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**SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Task Team for

**Maintenance**

registered by Organising Field 06 – Manufacturing, Engineering and Technology publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at [www.saqqa.org.za](http://www.saqqa.org.za). Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and **no later than 23 February 2009**. All correspondence should be marked **Standards Setting – Task Team Maintenance** and addressed to

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ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

**QUALIFICATION:****National Certificate: Diesel Electrical Fitting**

SAQA QUAL ID		QUALIFICATION TITLE	
65129		National Certificate: Diesel Electrical Fitting	
ORIGINATOR		PROVIDER	
Task Team - Maintenance			
QUALIFICATION TYPE	FIELD	SUBFIELD	
National Certificate	6 - Manufacturing, Engineering and Technology	Engineering and Related Design	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	128	Level 2	Regular-Unit Stds Based

***This qualification does not replace any other qualification and is not replaced by another qualification.***

**PURPOSE AND RATIONALE OF THE QUALIFICATION****Purpose:**

The purpose of this Qualification is to equip learners with the standards and learning required to begin working in various industries which use and maintain Diesel and Electrical machines such as locomotives and motor coaches. It will also enable the further development of learners within this environment by providing articulation with higher level learning in this dynamic changing and challenging environment.

The primary knowledge and skills that are provided in this Qualification are the ability to use hand skills in the diesel, diesel electric and electrical fitting environment. Learners will be able to apply basic mechanical and electrical assembly, maintenance and repair fundamentals and to recognise and respond to equipment faults. These capabilities require a basic understanding of diesel and electric machine functioning and maintenance, the concept of measurement and the reading and understanding of basic engineering drawings.

Learners credited with this qualification are able to:

- > Use verbal and written practices to communicate in the workplace and apply mathematical processes to solve everyday numerical problems.
- > Understand and apply diesel fitting, diesel electric fitting and electric fitting technology in a specific environment.
- > Remove and re-install machine sub-components (bearings, lubricators, direct and indirect drives).
- > Repair, re-adjust, reset or re-align the sub-components.
- > Maintain diesel and electric machines in a specific environment.

Qualifying learners will be able to show responsibility and independency and effectively manage themselves in the workplace.

**Rationale:**

This Qualification provides learners with opportunities for professional development and career advancement within the Diesel and Electrical Fitting sector such as Locomotive and Motor Coach Repair and Maintenance. Learners will be able to provide better and more efficient repair and maintenance services to their particular sector. The qualification develops the fundamental competencies required by workers at entry level.

The competencies in this Qualification are applicable to a wide range of industries. This Qualification is the first in a series for learners who want to follow a career in the field of Diesel, Diesel electric and Electric fitting. This Qualification focuses on developing the knowledge and skills and attitudes necessary to function at an entry level and also offers the opportunity for learners to apply what they have learnt in a range of specialized areas. Qualifications at higher levels are designed to develop learners into artisans.

#### **RECOGNIZE PREVIOUS LEARNING?**

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#### **LEARNING ASSUMED IN PLACE**

- > Mathematical Literacy at NQF Level 1.
- > Communication at NQF Level 1.

#### **Recognition of Prior Learning:**

The Qualification can be achieved in whole or part through the Recognition of Prior Learning (RPL). Learners obtaining the whole Qualification through RPL and wishing to be declared competent are required to complete a practical assessment component for the purpose of such recognition. This implies that the Qualification may be granted to learners who have acquired the skills and knowledge without attending formal courses, providing they can demonstrate competence in the outcomes of the individual Unit Standards as required by the Fundamental, Core and Elective components stipulated in the Qualification and by the Exit Level Outcomes.

Learners submitting themselves for RPL should be thoroughly briefed prior to the assessment, and may be required to submit a Portfolio of Evidence (POE) in the prescribed format and/or undergo a workplace assessment to be assessed for formal recognition. While this is primarily a workplace-based Qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the Exit Level Outcomes.

#### **Access to the Qualification:**

- > Access is open to all learners. It is preferable that learners first complete the GETC Level 1 before accessing this Qualification.

#### **QUALIFICATION RULES**

The Qualification is made up of a combination of learning outcomes from Fundamental, Core and Elective components, totalling a minimum of 128 Credits.

#### **Fundamental component:**

- > All unit standards to the value of 36 credits are compulsory.

#### **Core component:**

- > All unit standards to the value of 57 credits are compulsory.

#### **Elective component:**

- > The Elective component consists of a number of Unit Standards from which learners are required to choose a combination totalling a minimum of 35 credits.

Learners wishing to qualify in a Diesel Electric and Electrical Fitting trade in the Locomotive sector are required to complete the following set of Elective Unit Standards:

- > ID 261439: Describe locomotive layout, Level 2, 2 credits.
- > ID 10258: Design and install electric wire ways, Level 3, 8 credits.
- > ID 258997: Install batteries, Level 4, 4 credits.
- > ID 12484: Perform basic fire fighting, Level 2, 4 credits.
- > ID 12483: Perform basic first aid, Level 2, 4 credits.
- > ID 261442: Remove and replace faulty vacuum and/or air brake system components, Level 2, 4 credits.
- > ID 119889: Work to clearance from "live" high-voltage overhead track equipment to perform maintenance work Level 2, 9 credits.

Additional specialisations for other sectors in which Diesel, Diesel Electric and Electric Fitting that are applicable will be added to this Qualification once they are finalised.

#### **EXIT LEVEL OUTCOMES**

1. Use verbal and written practices to communicate in the workplace and apply mathematical processes to solve everyday numerical problems.
2. Understand and apply diesel fitting, diesel electric fitting and electric fitting technology in a specific environment.
3. Maintain machine sub-components.
  - > Range: Maintain includes the remove, re-install, repair, re-adjust, reset or re-align.
  - > Range: Sub-components include bearings, lubricators, direct- and indirect drives.
4. Maintain diesel and electrical machines in a specific environment.

Critical Cross field Outcomes:

Critical cross-field outcomes have been addressed by the exit level outcomes as follows:

- a) Identify and solve problems and make decisions using critical and creative thinking.
  - > Note: The ability of the candidate to identify the type of maintenance required.
- b) Work effectively with others as a member of a team, group, organisation or community.
  - > Note: The ability of the candidate to communicate with peers and supervisors.
- c) Organise and manage themselves and their activities responsibly and effectively.
  - > Note: The ability of the candidate to adhere to workplace timeframes and procedures.
- d) Collect, analyse, organise and critically evaluate information.
  - > Note: The ability of the candidate to identify repair and maintenance defects and act appropriately.
- e) Communicate effectively, using visual, mathematical and/or language skills in the modes of oral and/or written presentations.
  - > Note: The ability of the candidate to report on work conducted.
- f) Use science and technology effectively and critically, showing responsibility towards the environment and health of others.
  - > Note: The ability of the candidate to use the correct tools and equipment to carry out maintenance.

- g) Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.  
> Note: The ability of the candidate to repair items that can safely be repaired and replace those items that cannot be repaired.

**ASSOCIATED ASSESSMENT CRITERIA**

Associated Assessment Criteria for Exit level Outcome 1:

- 1.1 Oral and written c Information from texts, reports and standard operating procedures is practically applied in the workplace in diesel, diesel electric and electric fitting context.
- 1.2 Communications are addressed and responded to in accordance with the relevant workplace requirements.
- 1.3 Numerical conversions, calculations and measurements are performed as required in the workplace.
- 1.4 Health and safety signs are interpreted and explained as required by specific worksites.

Associated Assessment Criteria for Exit level Outcome 2:

- 2.1 The principles of electricity are explained according to internationally accepted definitions.
- 2.2 Engineering drawings are read and interpreted in terms of concepts and materials.
- 2.3 Familiar problems pertaining to diesel and electrical machines and related processes are evaluated and solved.

Associated Assessment Criteria for Exit level Outcome 3:

- 3.1 Safe working practices are adhered to when working with machine sub-components in compliance with health, safety and environmental requirements.
- 3.2 Basic fitting principles are applied to the removal and re-installation of sub-components according to standard operating procedures.
- 3.3 The use of appropriate hand and power tools, machinery and equipment are understood.
- 3.4 Solutions to problems are found based on a clear analysis of information gathered through simple repetitive diagnostic procedures.

Associated Assessment Criteria for Exit level Outcome 4:

- 4.1 The various types of diesel, electric and pneumatic machines are identified for a specific work environment.
- 4.2 Equipment to be used is selected for the maintenance work to be carried out according to worksite procedure.
- 4.3 Routine maintenance procedures are explained as they apply to the machines in a specific work environment.
- 4.4 Maintenance is carried out in terms of specific work instructions.

Integrated Assessment:

Integrated assessment at the level of the qualification provides an opportunity for learners to show they are able to integrate concepts, actions and ideas achieved across a range of unit standards and contexts.

Integrated assessment must evaluate the quality of observable performance as well as the thinking behind the performance, and must be based on a summative assessment guide. The guide will spell out how the assessor will assess different aspects of the performance and will include:

- > Observing the learner at work (both in the primary activity as well as other interactions).
- > Asking questions and initiating short discussions to test understanding.

> Looking at records and reports in the portfolio and reviewing previous assessments.

In some cases inference will be necessary to determine competence depending on the nature and context within which performance takes place.

It is necessary to ensure that the fundamental part of the qualification is also targeted to ensure that while the competence may have been achieved in a particular context, learners are able to apply it in a range of other contexts and for future learning. The assessment should also ensure that all the critical cross-field outcomes have been achieved.

The learner may choose in which language he/she wants to be assessed. This should be established as part of a process of preparing the learner for assessment and familiarising the learner with the approach being taken.

While this is primarily a workplace-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the exit-level outcomes. The assessment process should cover both the explicit tasks required for the qualification as well as the understanding of the concepts and principles that underpin the activities associated with minerals processing.

#### **INTERNATIONAL COMPARABILITY**

The purpose of this International Comparability study is to facilitate the development of a meaningful learning path and its associated curriculum incorporating both theoretical and practical vocational skills which will ensure compatibility, comparability and compliance with existing international qualification specifications and regulations.

This National Certificate was compared with equivalent courses/qualifications from a range of countries. However, Canada is the best country for comparison as their railway industry uses the same type/make of diesel and electrical machines as South Africa. However, other countries were selected because they offer education and training that is also considered international best practice in terms of diesel electric fitting and electric fitting' for diesel and electrical machines. These countries are Australia, United States of America and New Zealand.

It must be noted that in South Africa we have opted for individual Qualifications each of a year in duration. This has been made possible because of the fact that South Africa are using Unit Standards for the development of the Qualifications and this allows for the progression and difficulty to be built in to each individual Unit Standard.

Below are the qualifications/programmes that were used:

Canada:

Railway Association of Canada (RAC) - Career On Track:

Course Title: Railway Car Technician (3 year duration):

- > Interpret engineering drawing to plan maintenance.
- > Perform calculations and measurements.
- > Using manuals.
- > Completing required administration.
- > Using hand, power, pneumatic and hydraulic tools and equipment.
- > Welding techniques.
- > Benchworking practices.
- > Methods and procedures for services and inspecting rail vehicles.
- > Occupational health and safety practices.

Course Title: Diesel Mechanic (3 year duration):

Source: National Learners' Records Database

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- > Understanding mechanics.
- > Diesel engine technology.
- > Diagnose malfunctions using testing equipment.
- > Computer diagnostic tools.
- > Determining repair required.
- > Repairing and replacing defective parts, components using hand and power tools.
- > Testing repaired equipment.
- > Performing maintenance work.

Course Title: Industrial Electrician (4 year duration):

- > Read and interpret drawings, blueprints, schematics and code specifications.
- > Determine layout of industrial electrical installations.
- > Install, examine, replace and repair electrical components.
- > Test electrical and electronic equipments and components.
- > Maintain, repair, install and test a variety of components.
- > Troubleshoot, maintain and repair electrical and electronic control systems.
- > Conduct preventative maintenance.

Course Title: Industrial machinist (4 year duration):

- > Read and interpret engineering drawings, blueprints, charts and tables.
- > Set-up, operate and maintain a variety of machine tools.
- > Make or modify parts and products with precise dimensions.
- > Fit and assemble machined metal parts and subassemblies using hand and power tools.
- > Using precision measuring instruments.
- > Reporting deviations from specifications and tolerances.
- > Completing administration and reports.

Course Title: Sheet Metal Worker (3 year duration):

- > Read and interpret engineering and architectural drawings.
- > Develop patterns for sheet metal using CAD software.
- > Measure and mark sheet metal.
- > Operate light metalworking machines.
- > Operate computerised or plasma cutting equipment.
- > Install and use rigging and hoisting equipment.
- > Fit and join metal parts using specialised equipment.
- > Fabricate, assemble, install and repair sheet metal products.
- > Inspect product quality.
- > Inspect installation.

Course Title: Pipe Fitter (4 year duration):

- > Read and interpret drawings, blueprints and code specifications.
- > Determine type of pipe and tools use.
- > Lay-out and plan sequence of tasks.
- > Cut openings for pipe using hand and power tools and machines.
- > Measure, cut, bend and thread pipe using hand and power tools.
- > Join sections of piping system using a variety of methods.
- > Install supports, valves, piping and control systems.
- > Use testing equipment.
- > Clean and maintain pipe units.
- > Replace worn components in pipe units.

The above courses are far more compatible with the South African Qualification as they cover far more than just diesel electrical repair and maintenance of the diesel electrical machines. The modules however are much broader than this qualification by offering far more comprehensive issues, and are run over three to four years each.

Australia:

Fitzpatrick Rail Services:

Course Title: Locomotive Familiarisation:

Major Components - Above Deck:

- > Cooling fan.
- > Radiators.
- > Shutters.
- > Expansion tank and sight glass.
- > Oil filter housing.
- > Fuel pumps and filters.
- > Air compressor and governor.
- > Engine protective devices.
- > Diesel engine.
- > Generator.

Major Components - Below Deck:

- > Coupler and draft gear.
- > Trucks.
- > Sanders.
- > Brakes and rigging.
- > Fuel tank.
- > Main reservoirs.
- > Radio.

Understanding the Cab:

- > Throttle.
- > Reverser.
- > Load meter.
- > Automatic brake.
- > Independent brake.
- > Air gages and switches.
- > Warning lights.

The above course only covers a small section of our Qualification in that some of its content is covered in a single Unit Standard in the South African one.

United States of America:

National Academy of Railroad Sciences (NARS):

Course Title: Locomotive Engineer:

- > Safety and general operating skills.



- > Locomotive diesel power plants.
- > Air brake and locomotive electrical equipment.
- > On-board computerised systems.
- > Train handling rules.
- > Unusual events.
- > Hazardous materials transport.

This course does not compare well with the South African one as it covers more issues around the operating skills and the driving of locomotives as opposed to their repair and maintenance. Only the sections on the diesel power plant and air brakes involve some form of repair and maintenance.

Course Title: Mechanical:

- > Air brake operations, testing and repair.
- > Freight car inspection, testing and repair.
- > Electrical system design, diagnostics and repair on most models of locomotives.
- > Operation, maintenance and repair of diesel engines.
- > Remote control operations, diagnostics and repair.
- > Federal Railway Administration Regulations.

The above course is far more compatible with the South African Qualifications as its focus is more on the repair and maintenance of the locomotive. These modules however are much broader than this qualification by offering far more comprehensive issues. NARS also offer some learning on the operation of the locomotive which are not part of this qualification.

Okefenokee Technical College - Georgia:

Course Title: Locomotive Electrical Systems:

- > MAT 103 Algebraic concepts.
- > SCT 100 Introduction to microcomputers.
- > IFC 100 Industrial safety procedures.
- > IFC 101 Direct current circuits I.
- > IFC 102 Alternating current I.
- > IDS 103 Industrial wiring.
- > ADM 103 Basic engine theory.
- > IFC 103 Solid state devices I.
- > ELC 110 Alternating current II.
- > IDS 105 DC and AC motors.
- > IDS 110 Fundamentals of motor control.
- > IDS 113 Magnetic starters and braking.
- > RRI 101 Introduction to the rail industry.
- > RRE 101 Locomotive electrical systems.

Course Title: Locomotive Mechanical Systems:

- > MAT 101 General maths.
- > SCT 100 Introduction to microcomputers.
- > ADM 103 Basic engine theory.
- > ELC 152 Prep electronics training I.
- > IFC 100 Industrial safety procedures.
- > IDS 215 Industrial mechanics.
- > IDS 221 Industrial fluid power.
- > IDS 231 Pumps and piping systems.

- > WLD 103 Blueprint reading for welders I.
- > WLD 108 Blueprint for readers II.
- > WLD 133 Metal welding and cutting techniques.
- > RRI101 Introduction to the rail industry.
- > RRE 101 Locomotive electric systems.

Keeping Track - Railroad Consulting and Training - Texas:

Course Title: Re-Certification for Locomotive Engineers:

- > Operating rules, drugs and alcohol in the workplace.
- > Your operating rules, safety rules, FRA rules.
- > The locomotive: mechanical, electrical.
- > The locomotive: air brake and operation.
- > Tests evaluations, train handling.

Course Title: Re-Certification for Locomotive Engineers Currently Working as an Engineer:

- > The railroad: what it is and what it does computerised.
- > The role of operating rules for this railroad.
- > The role of operating rules, safety rules, FRA laws.
- > Safety rules, equipment and committee formation.
- > The locomotives on your railroad, construction.
- > Fundamental of locomotive air brakes.
- > Locomotive, diesel engine, governor, lube, fuel oil.
- > Locomotive, electrical, nomenclature, starting.
- > Battery, transition, load regulator, main generator controller and trouble shooting.
- > Final testing, evaluation and train handling.
- > Operation evaluation, safety and rules compliance.

Course Title: Operating Supervisors: VP, GM, Ex Railroad Professionals:

- > Operating rules for the railroad.
- > Operating rules, safety rules, the safety committee.
- > Adopting and discussing operating and safety rules.
- > Special instructions, employee timetable pro and con.
- > Dispatcher, more than one train out at a time, bulletins, track warrant, operational suggestions, the FRA today.
- > Road trip with instructor to put items discussed into effect as long as it takes.
- > Locomotives of your railroad, construction, trucks, carbody, couplers draft gear mechanical, diesel engine.
- > Fuel, lube oil systems, cooling system, the governor.
- > Locomotive electric's, traction motors, main generator.
- > Aux, gen, batteries, starting, load regulator, contractors relays, the controller and trouble shooting.
- > The locomotive and car air brake, review.
- > AAR interchange rules and car construction.
- > Being a leader-supervising people.
- > The role of the hearing officer.
- > Investigations, discipline and procedures.
- > The union and the local chairman.
- > Locomotive operation and evaluation.
- > Surprise testing and evaluations of your employees, proper equipment.
- > Drug and alcohol testing, tests taken.
- > Testing and evaluation review.

**Course Title: Machinery:**

- > General nomenclature of the diesel-electric locomotive, this course is made for the locomotives operated by your railroad or any other builder (Alco, Fairbanks-Morse, EMD, GE, Lima, Baldwin and any others) or models that you specify.
- > The diesel engine and its components: complete cooling, fuel, and lubricating systems.
- > The diesel engine governor (Woodward) and the load regulator.
- > Trucks, wheels, axles and suspension bearings.
- > Couplers and draft gears.
- > Basic electricity.
- > Electrical system: relays, contractors, control air, electromagnetic contractors, ganged control contractors, wiring, main generator, auxiliary generators, alternators, SCRs, controller, dynamic brakes.
- > Radio control of slave units.
- > Cab signals and train control.
- > Passenger: head end power and blended brake.

**Course Title: Air Brakes:**

- > History and development of braking systems.
- > Complete computerised air brake course including brake tests and train handling.
- > Locomotive air brakes: number 6, 24RL or 26L, and the independent brake.
- > Freight car air brakes AB, ABD, ABDW, ABDWX.
- > Heavy passenger air brakes UC, 24, 26.
- > Light rail braking.
- > Dynamic braking, extended range.
- > Blended braking and graduated release.
- > The air compressor and its operation.
- > Train control: why you need it and how it works.
- > The different overspeeds and the P2A.
- > Disk and shoe brakes.
- > Car and truck mounted brake rigging and equipment.
- > Alertors and their operation.

**Union Pacific:****Course Title: Diesel Mechanic (Mechanical: Locomotive):**

- > Conduct Inspections of Locomotive Electrical Systems. Perform daily and periodic locomotive and diesel engine inspections in compliance with company, industry and federal standards; inspect various mechanical systems (air brake, fuel, and lubrication) and locomotive components (wheels, trucks, cab, and internal diesel engine parts); inspect for unusual sounds, vibrations, smells, and small changes in the visual appearance of materials or objects.
- > Troubleshoot Malfunctions. Diagnose malfunctions in diesel engine components, air equipment, trucks, and other components; assess nature of problem and determine needed corrective action; make judgments concerning seriousness of defects or damage.
- > Perform Maintenance And Repair. Perform daily and periodic locomotive servicing (grease couplings and fittings, change oil and air filters, replace brake shoes and filters, adjust brake cylinder piston travel); replace locomotive and diesel engine components (wheels on trucks, traction motors); repair locomotive parts (cracked engine blocks, truck frames) requiring use of machine tools and welding equipment; re-bore and hone cylinders and other operations requiring use of lathes, grinders; disassemble engine and other components and clean parts.

> Work With Shop Machines And Tools. Safely and effectively operate the following: high and low precision measuring instruments (micrometers, tape measures, dial callipers); precision machines (drill and punch presses, bench lathes); electric, pneumatic and hydraulic tools (drills, wrenches, grinders); material handling equipment (fork lifts, cranes, overhead hoists); acetylene torches and electric welders.

> Practice Safe Work Habits. Follow company and federal safety rules, policy, and procedures; wear prescribed safety apparel; take appropriate action when conditions threaten safety of crew or other personnel; read and comply with train orders, signals, railroad rules, and regulation.

The above journeyman programme does not compare well with this level two Qualification as it covers the whole diesel mechanic apprenticeship and the issues around the skills of inspection, repair and maintenance of the engine and mechanical components on diesel electric locomotives. All of these subject will however be covered over the three Qualifications, at Levels 2, 3 and 4 if learners select the specialisation on Diesel Electric Fitting.

Course Title: Diesel Electrician (Electrical: Locomotive):

- > Perform, with use of blueprints, schematics, and location circuit plans, scheduled electrical inspections of various components and inspection and test of circuitry.
- > Ensure that all signals, lights, and other safety appliances used for protection are properly displayed and used.
- > Understand and follow company and industry safety rules, practices, and procedures.
- > Diagnose electrical malfunctions in locomotive control circuits and components, assess the nature of problems, and determine corrective action needed.
- > Perform maintenance and repair of electrical components in locomotive cabs or electrical compartments and perform maintenance for miscellaneous equipment using blueprints, schematics, and location circuit plans.
- > Work with shop machines and tools.
- > Plan and coordinate work activities, determine equipment needs, and develop sequences of steps to get work completed.
- > Read, interpret, and understand written or electronic information, maintain the information, and compile reports.
- > Communicate with others, verbally and in writing, technical information, job procedure recommendations, and other work-related information.
- > Detect and interpret visual colour signals and displays at near and far distances, identify alterations of objects (size, shape, temperature), detect unusual sounds and smells during inspections and tests (leaks in air systems), use depth perception to judge speed and distance of locomotives being moved on service area, and listen to detect warning signals.

The above journeyman programme does not compare well with this level two Qualification as it covers the whole diesel electrician apprenticeship and the issues around the skills of inspection, repair and maintenance of the electrical components on diesel electric machines. All of these subject will however be covered over the three Qualifications at Levels 2, 3 and 4 depending on the specialisation chosen by the learner.

New Zealand:

New Zealand Qualifications Authority (NZQA):

Course Title: National Certificate in Rail Operations (Locomotive Engineer) - Level 3 or 4:

Core Standards:

- > ID 3271 - Suppress fire with hand extinguishers and fixed hose reels Level 2 - 1 credit.
- > ID 548 - Plan to manage personal use of alcohol and other drugs - Level 1 - 2 credits.

- > ID 12355 - Demonstrate knowledge of stress and ways of dealing with it - Level - 2 - 2 credits.
- > ID 4249 - Demonstrate care and timeliness as an employee - Level 1 - 3 credits.
- > ID 16688 - Identify and manage the effects of shift work - Level 2 - 2 credits.
- > ID 497 - Protect health and safety in the workplace - Level 1 - 1 credit.
- > ID 17593 - Apply safe work practices in the workplace - Level 2 - 4 credits.
- > ID 1277 - Communicate information in a specified workplace - Level 2 - 3 credits.
- > ID 9705 - Give and receive feedback - Level 3 - 3 credits.
- > ID 1279 - Write in plain English - Level 3 - 2 credits.
- > ID 3490 - Write an incident report - Level 1 - 3 credits.
- > ID 18864 - Demonstrate basic knowledge of railway signals - Level 2 - 4 credits.
- > ID 19392 - Demonstrate knowledge of rail transport in New Zealand - Level 2 - 5 credits.
- > ID 19286 - Demonstrate an advanced knowledge of railway signals - Level 4 - 15 credits.
- > ID 19287 - Demonstrate knowledge of the Centralised Traffic Control (CTC) system - Level 4 - 5 credits.
- > ID 19387 - Haul a freight train on a network route using a main line locomotive - Level 4 - 25 credits.

#### Elective Standards

- > ID 19394 - Demonstrate knowledge of a track warrant control (TWC) system - Level 4 - 6 credits.
- > ID 19395 - Demonstrate knowledge of a single line automatic signalling system - Level 4 - 5 credits.
- > ID 19396 - Demonstrate knowledge of double line automatic signalling system - Level 4 - 5 credits.
- > ID 6401 - Provide first aid - Level 2 - 1 credit.
- > ID 6402 - Provide resuscitation at level 2 - Level 1 - 1 credit.
- > ID 18869 - Demonstrate basic knowledge of electric overhead traction systems - Level 2 - 2 credits.
- > ID 18863 - Service and operate a diesel-electric shunt class locomotive - Level 3 - 5 credits.
- > ID 18865 - Operate hand points within a railway system - Level 2 - 1 credit.
- > ID 18866 - Perform manual operation of lever-type motor points - Level 2 - 2 credits.
- > ID 18867 - Perform manual operation of crank-handle type motor points - Level 2 - 2 credits.
- > ID 18868 - Operate a two-way radio within a rail system - level 2 - 2 credits.
- > ID 18870 - Service and operate a diesel-electric main line locomotive - Level 3 - 5 credits.
- > ID 18871 - Service and operate a diesel shunt class locomotive - Level 3 - 4 credits.
- > ID 18872 - Move rail service vehicles using a shunt class or main line locomotive within yard limits - Level 3 - 4 credits.
- > ID 18873 - Service and operate an electric main line locomotive - Level 3 - 5 credits.
- > ID 19281 - Perform core stationary shunting duties - Level 2 - 2 credits.
- > ID 19282 - Perform freight and passenger train shunting duties - Level 3 - 8 credits.
- > ID 19283 - Perform freight train inspection - Level 3 - 10 credits.
- > ID 19288 - Demonstrate knowledge of shunting terms, commands, and hand signals - Level 2 - 2 credits.
- > ID 19388 - Haul a passenger train on a network route using a main line locomotive - Level 4 - 15 credits.
- > ID 16802 - Protect people in situations of danger - Level 3 - 6 credits.
- > ID 19284 - Perform passenger train inspection - Level 3 - 8 credits.
- > ID 19384 - Operate a diesel-mechanical railcar on a main line managed by a network operator - Level 4 - 10 credits.
- > ID 19386 - Operate an electric multiple-unit on a main line managed by a network operator - Level 4 - 10 credits.
- > ID 19390 - Operate a diesel-electric railcar on a main line managed by a network operator - Level 4 - 10 credits.
- > ID 16802 - Protect people in situations of danger - Level 3 - 6 credits.

**Conclusion:**

Some of the above qualifications and learning programmes do not compare well with this level two Qualification, as they cover the whole diesel mechanic apprenticeship and the issues around the skills of inspection, repair and maintenance of the engine and mechanical components on diesel electric locomotives. They focus more on the operations of a locomotive as opposed to its repair and maintenance with strands in signalling/track control and railcar operation.

**ARTICULATION OPTIONS**

Horizontal articulation is possible with:

- > ID 49773: National Certificate: Construction and Maintenance of Overhead Track Equipment, NQF Level 2.
- > ID 63789: National Certificate: Electrical Engineering, NQF Level 2.
- > ID 58269: National Certificate: Electro-Mechanics, NQF Level 2.
- > ID 59689: National Certificate: Mechanical Engineering, NQF Level 2.

Vertical articulation is possible with:

- > ID 50020: National Certificate: Construction and Maintenance of Overhead Track Equipment, NQF Level 3.
- > ID 63790: National Certificate: Electrical Engineering, NQF Level 3.
- > ID 59669: National Certificate: Mechanical Engineering: Fitting, NQF Level 3.
- > ID 59750: National Certificate: Mechanical Engineering: Pipe Fitting, NQF Level 3.

**MODERATION OPTIONS**

- > Anyone assessing a learner or moderating the assessment of a learner against the qualification must be registered as an assessor with the relevant Education, Training, Quality, Assurance (ETQA) Body, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.
- > Any institution offering learning that will enable the achievement of this qualification must be accredited as a provider with the relevant Education, Training, Quality, Assurance (ETQA) Body, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.
- > Assessment and moderation of assessment will be overseen by the relevant Education, Training, Quality, Assurance (ETQA) Body, or by an ETQA that has a Memorandum of Understanding with the relevant ETQA, according to the ETQA's policies and guidelines for assessment and moderation.
- > Moderation must include both internal and external moderation of assessments, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described in the associated unit standards.
- > Anyone wishing to be assessed against this qualification may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

**CRITERIA FOR THE REGISTRATION OF ASSESSORS**

For an applicant to register as an assessor, the applicant should:

- > Be registered as an assessor with the relevant ETQA.
- > Be in possession of a relevant Qualification at NQF Level 3 or higher.

**NOTES**

N/A

**UNIT STANDARDS**

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119463	Access and use information from texts	Level 2	5
Fundamental	9009	Apply basic knowledge of statistics and probability to influence the use of data and procedures in order to investigate life related problems	Level 2	3
Fundamental	7480	Demonstrate understanding of rational and irrational numbers and number systems	Level 2	3
Fundamental	9008	Identify, describe, compare, classify, explore shape and motion in 2-and 3-dimensional shapes in different contexts	Level 2	3
Fundamental	119454	Maintain and adapt oral/signed communication	Level 2	5
Fundamental	119460	Use language and communication in occupational learning programmes	Level 2	5
Fundamental	7469	Use mathematics to investigate and monitor the financial aspects of personal and community life	Level 2	2
Fundamental	9007	Work with a range of patterns and functions and solve problems	Level 2	5
Fundamental	119456	Write/present for a defined context	Level 2	5
Core	9964	Apply health and safety to a work area	Level 2	3
Core	114605	Carry out soldering and de-soldering procedures	Level 2	3
Core	11954	Design and construct a single phase circuit	Level 2	5
Core	10784	Grind steel by means of a pedestal / bench grinding machine	Level 2	2
Core	258918	Select, use and care for electrical measuring and testing instruments	Level 2	4
Core	119744	Select, use and care for engineering hand tools	Level 2	8
Core	12476	Select, use and care for engineering measuring equipment	Level 2	4
Core	12219	Select, use and care for engineering power tools	Level 2	6
Core	258967	Understand fundamentals of electricity	Level 2	8
Core	13283	Maintain bearings in machines and equipment	Level 3	8
Core	13280	Maintain direct drives	Level 3	6
Elective	254357	Bend a pipe by means of a hydraulic pipe bender	Level 2	2
Elective	243069	Braze metals using the oxy-fuel brazing process	Level 2	6
Elective	253496	Cut screw threads and install threaded pipe systems	Level 2	4
Elective	261439	Demonstrate knowledge of locomotive layout	Level 2	2
Elective	12466	Explain the individual's role within business	Level 2	4
Elective	12484	Perform basic fire fighting	Level 2	4
Elective	12483	Perform basic first aid	Level 2	4
Elective	261442	Remove and replace faulty vacuum and/or air brake system components	Level 2	4
Elective	119889	Work to clearance from "live" high-voltage overhead track equipment to perform maintenance work	Level 2	9
Elective	10258	Design and Install Electrical Wire Ways	Level 3	8
Elective	258997	Install batteries	Level 3	4

**LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION****None**



## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

## UNIT STANDARD:

*Demonstrate knowledge of locomotive layout*

SAQA US ID		UNIT STANDARD TITLE	
261439		Demonstrate knowledge of locomotive layout	
ORIGINATOR		PROVIDER	
Task Team - Maintenance			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 2	2

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Differentiate between various types of locomotives.

**SPECIFIC OUTCOME 2**

Identify the various systems of the locomotives.

**SPECIFIC OUTCOME 3**

Explain the instrumentation of locomotives.

**SPECIFIC OUTCOME 4**

Explain the purpose of locomotive control handles.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	65129	National Certificate: Diesel Electrical Fitter	Level 2





## SOUTH AFRICAN QUALIFICATIONS AUTHORITY

## UNIT STANDARD:

*Remove and replace faulty vacuum and/or air brake system components*

SAQA US ID	UNIT STANDARD TITLE		
261442	Remove and replace faulty vacuum and/or air brake system components		
ORIGINATOR		PROVIDER	
Task Team - Maintenance			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Engineering and Related Design	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 2	4

*This unit standard does not replace any other unit standard and is not replaced by another unit standard.*

**SPECIFIC OUTCOME 1**

Prepare for the removal and replacement of faulty vacuum and/or air brake system components.

**SPECIFIC OUTCOME 2**

Remove and replace faulty vacuum and/or air brake system components.

**SPECIFIC OUTCOME 3**

Finalise the removal and replacement procedure.

**QUALIFICATIONS UTILISING THIS UNIT STANDARD**

	ID	QUALIFICATION TITLE	LEVEL
Elective	65129	National Certificate: Diesel Electrical Fitter	Level 2