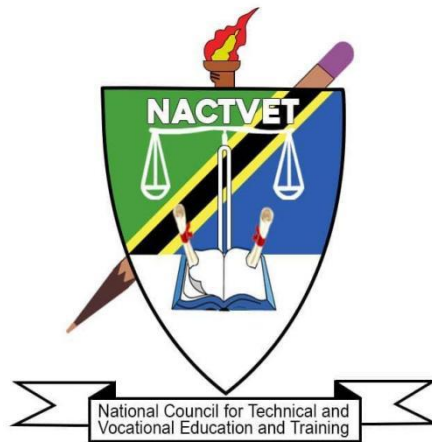


**THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND
TRAINING**



OCCUPATIONAL STANDARDS

**OCCUPATION: RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE
ENGINEER**

LEVEL: NTA LEVEL 7

FEBRUARY 2024

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ABBREVIATIONS

APU	Auxiliary Power Unit
BCU	Braking Control Unit
CIR	Cab Integrated Radio
CTCS	Chinese Train Control System
CBET	Competency Based Education and Training
CCU	Central Control Unit
CI	Traction Inverter
EBV	Electronic Brake Valve
HVB	Main Circuit Breaker
LCDM	Liquid Crystal Display Module
LBJ	Train Protection Alarm Equipment (Lieche Baohu Jingbao)
LKJ	Train Operation Monitoring and Recording Device (Lieche Jiankong Jilu)
MOPP	Maintenance Operation Processes and Procedures
MVB	Multifunction Vehicle Bus
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
PLC	Programmable Logic Controller
PPE	Personal Protective Equipment

PWM	Pulse Width Modulation
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training
VVVF	Variable Voltage Variable Frequency
WTB	Wire Train Bus

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a

composite of three completely interdependent components: cognitive, affective, and psychomotor.

Standards:	A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0 INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status, with a high level of human development. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical and Vocational Education and Training (NACTVET) has begun the job of drafting Occupational Standards (OS) that will eventually be adopted as National Occupational Standards (NOS) for use in the delivery of TET that meets the needs of the labour market and the country's economic agenda.

Occupational Standards (OS) are performance criteria that are matched with labour market demands. Each of them describes the functions, performance standards, and understanding or knowledge underpinning a given occupation. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruitment, supervision, and appraisal, as well as TET Standards. They are also helpful for benchmarking and harmonizing job qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current, and consistent in application across all public and private institutions.

However, it must be noted that Occupational Standards are different from Training /Education Standards. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical circuits, performs Maintenance in electrical circuits, etc.), and are usually defined by Employers following procedures as agreed upon by all the stakeholders. On the other hand, Training and Education Standards are developed from the activities defined in the occupational standards, and they specify learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him/her to function at an agreed level in an occupation. Training and Education Standards are used to define curricula in training institutions. It is critical, however, to establish a direct link between the occupational standards and the training standards for both of them to respond collaboratively to the demands of the labour market.

For the purpose of TET delivery, Tanzania has adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing competency-based training (CBET) programmes. Therefore, it is quite pertinent for TET institutions to use the relevant occupational standards as a benchmark for formulating their curricula.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training. The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0 OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The process of developing these Occupational Standards involved both local and international expertise. The process began with an examination of major documents that guide Tanzanian skills development including the *10-year National Skills Development Strategy (2016-2026)*. NACTVET labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a team of experts in consultation with practitioners developed draft occupational standards. The draft document was used to develop an occupational profile for each occupation (DACUM Chart), which is attached as an **Appendix** to every Occupational Standard.

The draft occupational standards will be validated during stakeholders' forum. The information from stakeholders' forum will provide insight from the workplaces and professional bodies regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation.

3.0 THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEERS

These standards cover a broad range of duties and tasks that can be performed by a Railway Locomotive Operation and Maintenance Engineer. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill

levels and knowledge for the technician in specific settings or positions. The Locomotive Engineering Technician may perform tasks in a number of key areas of the Occupational Standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Railway Locomotive Operation and Maintenance Engineer operates, inspects, maintains, and repairs railway locomotives under the supervision of an engineer. The technician is able to handle unusual situations on the circuit that are encountered by railway locomotives during crew operations; while in the workshop, the technician completes inspections and maintenance, and is able to deal with faults in the locomotive's running gear, braking system, traction transmission system and running safety devices.

Generally, the Railway Locomotive Operation and Maintenance Engineer performs the following responsibilities:

- a) Maintenance of locomotive running gears
- b) Maintenance of locomotive braking systems
- c) Maintenance of locomotive transmission systems
- d) Maintenance of running safety devices
- e) Handling of abnormal running

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA level 7 and 8.

4.0 VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0 OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER - NTA LEVEL 7

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE OF LOCOMOTIVE RUNNING COMPONENTS	DUTY NO.	701
TASK TITLE	CONDUCT MAINTENANCE OF LOCOMOTIVE FRAMES AND ACCESSORY COMPONENTS	TASK NO.	7011
PERFORMANCE CRITERIA	The person performing this task must be able to maintain the locomotive superstructure bogie, and accessory components in accordance with approved technical specifications and manufacturer's manual instructions.		
RANGE STATEMENT	The task can be performed in the locomotive overhaul workshop under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Underfloor lifting machines; 2. Overhead cranes; 3. Specialized turning machines and tools; 4. Specialized cleaning equipment; 5. Press machines; 6. Rail flat cars; 7. Flaw detection equipment; 8. Gas (electric) welding equipment; 9. Platforms; 10. Steel rulers; 11. Flashlights; 12. Checking hammers. 13. Safety gear 14. Work bench 15. Computer with accessories.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Inspect the bogie frame; 3. Inspect accessory components;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Inspect the bogie frame; 1.2 Inspect accessory components;	

4. Establish the dimensions of each component; 5. Perform manual decontamination; 6. Perform structural flaw detection; 7. Record fault information; 8. Analyze the cause of faults; 9. Perform repair work such as welding, straightening, and cutting; 10. Make anti-slowdown markings; 11. Observe health and safety regulations; 12. Clean tools, equipment and the workplace; 13. Store tools, equipment and safety gear.	1.3 Inspect the dimensions of each component; 1.4 Perform manual decontamination; 1.5 Perform structural flaw detection; 1.6 Perform repair work such as welding, straightening, and cutting; 1.7 Make anti-slowdown markings. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of inspecting locomotive frames and accessory components. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Classification, composition and technical parameter requirements of locomotive frames; 3.2 Composition and technical parameter requirements of accessory components; 3.3 Fault analysis and treatment of locomotive frames and accessory components; 3.4 Usage of proper tools and equipment. 4.0 Essential Skills 4.1 Communication skills; 4.2 Computer skills; 4.3 Data analysis skills; 4.4 Standardized operation skills; 4.5 Teamwork skills; 4.6 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and MAINTENANCE of locomotive frames and accessory components are performed in accordance with the railway locomotive maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating machines and tools; 2. Safety operation of detection equipment; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE OF LOCOMOTIVE RUNNING COMPONENTS	DUTY NO.	701
TASK TITLE	CARRY OUT MAINTENANCE OF LOCOMOTIVE WHEEL PAIRS	TASK NO.	7012
PERFORMANCE CRITERIA	The person performing this task must be able to troubleshoot the locomotive wheel pairs in accordance with technical requirements and manufacturer's manual specifications.		
RANGE STATEMENT	The task can be performed in the locomotive overhaul workshop under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Underfloor wheel lathes; 2. Wheel lathes; 3. Ultrasonic flaw detectors; 4. Electromagnetic flaw detectors; 5. Angle grinders; 6. Checkers; 7. Specialized measuring tools for wheel diameters; 8. Inside gauges; 9. Taper gages; 10. Boring machines; 11. Flashlights; 12. Checking hammers; 13 Fitter’s complete tool kit.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Inspect the wheel pairs; 3. Establish the dimensions of each component; 4. Perform flaw detection for wheel pairs; 5. Record fault information; 6. Analyze the cause of faults; 7. Perform rotary repair of wheels; 8. Replace the wheel hub;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Inspect the wheel pairs; 1.2 Inspect the dimensions of each component; 1.3 Perform flaw detection for wheel pairs; 1.4 Perform rotary repair of wheels; 1.5 Replace the wheel hub. 2.0 Principles The person performing this task must be able to explain the following principles:	

9. Make anti-slowdown markings; 10. Observe safety regulations; 11. Clean tool, equipment and the workplace; 12. Store the tools, equipment and safety gear; 13. Inspect wick lubricator and earring cap bolt from any abnormal conditions; 14. Inspect level of oil in traction motor suspension bearing for abnormality; 15. Inspect the level of crator compound .	2.1 Working principles of locomotive wheel pairs. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Inspection procedures for locomotive wheel pairs; 3.2 Assembly and technical parameter requirements for locomotive wheel pairs; 3.3 Fault analysis and treatment plan for locomotive wheel pairs; 3.4 Usage of proper tools and equipment. 4.0 Essential Skills 4.1 Communication skills; 4.2 Computer skills; 4.3 Standardized operation skills; 4.4 Teamwork skills; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and maintenance of locomotive wheel pairs are performed in accordance with the railway locomotive maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating machines and tools; 2. Safety operation of detection equipment; 3. Occupational health and safety; 4. Fault analysis and treatment; 5. Waste disposal methods.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE OF LOCOMOTIVE RUNNING COMPONNTS	DUTY NO.	701
TASK TITLE	CONDUCT MAINTENANCE OF LOCOMOTIVE DRIVING DEVICES	TASK NO.	7013
PERFORMANCE CRITERIA	The person performing this task must be able to troubleshoot the locomotive driving devices in accordance with technical requirements and manufacturer's manual specifications.		
RANGE STATEMENT	The task can be performed in the locomotive overhaul workshop under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Magnetic particle flaw detectors; 2. Angle grinders; 3. Wheel hub thickness gauges; 4. Wheel pair inside gauges; 5. Oiling and press-mounting equipment for wheel pairs; 6. Specialized equipment and instruments for installing and disassembling bearing units; 7. Fitter’s complete tool kit 8. Torque wrenches and sockets; 9. Overhead cranes; 10. Flashlights; 11. Checking hammers 12. Safety gear; 13. Work bench; 14. Computer with accessories		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Inspect the driving device; 3. Establish the dimensions of each component; 4. Supplement or replace the gearbox oil; 5. Clean the magnetic plug; 6. Perform magnetic particle flaw		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Inspect the driving device; 1.2 Inspect the dimensions of each component; 1.3 Supplement or replace the gearbox oil; 1.4 Clean the magnetic plug; 1.5 Perform magnetic particle flaw detection; 1.6 Perform polishing;	

detection; 7. Record fault information; 8. Analyze the cause of faults; 9. Perform polishing; 10. Perform welding repair; 11. Make anti-slowdown markings; 12. Observe health and safety regulations; 13. Clean tools, equipment and the workplace; 14. Store the tools, equipment and safety gear.	1.7 Perform the welding repair; 1.8 Make anti-slowdown markings. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of performing inspections for locomotive driving devices. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Inspection procedures for locomotive driving devices; 3.2 Types, assembly and technical parameter requirements of locomotive driving devices; 3.3 Fault analysis and treatment of locomotive driving devices; 3.4 Usage of proper tools and equipment; 3.5 The importance of using the proper gear oil. 4.0 Essential Skills 4.1 Communication skills; 4.2 Computer skills; 4.3 Data analysis skills; 4.4 Standardized operation skills; 4.5 Teamwork skills; 4.6 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and maintenance of locomotive driving devices are performed in accordance with the railway locomotive maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating machines and tools; 2. Safety operation of detection equipment; 3. Occupational health and safety; 4. Fault analysis and treatment; 5. Waste disposal methods.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE OF LOCOMOTIVE RUNNING GEARS	DUTY NO.	701
TASK TITLE	CARRY OUT MAINTENANCE OF LOCOMOTIVE TRACTION DEVICES	TASK NO.	7014
PERFORMANCE CRITERIA	The person performing this task must be able to troubleshoot the locomotive traction devices in accordance with technical specifications and manufacturer's manual specifications.		
RANGE STATEMENT	The task can be performed in the locomotive overhaul workshop under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Magnetic particle flaw detectors; 2. Drawbar removal trolleys; 3. Overhaul platforms; 4. Press machines; 5. Fitter's complete tool kit 6. Torque wrenches with sockets; 7. Jacks; 8. Hammers; 9. Crowbars; 10. Gas (electric) welding equipment; 11. Specialized lifting trolleys; 12. Oil presses; 13. Coupler overhauling platforms; 14. Slings; 15. Hand emery wheels; 16. Cotter pins for disassembly and assembly; 17. Coupler inspection template rules; 18. Coupler height measuring gauges; 19. Wire brushes; 20. Brushes; 21. Vernier calipers; 22. Inside and outside calipers; 23. Steel rulers; 24. Flashlights; 25. Checking hammers. 26. Safety gear 27. Computer with accessories		

28. Work bench	
EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Inspect drawbar devices; 3. Inspect traction buffer devices; 4. Establish the dimensions of each component; 5. Perform magnetic particle flaw detection; 6. Record fault information; 7. Analyze the cause of faults; 8. Clean assembly surfaces; 9. Grease assembly surfaces; 10. Perform welding repair; 11. Make anti-slowdown markings; 12. Observe safety regulations; 13. Clean tools, equipment and the workplace; 14. Store the tools and equipment and safety gear.	Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Inspect drawbar devices; 1.2 Inspect traction buffer devices; 1.3 Inspect the dimensions of each component; 1.4 Perform magnetic particle flaw detection; 1.5 Clean assembly surfaces; 1.6 Grease assembly surfaces; 1.7 Perform the welding repair; 1.8 Make anti-slowdown markings. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of performing inspections for locomotive traction devices. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Inspection procedures for locomotive traction devices; 3.2 Types, assembly and technical parameter requirements of locomotive traction devices; 3.3 Fault analysis and treatment of locomotive traction devices; 3.4 Usage of proper tools and equipment; 3.5 The importance of using the proper lubricating grease. 4.0 Essential Skills 4.1 Communication skills; 4.2 Computer skills; 4.3 Data analysis skills; 4.4 Standardized operation skills; 4.5 Teamwork skills; 4.6 Report writing skills.
DESCRIPTION OF THE END	Inspection and maintenance of locomotive traction

PRODUCT / SERVICE	devices are performed in accordance with the railway locomotive maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating machines and tools; 2. Safety operation of detection equipment; 3. Occupational health and safety; 4. Fault analysis and treatment; 5. Waste disposal methods.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE OF LOCOMOTIVE RUNNING COMPONENTS	DUTY NO.	701
TASK TITLE	CONDUCT MAINTENANCE OF LOCOMOTIVE SUSPENSION DEVICES	TASK NO.	7015
PERFORMANCE CRITERIA	The person performing this task must be able to troubleshoot the locomotive suspension devices in accordance with approved technical specifications and manufacturer's manual instructions.		
RANGE STATEMENT	The task can be performed in the locomotive overhaul workshop under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Ultrasonic flaw detectors; 2. Magnetic particle flaw detectors; 3. Angle grinders; 4. Feeler gauges; 5. Platforms; 6. Spring special fixtures; 7. Press machines; 8. Spring pressure testing machines; 9. Scimitar-shaft external circlip pliers; 10. Motor brackets; 11. Torque wrenches; 12. Special sockets; 13. Outside micrometers; 14. Specialized equipment and instruments for installing and disassembling bearing units; 15. Overhead cranes; 16. Flashlights; 17. Checking hammers; 18. Fitter’s complete tool kit; 19. Safety gear; 20. Computer with accessories; 21. Work bench.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following:		Detailed knowledge about: 1.0 Methods	

1. Select tools, equipment and safety gear; 2. Inspect the locomotive suspension systems; 3. Establish the dimensions of each component; 4. Perform flaw detection; 5. Record fault information; 6. Analyze the cause of faults; 7. Disassemble and assemble the axle box; 8. Disassemble and assemble the oleo damper; 9. Disassemble and assemble the spring; 10. Perform spring compression test; 11. Clean assembly surfaces; 12. Grease assembly surfaces; 13. Make anti-slowdown markings; 14. Observe safety regulations; 15. Clean tools, equipment and the workplace; 16. Store the tools, equipment and safety gear.	The person performing this task must be able to explain how to: 1.1 Inspect the locomotive suspension device; 1.2 Inspect the dimensions of each component; 1.3 Perform flaw detection; 1.4 Disassemble and assemble the axle box; 1.5 Disassemble and assemble the oleo damper; 1.6 Disassemble and assemble the spring; 1.7 Perform spring compression test; 1.8 Clean assembly surfaces; 1.9 Grease assembly surfaces; 1.10 Make anti-slowdown markings. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of performing inspections for locomotive suspension devices. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Inspection procedures for locomotive suspension devices; 3.2 Types, assembly and technical parameter requirements of locomotive suspension devices; 3.3 Fault analysis and treatment of locomotive suspension devices; 3.4 Usage of proper tools and equipment; 3.5 The importance of using the proper lubricating grease. 4.0 Essential Skills The person performing this task must have the following skills: 4.1 Communication skills; 4.2 Computer skills; 4.3 Data analysis skills; 4.4 Standardized operation skills; 4.5 Teamwork skills; 4.6 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and maintenance of locomotive suspension devices are performed in accordance with the approved technical specifications and railway locomotive maintenance manual.

CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating machines and tools; 2. Safety operation of detection equipment; 3. Occupational health and safety; 4. Fault analysis and treatment; 5. Waste disposal methods.
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OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	CONDUCT MAINTENANCE OF LOCOMOTIVE BRAKING SYSTEM	DUTY NO.	702
TASK TITLE	PERFORM MAINTENANCE OF LOCOMOTIVE AIR SOURCE SYSTEMS	TASK NO.	7021
PERFORMANCE CRITERIA	The person performing this task must be able to troubleshoot the locomotive air source system in accordance with the railway locomotive overhaul process, disposal regulations for abnormal conditions during railway locomotive utilization, other regulations of the locomotive department, railway safety regulations and technical requirements.		
RANGE STATEMENT	The task can be performed in the railway locomotive overhaul workshop or the railway operating area under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Air compressor test benches; 2. Oil pump test benches; 3. 0.5t cranes; 4. Oil bath resistance furnaces; 5. Crankshaft storage benches; 6. Extractors; 7. Piston ring removers; 8. Feeler gauges; 9. Dial indicators; 10. Outside micrometers; 11. Dedicated slings; 12. Commonly-used tools; 13. Multimeters; 14. Commonly-used tools; 15. Fitter’s complete tool kit; 16. Safety gear; 17. Work bench; 18. Computer with accessories.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Check the spare parts required for		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Troubleshoot the air compressor;	

the task; 3. Troubleshoot the air compressor; 4. Troubleshoot the air compressor motor; 5. Troubleshoot the desiccator; 6. Troubleshoot other locomotive air source system components; 7. Analyze detected faults; 8. Develop solutions to the fault; 9. Design the locomotive air source system modification scheme; 10. Revise the overhaul process for locomotive air source systems; 11. Comply with health and safety regulations when performing tasks; 12. Clean tools, equipment and the workplace; 13. Store the tools, equipment and safety gear; 14. Check compressor, loader and unloader systems; 15. Check the condition of air intake filter; 16. Check oil quality and level and replace or top up if necessary.	1.2 Troubleshoot the air compressor motor; 1.3 Troubleshoot the desiccator; 1.4 Troubleshoot other locomotive air source system components; 1.5 Develop solutions to the fault. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of locomotive wind source MAINTENANCE and treatment. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Maintenance logic for locomotive air source systems; 3.2 Types of locomotive air source system faults; 3.3 Composition and working methods of locomotive air source systems. 4.0 Essential Skills 4.1 Management skills; 4.2 Computer skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The maintenance of locomotive air source systems is completed in accordance with the locomotive air source system maintenance manual and the locomotive crew emergency response manual.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of measuring instruments; 2. Safety operation of air compressor overhaul equipment; 3. Safety regulations.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	CONDUCT MAINTENANCE OF LOCOMOTIVE BRAKING SYSTEM	DUTY NO.	702
TASK TITLE	PERFORM MAINTENANCE OF LOCOMOTIVE AIR BRAKING SYSTEMS	TASK NO.	7022
PERFORMANCE CRITERIA	The person performing this task must be able to troubleshoot the locomotive air braking system in accordance with the railway locomotive overhaul process, disposal regulations for abnormal conditions during railway locomotive utilization, other regulations of the locomotive department, railway safety regulations and technical requirements.		
RANGE STATEMENT	The task can be performed in the railway locomotive overhaul workshop or the railway operating area under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Automatic braking test benches; 2. Vernier calipers; 3. Feeler gauges; 4. Set of Screwdrivers; 5. Templates; 6. Commonly-used wrenches; 7. Work bench; 8. Circlip pliers; 9. Cleaning plates; 10. Grinding platforms; 11. Oilstones; 12. Stopwatches; 13. Hammers; 14. Straight steel rules; 15. Computer with accessories; 16. Rubber parts; 17. Cleaning gasolines; 18. Butter; 19. Gauzes. 20. Fitter's complete tool kit 21. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Select suitable tools, equipment and safety gear; 2. Check the spare parts required for the task; 3. Clarify the phenomenon of locomotive braking system faults; 4. Troubleshoot the automatic brake valve; 5. Inspect the independent brake valve; 6. Inspect the distribution valve; 7. Inspect the brake pipe; 8. Inspect the brake cylinder; 9. Inspect the dual-port relay valve; 10. Inspect the general air shutoff valve; 11. Inspect the brake auxiliary valve; 12. Disassemble locomotive brake valve parts; 13. Maintain locomotive brake valve parts; 14. Assemble locomotive brake valve parts; 15. Test locomotive brake valve parts; 16. Clean tools, equipment and the workplace; 17. Store the tools, equipment and safety gear.	Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Troubleshoot the brake auxiliary valve; 1.2 Disassemble locomotive brake valve parts; 1.3 Maintain locomotive brake valve parts; 1.4 Assemble locomotive brake valve parts; 1.5 Test locomotive brake valve parts. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Perform maintenance and handling of locomotive braking systems. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Maintenance of logic for locomotive braking systems; 3.2 Fault type of locomotive braking systems; 3.3 Composition of locomotive braking systems; 3.4 Composition and working principles of locomotive brake valve parts. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Maintenance of locomotive air braking systems is performed in accordance with approved technical specifications and manufacturer's instructions.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of measuring instruments; 2. Safety operation of locomotive braking system overhaul equipment; 3. Safety regulations.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	CONDUCT MAINTENANCE OF LOCOMOTIVE TRACTION TRANSMISSION SYSTEMS	DUTY NO.	703
TASK TITLE	PERFORM MAINTENANCE OF LOCOMOTIVE ELECTRICAL MAIN CIRCUITS	TASK NO.	7031
PERFORMANCE CRITERIA	The person performing this task must be able to perform maintenance of locomotive main circuits in accordance with the approved technical specifications and the standard operating procedures for the overhaul of internal combustion locomotives.		
RANGE STATEMENT	The task can be performed in the overhaul workshop under the supervision of senior engineers. The tools and equipment to be used include: 1. Personal protective equipment; 2. Wrenches, screwdrivers, pliers and hand hammers; 3. Fine files, emery paper, and cotton cloth; 4. Test benches; 5. Electrician’s complete tool kit; 6. Fitter’s complete tool kit; 7. Computer with accessories; 8. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Inspect the synchronized main generator; 3. Inspect the traction motor; 4. Inspect the silicon rectifier cabinet; 5. Inspect the resistance brake cabinet; 6. Inspect the electrical circuit of the main circuit; 7. Inspect the main circuit apparatus; 8. Inspect other parts of the main circuit; 9. Resolve any observed issues; 10. Observe health and safety		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Overhaul synchronous main generators; 1.2 Overhaul the traction motor; 1.3 Overhaul the silicon rectifier cabinet; 1.4 Overhaul the resistance brake cabinet; 1.5 Overhaul the electrical circuit of the main circuit; 1.6 Overhaul the main circuit apparatus; 1.7 Overhaul other parts of the main circuit. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Operational procedures for the main transmission system of internal combustion locomotives.	

regulations; 11. Clean tools, equipment and the workplace; 12. Store tools, equipment and safety gear.	3.0 Theories The person performing this task must be able to explain the following: 3.1 Inspection procedures for each part of the main circuit of internal combustion locomotives; 3.2 Preventative maintenance plan; 3.3 Usage of proper tools and equipment. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and maintenance of locomotive main circuits are performed in accordance with approved technical specifications and manufacturer's instructions.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational health and safety; 2. Safety operation of equipment.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	CONDUCT MAINTENANCE OF LOCOMOTIVE TRACTION TRANSMISSION SYSTEMS	DUTY NO.	703
TASK TITLE	CARRY OUT MAINTENANCE OF LOCOMOTIVE ELECTRICAL AUXILIARY CIRCUITS	TASK NO.	7032
PERFORMANCE CRITERIA	The person performing this task must be able to inspect and overhaul the auxiliary transmission system in accordance with approved technical specifications and the standard operating procedures for the overhaul of internal combustion locomotives.		
RANGE STATEMENT	The task can be performed in the overhaul workshop under the supervision of senior engineers. The tools and equipment to be used include: 1. Personal protective equipment; 2. Electrician’s complete tool kit 3. Fitter’s complete tool kit 4. Sets of Wrenches, screwdrivers, pliers and hand hammers; 5. Fine files, emery paper, and cotton cloth; 6. Work benches. 7. Computer with accessories		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Inspect the lubricating system; 3. Inspect the cooling system; 4. Inspect the hydrostatic system; 5. Inspect the speed control and transmission system; 6. Inspect the traction motor ventilator; 7. Inspect the electrical circuit of the auxiliary circuit; 8. Inspect the auxiliary circuit accessories; 9. Inspect the air filter; 10. Inspect other parts of the auxiliary circuit; 11. Resolve any observed issues		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Overhaul the lubricating system; 1.2 Overhaul the cooling system; 1.3 Overhaul the hydrostatic system; 1.4 Overhaul the speed control and transmission system; 1.5 Overhaul the traction motor ventilator; 1.6 Overhaul the electrical circuit of the auxiliary circuit; 1.7 Overhaul the auxiliary circuit apparatus; 1.8 Overhaul the air filter; 1.9 Overhaul other parts. 2.0 Principles The person performing this task must be able to explain	

12. Observe safety regulations; 13. Clean tools, equipment and the workplace; 14. Store the tools, equipment and safety gear.	the following principles: 2.1 Operational procedures for the auxiliary transmission system of internal combustion locomotives. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Inspection procedures for the components of the auxiliary transmission system of internal combustion locomotives; 3.2 Preventative maintenance plan; 3.3 Usage of proper tools and equipment. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and maintenance of locomotive auxiliary circuits are carried out in accordance with approved technical specifications and manufacturer's instructions.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational health and safety; 2. Safety operation of equipment.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	CONDUCT MAINTENANCE OF LOCOMOTIVE TRACTION TRANSMISSION SYSTEMS	DUTY NO.	703
TASK TITLE	PERFORM MAINTENANCE OF LOCOMOTIVE ELECTRICAL CONTROL CIRCUITS	TASK NO.	7033
PERFORMANCE CRITERIA	The person performing this task must be able to inspect and overhaul the locomotive control system in accordance with the requirements of the standard operating procedures for the overhaul of internal combustion locomotives.		
RANGE STATEMENT	The task can be performed in the overhaul workshop under the supervision of senior engineers. The tools and equipment to be used include: 1. Personal protective equipment; 2. Wrenches, screwdrivers, pliers and hand hammers; 3. Fine files and emery paper; 4. Test benches; 5. Electrician’s complete tool kit; 6. Fitter’s complete tool kit; 7. Work bench; 8. Computer with accessories		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Inspect the electrical circuit of the control circuit; 3. Inspect the control circuit accessories; 4. Inspect the electronic system of the control circuit; 5. Inspect the control circuit instruments; 6. Inspect the battery; 7. Inspect other parts of the auxiliary circuit; 8. Resolve any observed issues; 8. Observe safety regulations; 9. Clean tools, equipment and the		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Overhaul the electrical circuit of the control circuit; 1.2 Overhaul the control circuit apparatus; 1.3 Overhaul the electronic device of the control circuit; 1.4 Overhaul the control circuit instrument; 1.5 Overhaul the battery; 1.6 Overhaul other parts of the auxiliary circuit. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Overhaul workflow for the control circuit of internal combustion locomotives.	

workplace; 10. Store the tools, equipment and safety gear.	3.0 Theories The person performing this task must be able to explain the following: 3.1 Inspection procedures for each part of the control circuit of internal combustion locomotives; 3.2 Preventative maintenance plan; 3.3 Usage of proper tools and equipment. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and maintenance of locomotive control circuits are completed in accordance with technical requirements and manufacturer's specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational health and safety; 2. Safety operation of equipment.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	CONDUCT MAINTENANCE OF LOCOMOTIVE TRACTION TRANSMISSION SYSTEMS	DUTY NO.	703
TASK TITLE	CARRY OUT MAINTENANCE OF LOCOMOTIVE DIESEL ENGINES	TASK NO.	7034
PERFORMANCE CRITERIA	The person performing this task must be able to inspect and overhaul the diesel engine in accordance with the approved technical specifications and the standard operating procedures for the overhaul of internal combustion locomotives.		
RANGE STATEMENT	The task can be performed in the overhaul workshop under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Personal protective equipment; 2. Wrenches, screwdrivers, pliers and hand hammers; 3. Fine files and emery paper; 4. Test benches; 5. Electrician’s complete tool kit; 6. Fitter’s complete tool kit; 7. Computer with accessories; 8. Work bench.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Inspect the crankshaft case; 3. Inspect the camshaft case; 4. Inspect the cylinder head and enclosure; 5. Inspect the transmission gear; 6. Inspect protective devices; 7. Inspect the pressurization system; 8. Inspect the oil-water line; 9. Observe safety regulations; 10. Clean tools, equipment and the workplace; 11. Store tools, equipment and safety gear.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Overhaul the crankshaft case; 1.2 Overhaul the camshaft case; 1.3 Overhaul the cylinder end and enclosure; 1.4 Overhaul the transmission gear; 1.5 Overhaul protective devices; 1.6 Overhaul the pressurization system; 1.7 Overhaul the oil-water line. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Overhaul workflow for diesel engines in internal combustion locomotives.	

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Inspection procedures for each structure of internal combustion locomotive diesel engines; 3.2 Preventative maintenance plan; 3.3 Usage of proper tools and equipment. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and maintenance of locomotive diesel engines are carried out in accordance with approved technical specifications and manufacturer's instructions.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational health and safety; 2. Safety operation of equipment.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE OF RUNNING SAFETY DEVICES	DUTY NO.	704
TASK TITLE	CARRY OUT MAINTENANCE OF LOCOMOTIVE SIGNAL EQUIPMENT	TASK NO.	7041
PERFORMANCE CRITERIA	The person performing this task must be able to troubleshoot the locomotive signal machine in accordance with approved technical requirements and manufacturer's manual instructions.		
RANGE STATEMENT	The task can be performed in the locomotive overhaul workshop under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Locomotive signaling mainframe test bench; 2. Digital multimeters; 3. Trameggers; 4. Card readers; 5. Card reading software; 6. Fire extinguishers; 7. Personal protective equipment, such as safety boots, goggles, safety helmets, protective gloves and insulating gloves; 8. First aid kits; 9. Electrician’s complete tool kit; 10. Fitter’s complete tool kit; 11. Work bench; 12. Computer with accessories		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Observe safety precautions; 3. Verify the logger data; 4. Inspect the wiring and cable system; 5. Inspect the fuse-boxes; 6. Troubleshoot the locomotive signal main board; 7. Check the receiving coil; 8. Check the signal machine; 9. Resolve any observed issues; 10. Clean tools, equipment and the		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Troubleshoot the locomotive signal machine. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Working principles of locomotive signal machines. 3.0 Theories The person performing this task must be able to explain	

workplace; 11. Store tools, equipment and safety gear. ;	the following: 3.1 Equipment composition and functions of locomotive signal machine systems; 3.2 Working principles of locomotive signal machines; 3.3 Fault analysis and treatment of locomotive signal machines. 4.0 Essential Skills 4.1 Communication skills; 4.2 Data analysis skills; 4.3 Equipment standardized operation skills; 4.5 Teamwork skills; 4.6 Report writing skills; 4.7 Computer operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and maintenance of locomotive signal machines are performed in accordance with approved technical specifications and manufacturer's instructions.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating machines and tools; 2. Safety operation of detection equipment; 3. Occupational health and safety; 4. Fault analysis and treatment; 5. Waste disposal methods.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE OF RUNNING SAFETY DEVICES	DUTY NO.	704
TASK TITLE	CONDUCT MAINTENANCE OF TRAIN OPERATION MONITORING AND RECORDING DEVICES	TASK NO.	7042
PERFORMANCE CRITERIA	The person performing this task must be able to troubleshoot the train operation monitoring and recording devices in accordance with technical requirements and manufacturer's manual specifications.		
RANGE STATEMENT	The task can be performed in the locomotive machine shop or overhaul workshop under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Integrated test benches; 2. Digital multimeters; 3. Trameggers; 4. Portable testers; 5. Dump units; 6. Fire extinguishers; 7. Personal protective equipment, such as safety boots, goggles, safety helmets, protective gloves and insulating gloves; 8. First aid kits 9. Electrician’s complete tool kit; 10. Fitter’s complete tool kit; 11. Computer with accessories; 12. Work bench.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Observe health and safety precautions; 3. Verify the logger data; 4. Inspect the wiring and cable system; 5. Inspect the fuse-boxes; 6. Troubleshoot the locomotive main board; 7. Dump the logger data; 8. Resolve any observed issues;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Troubleshoot the train operation monitoring and recording devices. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Working principles of the train operation monitoring and recording devices.	

9. Clean tools, equipment and the workplace; 10. Store tools, equipment and safety gear.	3.0 Theories The person performing this task must be able to explain the following: 3.1 Equipment composition and functions of the train operation monitoring and recording devices; 3.2 Working principles of the train operation monitoring and recording devices; 3.3 Fault analysis and treatment of the train operation monitoring and recording devices. 4.0 Essential Skills 4.1 Communication skills; 4.2 Data analysis skills; 4.3 Equipment standardized operation skills; 4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Computer operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and maintenance of the train operation monitoring and recording devices are conducted in accordance with approved technical specifications and manufacturer's instructions.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating machines and tools; 2. Safety operation of measuring instruments; 3. Occupational health and safety; 4. Maintenance operation processes and procedures; 5. Waste disposal methods.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	PERFORM MAINTENANCE OF RUNNING SAFETY DEVICES	DUTY NO.	704
TASK TITLE	CARRY OUT MAINTENANCE OF LOCOMOTIVE COMMUNICATION EQUIPMENT	TASK NO.	7043
PERFORMANCE CRITERIA	The person performing this task must be able to troubleshoot the locomotive communication equipment in accordance with technical requirements and manufacturer's manual specifications.		
RANGE STATEMENT	The task can be performed in the locomotive machine shop or overhaul workshop under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Locomotive signaling mainframe test benches; 2. Digital multimeters; 3. Trameggers; 4. Electrician’s complete tool kit; 5. Fitter’s complete tool kit 6 Computer with accessories; 7. Card readers; 8. Card reading software; 9. Fire extinguishers; 10. Personal protective equipment, such as safety boots, goggles, safety helmets, protective gloves and insulating gloves; 11 Work bench; 12. First aid kits.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Observe health and safety precautions; 3. Verify the logger data; 4. Inspect the wiring and cable system; 5. Inspect the fuse-boxes; 6. Troubleshoot the locomotive communication equipment; 7. Dump logger data; 8. Check the battery charge level; 9. Resolve any observed issues;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Troubleshoot the locomotive communication equipment. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Working principles of the locomotive communication equipment.	

10. Clean tools, equipment and the workplace; 11. Store tools, equipment and safety gear.	3.0 Theories The person performing this task must be able to explain the following: 3.1 Composition and functions of the locomotive communication equipment; 3.2 Working principles of the locomotive communication equipment; 3.3 Fault analysis and treatment of the locomotive communication equipment. 4.0 Essential Skills 4.1 Communication skills; 4.2 Data analysis skills; 4.3 Equipment standardized operation skills; 4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Computer operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Inspection and MAINTENANCE of the locomotive communication equipment are conducted in accordance with approved technical specifications and manufacturer's instructions.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating machines and tools; 2. Safety operation of measuring instruments; 3. Occupational health and safety; 4. Maintenance operation processes and procedures; 5. Waste disposal methods.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	HANDLE ABNORMAL RUNNING	DUTY NO.	705
TASK TITLE	HANDLE ABNORMAL TRAIN RECEPTION AND DEPARTURE	TASK NO.	7051
PERFORMANCE CRITERIA	The person performing this task must be able to handle the abnormal train reception and departure in accordance with the approved technical regulations for the railway and other traffic regulations.		
RANGE STATEMENT	The task can be performed during locomotive utilization under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Locomotive communication equipment; 2. Signal flags for railways; 3. Green licenses. 4. Safety gear; 5. Firefighting equipment		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Observe health and safety regulations 3. Use green licenses to dispatch the train; 4. Dispatch trains for special situations on semi-automatic blocking sections; 5. Guide and receive the train; 6. Store tools, equipment and safety gear; 7. Observe Railways general rules and general appendix.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Handle the abnormal train reception and departure. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Handling regulations and procedures for abnormal running. 3.0 Theories The person performing this task must be able to explain the following: 3.1 The basic occlusion method; 3.2 Handling rules for special running methods; 3.3 Running token requirements for special running methods. 4.0 Essential Skills 4.1 Communication skills;	

	4.2 Data analysis skills; 4.3 Standardized operation skills; 4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Computer operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The abnormal train reception and departure are handled in accordance with the approved technical regulations for the railway and other traffic regulations.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of locomotive utilization; 2. Safety operation of the locomotive communication equipment; 3. Occupational health and safety.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	HANDLE ABNORMAL RUNNING	DUTY NO.	705
TASK TITLE	HANDLE TRAIN DIVISION AND BACKING-OUT	TASK NO.	7052
PERFORMANCE CRITERIA	The person performing this task must be able to handle the train division and backing-out in accordance with the requirements of the technical regulations for the railway and other traffic regulations.		
RANGE STATEMENT	The task can be performed during locomotive utilization under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Locomotive communication equipment; 2. Signal flags for railways; 3. Green licenses; 4. Safety gear; 5. Firefighting equipment.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Observe health and safety precautions; 3. Conduct train backing-out; 4. Conduct train operation in divisions; 5. Propel the train operation 6. Store tools, equipment and safety gear; 7. Observe Railways general rules and general appendix.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Handle the train division and backing-out. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Rules and procedures for handling train division and backing-out. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Requirements of train backing-out; 3.2 Requirements for train operation in divisions; 3.3 Running token requirements for special running methods. 4.0 Essential Skills 4.1 Communication skills;	

	4.2 Data analysis skills; 4.3 Standardized operation skills; 4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Computer operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The train division and backing-out are handled in accordance with the requirements of the technical regulations for the railway and other traffic regulations.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of locomotive utilization; 2. Safety operation of the locomotive communication equipment; 3. Occupational health and safety.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	HANDLE ABNORMAL RUNNING	DUTY NO.	705
TASK TITLE	HANDLE FIRE AND EXPLOSION IN TRAINS	TASK NO.	7053
PERFORMANCE CRITERIA	The person performing this task must be able to handle the fire and explosion in trains in accordance with the approved technical regulations for the railway and other safety regulations.		
RANGE STATEMENT	The task can be performed during locomotive utilization under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Locomotive communication equipment; 2. Signal flags for railways; 3. Green licenses; 4. Fitter’s complete tool kit; 5. Safety gear; 6. Firefighting equipment; 7. First Aid kit		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Observe health and safety precautions 3. Perform immediate stopping operation in case of fire or explosion in trains; 4. Avoid oversized bridges, long tunnels, etc., and choose locations that are easy for travelers to evacuate; 5. Evacuate passengers to safe area; 6. Use train radio dispatch communication equipment to report to the nearest station, stop location, overview; 7. Inform the power department of the power outage; 8. Store tools, equipment and safety gear;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Handle fire and explosion in trains. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Regulations and procedures for handling fire and explosion in trains. 3.0 Theories The person performing this task must be able to explain the following: 3.1 En-route running requirements; 3.2 Abnormal running methods. 4.0 Essential Skills 4.1 Communication skills;	

9. Observe Railways general rules and general appendix	4.2 Data analysis skills; 4.3 Standardized operation skills; 4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Computer operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The fire and explosion in trains are handled in accordance with the approved standards/technical regulations for the railway and other safety regulations.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of locomotive utilization; 2. Safety operation of the locomotive communication equipment; 3. Occupational health and safety.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	HANDLE ABNORMAL RUNNING	DUTY NO.	705
TASK TITLE	HANDLE RUNNING IN STORMS DURING FLOOD SEASONS	TASK NO.	7054
PERFORMANCE CRITERIA	The person performing this task must be able to handle the running in storms during flood seasons in accordance with approved technical regulations for the railway and other traffic regulations.		
RANGE STATEMENT	The task can be performed during locomotive utilization under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Locomotive communication equipment; 2. Signal flags for railways; 3. Green licenses. 4. Fitter’s complete tool kit 5. Work bench		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear; 2. Observe health and safety precautions; 3. Intensify vigilance and take necessary safety measures when trains pass through flood-endangered areas; 4. Perform risk assessment for trains operating in flooded areas at restricted speeds; 5. Take emergency safety measures and inform tracking trains, neighboring trains and neighboring stations. 6. Store tools, equipment and safety gear; 7. Observe Railways general rules and general appendix.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Handle the running in storms during flood seasons. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Regulations and procedures for running in storms during flood seasons. 3.0 Theories The person performing this task must be able to explain the following: 3.1 En-route running requirements; 3.2 Abnormal running methods. 4.0 Essential Skills 4.1 Communication skills; 4.2 Data analysis skills. 4.3 Standardized operation skills;	

	4.4 Teamwork skills; 4.5 Report writing skills; 4.6 Computer operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The running in storms during flood seasons is handled in accordance with the approved technical specifications for the railway and other traffic regulations.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of locomotive utilization; 2. Safety operation of the locomotive communication equipment; 3. Occupational health and safety.

OCCUPATION	RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER	OCCUPATION CODE	
DUTY TITLE	HANDLE ABNORMAL RUNNING	DUTY NO.	705
TASK TITLE	TROUBLESHOOT TRAINS DURING OPERATION	TASK NO.	7055
PERFORMANCE CRITERIA	The person performing this task must be able to troubleshoot the trains during operation in accordance with the requirements of the technical regulations for the railway and other traffic regulations.		
RANGE STATEMENT	The task can be performed during locomotive utilization under the supervision of railway locomotive operation and maintenance engineers. The tools and equipment to be used include: 1. Locomotive communication equipment; 2. Signal flags for railways; 3. Green licenses.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Perform risk avoidance operation in case of locomotive faults during operation; 2. Brake passenger trains with excessive leakage; 3. Brake freight trains with excessive leakage; 4. Observe Railways general rules and general appendix.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Handle the faults of trains. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Handling regulations and procedures for the faults of trains. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Methods of MAINTENANCE the trains; 3.2 Running practices for passenger and freight trains under special conditions. 4.0 Essential Skills 4.1 Communication skills; 4.2 Data analysis skills; 4.3 Standardized operation skills; 4.4 Teamwork skills;	

	4.5 Report writing skills; 4.6 Computer operation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	MAINTENANCE of the trains during operation is handled in accordance with the approved technical regulations for the railway and other traffic regulations.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of locomotive utilization; 2. Safety operation of the locomotive communication equipment; 3. Occupational health and safety.

APPENDIX: DACUM CHART FOR RAILWAY LOCOMOTIVE OPERATION AND MAINTENANCE ENGINEER - NTA LEVEL 7

DUTIES	TASKS	ENABLERS
1.0 Perform maintenance of locomotive running gears	1.1 Conduct maintenance of locomotive frames and accessory components.	General skills and knowledge • Cooperation with others using communication skills and submission of reports to the superiors • Railway locomotive maintenance manuals, safety regulations and technical requirements • Types, assembly and main technical parameters of each component of the locomotive running gear • Skills and knowledge in locomotive running gear maintenance • Machine elements • Interpretation of technical drawings Tools and equipment • No-movement signs, signal protection flags, iron shoes and other safety protection equipment • Flashlights, inspection hammers, steel rulers, inside gauges, height gauges and other commonly-used testing tools • Commonly-used overhaul equipment such as flaw detection equipment, gas welding equipment, overhead cranes, lathes and angle grinders Materials • Lubricating grease and gear oil Requirements for employees • Teamwork spirit, integrity, time management and commitment
	1.2 Carry out maintenance of locomotive wheel pairs.	
	1.3 Conduct maintenance of locomotive driving devices.	
	1.4 Carry out maintenance of locomotive traction devices.	
	1.5 Conduct maintenance of locomotive suspension devices.	
2.0 Conduct maintenance of locomotive	2.1 Perform maintenance of locomotive air source systems.	General skills and knowledge • Cooperation with others using communication skills

DUTIES	TASKS	ENABLERS
braking systems	2.2 Perform maintenance of locomotive air braking systems.	• Mastery of locomotive manufacturer's technical instructions • Skills and knowledge in locomotive air source systems • Skills and knowledge in locomotive air braking • Interpretation of locomotive air pipeline diagrams • Components of locomotive air source systems and air braking systems • Knowledge of pneumatic technology Tools and equipment • Automatic braking test benches • Commonly-used tools • Special tools • Personal protective equipment Materials • Air compressors • Desiccators • Brake valves • Relay valves • General air shutoff valves • Emergency valves • Brake hoses Requirements for employees • Teamwork spirit, excellence, craftsmanship, responsibility
3.0 Conduct maintenance of locomotive transmission systems	3.1 Perform maintenance of locomotive main circuits.	General skills and knowledge • Cooperation with others using communication skills and submission of reports to the superiors • Mastery of locomotive manufacturer's manuals
	3.2 Carry out maintenance of locomotive auxiliary circuits.	
	3.3 Perform maintenance of locomotive control	

DUTIES	TASKS	ENABLERS
	circuits.	• Mastery of standard operation procedures for the overhaul of internal combustion locomotives • Basic operating skills for internal combustion locomotive electricians • Basic operating skills for internal combustion locomotive fitters • Knowledge of the traction transmission system of internal combustion locomotives • Interpretation of technical drawings Tools and equipment • Personal protective equipment, such as safety shoes, safety helmets and gloves • Related overhaul tools for internal combustion locomotives • Overhaul test benches Materials • Cleaner and lubricating grease meeting technical requirements Requirements for employees • Teamwork spirit, honesty and trustworthiness, carefulness, patience, time management, and commitment
	3.4 Carry out maintenance of locomotive diesel engines.	
4.0 Perform maintenance of running safety devices	4.1 Carry out maintenance of locomotive signal machines.	General skills and knowledge • Cooperation with others using communication skills and submission of reports to the superiors • Mastery of manufacturer's manuals • Skills and knowledge of running safety devices • Interpretation of technical drawings • Basic materials science Tools and equipment
	4.2 Conduct maintenance of train operation monitoring and recording devices.	
	4.3 Carry out maintenance of locomotive communication equipment.	

DUTIES	TASKS	ENABLERS
		• Locomotive signaling mainframe test benches • Digital multimeters • Trameggers • Card readers • Card reading software • Fire extinguishers • Safety shoes, goggles, safety helmets, work gloves and insulating gloves • First aid kits Materials • Cleaner and lubricating grease meeting technical requirements Requirements for employees • Safety consciousness, compliance, obedience to unified command and teamwork spirit
5.0 Manage abnormal running	5.1 Manage abnormal train reception and departure.	General skills and knowledge • Cooperation with others using communication skills and submission of train operation reports to the superiors • Use of railway-related rules and regulations • Skills and knowledge in train operations • Overall locomotive situation • Interpretation of train working diagrams Tools and equipment • Safety shoes, signal flags for railways, flashlights, railway-specific clothing and other personal protective equipment • License documents related to abnormal running • Torpedoes, torches and shorted copper wires
	5.2 Manage train division and backing-out.	
	5.3 Manage fire and explosion in trains.	
	5.4 Manage running in storms during flood seasons.	
	5.5 Troubleshoot trains during operation.	

DUTIES	TASKS	ENABLERS
		• Re-railer devices, etc. Materials • Communication equipment meeting technical specifications Requirements for employees • Teamwork spirit, integrity, time management and compliance