pneumatic, hydraulic, or mechanical system interactions. in accordance with approved fault-finding procedures, safety requirements, and OEM technical documentation.</p> <p>4.5 Collaborate effectively with electrical and mechanical teams to ensure system alignment and functional integration after servicing.</p> |

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| | 4.6 Communicate technical findings clearly using industry-standard terminology, diagrams, and structured reporting formats. |
| LO5: Apply Locomotive maintenance Safety, Quality, and Environmental Standards as Per Southern African Railway Association (SARA) standards. | <p>5.1 Demonstrate broad technical knowledge of Botswana Railways and international railway safety codes, standards, and organizational policies.</p> <p>5.2 Apply Principles of occupational health, quality assurance, and environmental management in maintenance operations.</p> <p>5.3 Carry out Hazard identification, risk assessment, and control procedures, including the classification of hazardous materials and use of safety signage in Locomotive workshop.</p> <p>5.4 Handle, store, and dispose of hazardous materials safely and in accordance with environmental standards.</p> <p>5.5 Maintain good housekeeping, personal hygiene, and use appropriate personal protective equipment (PPE) effectively.</p> |
| LO6: Communicate and Collaborate in the Railway Engineering Environment systems in line with railway standards and safety procedures. | <p>6.1 Adhere to and demonstrate knowledge of communication channels, reporting structures, and workplace protocols used in railway operations.</p> <p>6.2 Demonstrate knowledge of key elements and formats of technical documentation, including maintenance reports, job cards, and inspection records.</p> <p>6.3 Apply principles of effective workplace communication, including verbal, written, and non-verbal (symbols, body language) methods.</p> |
| LO7: Apply Supervisory and Planning Skills in Locomotive Maintenance in line with organisational requirements. | <p>7.1 Apply principles of planning, organizing, and coordinating locomotive maintenance activities.</p> <p>7.2 Supervise and monitor team performance to ensure compliance with maintenance and safety standards.</p> <p>7.3 Demonstrate leadership and interpersonal skills that motivate teams and promote discipline and accountability.</p> |
| LO8: Demonstrate Professional work ethics within the rail operations sector. | <p>8.1 Apply organisational policies, codes of conduct, and ethical standards in accordance with rail operations procedures and labour regulations.</p> <p>8.2 Demonstrate personal responsibility for compliance with safety, health, environmental, and quality management systems applicable to rail operations.</p> <p>8.3 Work independently with minimal supervision while adhering to approved rail standards, procedures, and reporting lines.</p> <p>8.4 Communicate work-related information clearly and accurately using approved rail communication channels, reports, and records.</p> |
| LO9: Assist in Locomotive Testing and Commissioning as per original equipment | 9.1 Interpret and apply OEM manuals, technical bulletins, commissioning checklists, and test procedures relevant to the locomotive type and system under test. |

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| manufacturer standards. | <p>9.2 Identify tools, test equipment, consumables, and documentation required for locomotive testing and commissioning activities in accordance with OEM and organisational requirements.</p> <p>9.3 Monitor test parameters, readings, and system responses using approved measuring instruments and diagnostic tools.</p> <p>9.4 Assist in setting up, adjusting, and calibrating locomotive systems during commissioning in line with OEM specifications and tolerances.</p> <p>9.5 Accurately record test results, measurements, and observations using approved OEM and organisational documentation formats.</p> |
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| SECTION C | QUALIFICATION STRUCTURE | | | | |
|---|--|---------------------------------|-----------|-----------|---------------|
| COMPONENT | TITLE | Credits Per Relevant NCQF Level | | | Total Credits |
| | | Level [4] | Level [5] | Level [6] | |
| FUNDAMENTAL COMPONENT <i>Subjects/ Courses/ Modules/Units</i> | Communication in the Workplace | | 6 | | 6 |
| | Mathematical Applications for Engineering | | 6 | | 6 |
| | Occupational Safety, Health, Environment, and Quality (SHEQ) | | 8 | | 8 |
| | | | | | |
| CORE COMPONENT <i>Subjects'/Courses/ Modules/Units</i> | Principles of Locomotive Systems | | 10 | | 10 |
| | Diesel Engine Maintenance and Repair | | 12 | | 12 |
| | Braking and Pneumatic Systems | | 12 | | 12 |
| | Mechanical Maintenance and Repair Systems | | 12 | | 12 |
| | Electrical and Control System Integration | | 12 | | 12 |

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| | System Diagnostics and Fault-Finding | | 10 | | 10 |
| | Workshop Tools, Equipment, and Materials | | 10 | | 10 |
| | Quality Assurance in Maintenance | | 6 | | 6 |
| | Teamwork and Communication in Maintenance | | 6 | | 6 |
| | ICT in Locomotive Maintenance | | 4 | | 4 |
| | Professional Conduct and Ethics | | 6 | | 6 |
| STRANDS/ SPECIALIZATION | <i>Subjects/ Courses/ Modules/Units</i> | Credits Per Relevant NCQF Level | | | Total Credits |
| | | Level [] | Level [] | Level [5] | 120 |
| 1. | <i>N/A</i> | | | | |
| 2. | <i>N/A</i> | | | | |
| Electives | <i>N/A</i> | | | | |

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL

TOTAL CREDITS PER NCQF LEVEL

| NCQF Level | Credit Value |
|----------------------|---------------------|
| • NCQF Level 5 | 120 |
| TOTAL CREDITS | 120 |

Rules of Combination:

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

To complete this qualification candidates must complete 20 credits from fundamental courses and 100 credits from core courses. Total credits to be accumulated should 120 to complete the course and qualify for graduation.

ASSESSMENT ARRANGEMENTS

Formative assessment

Formative assessment or continuous assessment contributing towards the award of credits shall be based on qualification outcomes. This can include tests, assignments, and projects as well as simulated and real work settings. The contribution of formative assessment to the final grade shall be 50%.

Summative assessment

Assessments that make judgments about achievement of a candidate. It is used to provide information about a candidate's level of competence (i.e., pass or fail) on completion of a course or sub-unit in a module, a module or training programme.

Assessment tools and methods for the course shall include among others, tests, questionnaires, Task observations, and checklists. All summative practical assessments shall, as far as possible, be related to real work settings.

Assessors for this qualification must be registered as assessors and moderator with the BQA, qualified or experienced in Locomotive Fitter.

MODERATION ARRANGEMENTS

There shall be provision for internal and external moderation, conducted by persons qualified and having experience in Locomotive Fitter and registered with the BQA.

RECOGNITION OF PRIOR LEARNING

RPL will be applicable for award of credits towards the qualification as per ETP RPL policy guidelines, which are aligned with National RPL policy.

CREDIT ACCUMULATION AND TRANSFER

CAT will be applicable for award of credits towards the qualification as per ETP RPL policy guidelines, which are aligned with National CAT policy.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning Pathways

Horizontal

- Advanced Certificate in Rolling Stock Maintenance
- Certificate level V in Wagon Fitter

Vertical

- Diploma Rail Engineering
- Diploma in Rail Mechanical Engineering
- Diploma in Radio Communications
- Diploma in Mechanical Engineering
- Diploma in Civil Engineering

Employment Pathways

Holders of this qualification may be eligible for jobs including but not limited to:

- Senior Locomotive Technician
- SHED /Maintenance Foreman
- Maintenance Supervisor / Engineer Trainee
- Technical Manager

QUALIFICATION AWARD AND CERTIFICATION

Standards of achievement for the award of the qualification

A candidate is required to achieve 120 credits inclusive of the fundamental and core components, to be awarded the qualification - Certificate V in Locomotive Fitter.

Certification

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

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

INTERNATIONAL BENCHMARK

Certificate III in Rail Infrastructure (Rolling Stock Maintenance) under the Australian Qualifications Framework (AQF Level 3)

REGIONAL BENCHMARK

National Certificate in Railway Rolling Stock Maintenance (Diesel-Electric) under the South African NQF (Level 4).

TITLE

The qualification titles across all two frameworks [Australian Qualifications Framework (AQF Level 3) and South African NQF (Level 4)] reflect a focus on railway rolling stock maintenance and locomotive engineering, while the developed qualification not only focuses on mechanical maintenance but also leadership, supervision, safety management, and diagnostics.

The term “Locomotive Fitter” is internationally equivalent to “Rolling Stock Mechanical Technician” or “Railway Mechanical Maintainer”, emphasizing the same occupational domain. Thus, the titles are comparable in purpose, though terminology varies according to national context and industry structure.

EXIT LEARNING OUTCOMES

The exit outcomes of the developed and benchmarked qualification although the NCQF Level 5 qualification sits higher than both benchmark levels, the scope and expected learner autonomy justify the difference as the graduate to be able to carry out both mechanical and Electrical, Supervise and SHEQ duties.

MODULES AND NQF LEVEL OF THE QUALIFICATION

The two Certificate III in Rail Infrastructure (Rolling Stock Maintenance) is at AQF level 3 whereas the South African qualification National Certificate: Railway Rolling Stock Maintenance (Diesel-Electric) is at NQF level 4. However, the developed qualification is at NCQF Level 5 and carries all core roles of a Locomotive Fitter in addition to supervisory functions. The developed qualification not only mechanical maintenance but also leadership, supervision, safety management, and diagnostics — functions that extend beyond the operational focus of the Australian and South African equivalents.

- AQF Level 3 and SA NQF Level 4 qualifications are positioned at artisan / skilled worker levels with strong emphasis on practical competence under supervision.
- NCQF Level V reflects:
 - Broader technical depth
 - Judgement and responsibility for work outcomes
 - Ability to operate with limited supervision
 - Contribution to continuous improvement and asset reliability

This places the Botswana qualification above the benchmark levels in complexity and autonomy, while remaining within the same occupational family.

DIFFERENCES

- The term “Rolling Stock Maintenance” (Australia and South Africa) describes a functional domain, covering locomotives, wagons, and coaches.
- The term “Locomotive Fitter” (Botswana) specifies a distinct occupational role within that same functional domain, focusing on locomotive systems.
- The use of “Certificate” in Australia and South Africa reflects formal qualification naming conventions, whereas Botswana’s title aligns with artisan trade nomenclature used by industry and regulators.
- The developed qualification reflects greater depth of technical competence, diagnostic responsibility, and autonomy, rather than a mismatch of occupational scope.

ASSESSMENT CRITERIA

The benchmarked qualifications offer an integrated approach to assessments, combining both theory and practical assessments. Further recognizing that assessments must be carried out in the real occupational context or simulated. All the learning outcomes and assessment criteria must be achieved at 80%. The NCQF qualification integrates workplace-based assessment, emphasizing diagnostic reasoning, safety compliance, and quality assurance, making it more advanced than the benchmark levels.

ARTICULATION PATHWAYS

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The Certificate V In Locomotive Fitter supports both **horizontal and vertical articulation**:

Employment pathways

- Rolling Stock Technician
- Wagon / Coach Fitter
- Rail Plant Maintenance Artisan

Vertical articulation:

- Diploma in Railway Engineering / Mechanical Engineering
- Advanced Certificate in Rail Operations or Asset Management

Supervisory or Foreman-level railway qualifications

REVIEW PERIOD

This qualification shall be reviewed every 5 years.

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 | |
| | | | |