RAIL SYSTEM VEHICLES MAINTAINER AND REPAIRER

LEVEL 4

REVISION NO: 01

REFERENCE CODE

21UY0…-4

INTRODUCTION

Rail System Vehicles Maintenance and Repairer (Level 4) National Occupational Standard, which was prepared by the TCDD Development and TCDD Personnel Solidarity and Assistance Foundation appointed by the VQA in accordance with the provisions of "Regulation on the Preparation of National Occupational Standards and National Competencies" that was published in the Official Gazette dated 19/10/2015 - numbered 29507 "Regulation on the Establishment, Duties, Working Procedures and Principles of Vocational Qualifications Institution Sector Committees" that was published in the Official Gazette dated 27/11/2007 – numbered 26713, and which was evaluated by taking the opinions of the relevant institutions and organizations in sector, has been approved by the Executive Board of VQA after being reviewed by VQA Transport, Logistics and Communications Sector Committee.

Rail System Vehicles Maintainer and Repairer (Level 4) National Qualification was updated by the working group assigned by VQA and revised with the decision of VQA Executive Board dated …… and numbered …..

TERMS, SYMBOLS AND ABBREVIATİONS

EMERGENCY: Incidents that require emergency intervention, struggle, first aid or evacuation such as fire, explosion, spread of dangerous chemicals, natural disasters that may occur in the whole or part of the workplace,

EMERGENCY PLAN: A plan that includes information and practical actions, including the work and actions to be taken in emergencies that may occur in the workplace,

ALTERNATOR: Electric machine that produces alternating current with its mechanical rotation motion,

VEHICLE: One rail vehicle,

ON-BOARD SIGNALIZATION: On-board equipment that introduces trains to the signalling system and provides movement, safety and control of trains according to signal information,

ARTICULATION ZONE: The area that provides the mechanical connection of the Passenger Sections of the Rail System Vehicles with each other,

BATTERY: Generator, which is created by connecting more than one battery in series or parallel and provides the electrical energy required during the revival of the trains,

BOGIE: Equipment consisting of more than one wheel set, capable of carrying the brake and drive system and carrying the vehicle,

TRACTION VEHICLE (TOWING VEHICLE): The locomotive and its railcar moving with the propulsion power produced or regulated by the power unit on it,

TRACTION MOTOR: Electric motor that drives the towing vehicle,

TRACTION SYSTEM: The system enabling a vehicle to move,

CCTV: Close Circuit TeleVision system,

RAILWAY: All the facilities that make up a double rail series and this series, on which the vehicle series consisting of towing and towed vehicles moves,

DYNAMO: Generator,

ISCO: International Standard Occupation Classification,

AIR CONDITIONING: The system that performs heating, cooling and ventilation operations,

OHS: Occupational Health and Safety,

CATENARY: The system that transfers the electrical energy used in railway vehicles to the vehicle over the overhead line,

PERSONAL PROTECTIVE EQUIPMENT: All tools, equipment and devices designed for this purpose, which are worn or held by employee, which protect the employee against one or more risks arising from the work carried out, affecting health and safety,

COMPRESSOR: Compressed air generator,

CONTACT: The part that provides voltage to cut-off and supply in electrical circuits,

CONTACTOR: Electromechanical device that enables the receiver to be energized or de-energized in electrical circuits,

COUPLING: The process of joining two trains/vehicles electrically, mechanically and /or pneumatically,

LOCOMOTIVE: A rail system vehicle that moves with the mechanical power applied to its wheels and that moves the towed vehicles that are connected to the front or rear with this movement,

PNEUMATIC: Compressed air,

PT (PANTOGRAPH): In electric traction systems, the equipment that transits the electrical energy needed by the traction vehicle from the electric line (catenary) to the traction vehicle,

NEAR-MISSING EVENT: The event that occurs in the workplace, which is not occurring any damages, although it has the potential to cause damage to the employee, workplace or equipment,

RAIL SYSTEM VEHICLE: General name given to all vehicles moving on the railway (High Speed Train, locomotive, passenger/freight wagon, diesel multiple units, electric multiple units, tram, metro, funicular, light rail vehicle, suburban, train etc.),

RECTIFIER: A device that converts alternating current (AC) to direct current (DC),

RIGID CATENARY: System consisting of copper conductor fixed on the ceiling of the tunnel or on the aluminium profile carrier part attached with direct post insulators,

RISK: The possibility of loss, injury or other harmful consequence resulting from the hazard,

RISK ASSESSMENT: Necessary work to be done in order to determine the dangers that exist in the workplace or that may come from outside, the factors that cause these hazards to turn into risks, and the analysis and rating of the risks arising from the hazards, and to decide on control measures,

RELAY: Electromagnetically operated electromechanical switching element,

SECTIONER: Unit that separates and cuts energy,

SENSOR: A device that detects flow, weight, temperature, velocity, capacity etc. variables electrically, electronically and mechanically,

CHARGE: Charging accumulators with electric charge,

DRIVE: Excitation and power transfer,

DANGER: The potential for harm or damage that exists in the workplace or may come from outside, which may affect the employee or the workplace,

TRAIN SET (TRAIN SERIE): Railcar/Rail-car series, which is a combination of inseparable vehicles consisting of cars and wagons designed accordingly,

TRAIN: Compound rail system vehicle consisting of one or more traction vehicles and wagons or one or more traction vehicles,

3.RAIL: The energy rail that transfers the electrical energy used in the railway vehicles to the vehicle through the current collector,

ELECTROMECHANIC VALVE: Electrically controlled valve with magnetic coil used to control the flow of fluid,

AXLE: Each wheel pair set in railway vehicles,

TCMS: Train Control and Management System,

PIS: Announcement and Passenger Information System.

NATIONAL QUALIFICATION OF RAIL SYSTEM VEHICLES MAINTAINER AND REPAIRER

1	**NAME OF QUALIFICATION**	Rail Vehicle Systems Maintainer and Repairer
2	**REFERENCE CODE**	21UY0…-4
3	**LEVEL**	4
4	**PLACE IN INTERNATIONAL CLASSIFICATION**	ISCO 08: 7412 (Electrical mechanics and installers)
5	**TYPE**	
6	**CREDIT VALUE**	
7	**A) RELEASE DATE**	
	B) REVISION NO	01
	C) REVISION DATE	-
8	**AIM**	To carry out the profession of Railway Road Construction, Maintenance and Repair Machine Operator (Level 4) by trained and qualified people and to increase the quality of the works, the aim of this national qualification is; • To define the qualifications, knowledge, skills and competencies that candidates should have, • To allow candidates to prove their professional competence with a valid and reliable document, To create references and resources for the education system, examination and certification bodies.
9	**THE PROFESSIONAL STANDARD THAT RESOURCES THE QUALIFICATION UNIT**	
21UMS0…-4/ Rail Vehicle Systems Maintainer and Repairer (Level 4)		
10	**QUALIFICATION EXAM ENTRANCE REQUIREMENT(S)**	
-		
11	**THE STRUCTURE OF QUALIFICATION**	
11-a) Mandatory Units		
21UY0…-4/A1 OHS, Environmental protection and Quality		
11-b) Optional Units		
21UY0…-4/B1 Electrical and Electronic System and Hardware Maintenance/Repair 21UY0…-4/B2 Mechanical System Maintenance/Repair 21UY0…-4/B3 Diesel Engine Maintenance/Repair		
11-c) Alternatives How to Be Grouped of Units		
In order for the candidate to receive a professional qualification certificate, it is obligatory to be successful in at least one of the A1 compulsory qualification units and the B group qualification units.		
12	**ASSESSMENT AND EVALUATION**	
Candidates who want to obtain the Rail System Vehicles Maintenance and Repairer (Level 4), Professional Competence Certificate are subjected to the theoretical and performance-based exams defined in the units. Candidates must be successful in both theoretical and performance-based exams in order to receive the proficiency certificate.		

Theoretical and performance-based exams in the qualification units can be done separately for each unit or together. However, each unit should be evaluated independently.

The validity period of qualification units is 2 years from the date of achievement of the unit. In order to obtain a qualification by combining the qualification units, all units must remain valid.

13	CRITERIA OF EVALUATOR

Evaluators who will take part in the assessment and evaluation practices of the profession must meet at least one of the following conditions;

- To have at least 3 years of teacher / lecturer / lecturer experience in institutions providing training in the field of rail system vehicles or rail systems machine technology and at least 2 years of field experience in the field of rail system vehicles, maintenance and repair,
- To have worked in the field of maintenance and repair of rail system vehicles for at least 5 years and to have received at least undergraduate technical education,
- Having worked in the maintenance and repair of rail system vehicles for at least 10 years and received at least high school education,

Evaluators who have at least one of the above characteristics and will take part in the assessment and evaluation process; Training on vocational qualification system, national qualification(s), relevant international/national occupational standard(s), measurement and evaluation, quality assurance in assessment and evaluation and OHS should be provided by examination and certification bodies.

14	**DOCUMENT VALIDITY PERIOD**	The validity period of the certificate is five (5) years.
15	**SURVEILLANCE FREQUENCY**	-
16	**ASSESSMENT-EVALUATION METHOD TO BE APPLIED IN DOCUMENT RENEWAL**	Document renewal activities are carried out according to one of the methods stated below, preferred by the applicant: a) The applicant; transmits the records (service transcript, reference letter/letter, contract, invoice, portfolio, etc.) showing that it has worked in the relevant field for at least two years or the last six months in total within the validity period of the certificate. b) The applicant participates in all performance-based exams included in the relevant national qualification and is not subjected to theoretical exams.
17	**HORIZONTAL AND VERTICAL PROGRESS IN THE PROFESSION**	Vertical Transition Way: - Horizontal Transition Way: -
18	**FOUNDATION(S) THAT DEVELOP QUALIFICATION**	VQA Working Group
19	**SECTOR COMMITTEE VERIFYING QUALIFICATION**	VQA Transport, Logistics and Communications Sector Committee

21UY0…-4/A1 OHS, ENVIRONMENTAL PROTECTION AND QUALITY QUALIFICATION UNIT

1	**QUALIFICATION UNIT NAME**	OHS, Environmental Protection and Quality
2	**REFERENCE CODE**	21UY0…-4/A1
3	**LEVEL**	4
4	**CREDIT VALUE**	
5	**A) RELEASE DATE**	
	B) REVISION NO	01
	C) REVISION DATE	-
6	**THE PROFESSIONAL STANDARD THAT SOURCES TO THE QUALIFICATION UNIT**	
21UMS0…-4/ Rail Vehicle Systems Maintainer and Repairer (Level 4)		
7	**LEARNING OUTCOMES**	

Learning Outcome 1: Explains OHS and environmental protection requirements.

Sub Learning Outcomes:
1.1: Explains possible dangers and risks in business processes and OHS measures.
1.2: Distinguish appropriate behaviour and precautions in emergency situations.
1.3: Explains the environmental protection measures in the working environment.

Learning Outcome 2: Explains quality and professional development requirements.

Sub Learning Outcomes:
2.1: Explains the quality requirements of the work.
2.2: Explains the contribution of professional development activities to quality and productivity.

8	**ASSESSMENT AND EVALUATION**

8 a) Theoretical Exam

(T1) Multiple Choice Exam: The theoretical exam for the A1 proficiency unit is carried out according to the "Information" checklist in annex A1-2. In the theoretical exam, candidates are given a multiple-choice test with at least 20 (twenty) questions with 4 options, each of which is worth equal points. Candidates are given 2 minutes for each question in the exam and no points are deducted from questions answered incorrectly. The candidate who answers at least 70% of the questions correctly in the exam is considered successful. Exam questions should measure all knowledge expressions (Annex A1-2 a. Information) that are intended to be measured by the theoretical exam in this unit.

8 b) Performance Based Exam

Expressions of skills and competencies for the A1 qualification unit are defined in the skill and competence checklists of the B group qualification units, and measurement and evaluation will be made within this scope.

8 c) Other Conditions Regarding Measurement and Evaluation

The candidate must be successful in the T1 exam in order to be considered successful in the said unit. The validity period of the qualification unit is 2 years from the date of achievement of the unit.

9	**INSTITUTION(S) DEVELOPING THE QUALIFICATION UNIT**	VQA Working Group
10	**INDUSTRY COMMITTEE VERIFYING QUALIFICATION UNIT**	VQA Transport, Logistics and Communications Sector Committee

QUALIFICATION UNIT APPENDİCES

APPENDIX [A1]-1: Information on Recommended Training for Acquisition of the Qualification Unit

1. Occupational Health and Safety
   1.1. Occupational Health and Safety
   1.2. OHS Instructions
   1.3. Implementation of OHS instructions in business processes
   1.4. Emergency instructions
   1.5. Implementation of emergency instructions in business processes
   1.6. Danger and risk concepts
   1.7. Actions to be taken against dangers and risks and implementation of procedures
2. Environmental Protection
   2.1. Environmental protection instructions
   2.2. Implementation of environmental protection instructions in business processes
   2.3. Environmental dangers and risks and precautions to be taken
3. Quality Requirements
   3.1. Quality requirements to be applied in business processes
   3.2. Performing business processes according to quality requirements
   3.3. Nonconformities that arise in business processes and their elimination methods
   3.4. Implementation of nonconformity removal methods
4. Professional Development
   4.1. Professional legislation
   4.2. Professional terminology
   4.3. Professional innovation and developments
   4.4. Observing and evaluating
   4.5. Transfer of Professional knowledge and experience

APPENDIX [A1]-2: Checklist to be Used in the Assessment and Evaluation of the Qualifications Unit

a) INFORMATION

No	Information Statement	UMS Related Section	Sub Learning Outcome	Assessment Tool
BG.1	Explains the dangers and risks in the working environment.	A.1.1	1.1	T1
BG.2	Explains the precautions to be taken according to the dangers and risks in the working environment.	A.1.1	1.1	T1
BG.3	Distinguishes dangers and risks from ordinary situations in business processes.	A.1.5	1.1	T1
BG.4	Explains the meanings of warning signs and plates in the working environment.	A.1.2	1.1	T1
BG.5	Explains the safety equipment of the machinery and equipment used.	A.1.2	1.1	T1
BG.6	Distinguishes the personal protective equipment that should be used according to the dangers and risks in the working environment.	A.1.3	1.1	T1

No	Information Statement	UMS Related Section	Sub Learning Outcome	Assessment Tool
BG.7	Lists occupational diseases that are exposed during work processes.	A.1.1	1.1	T1
BG.8	Explains the precautions to be taken against occupational diseases that are exposed during the work processes.	A.1.1 A.1.3	1.1	T1
BG.9	Defines the concepts of work accident, emergency and near-miss.	A.1.4	1.1	T1
BG.10	Explains the procedures to be applied in case of work accident.	A.1.4	1.1	T1
BG.11	Explains the issues in the emergency plan.	A.1.7	1.2	T1
BG.12	Explains the behaviours in accordance with the emergency plan.	A.1.7-8	1.2	T1
BG.13	Distinguishes the cautions for environmental protection in the working area.	A.2.2	1.3	T1
BG.14	Explains the efficient use of natural and business resources in business processes.	A.2.3	1.3	T1
BG.15	Lists the procedures to be done regarding the collection and preservation of the recyclable materials in the working environment.	A.2.4	1.3	T1
BG.16	Distinguishes the quality requirements that must be applied in business processes.	A.3.1	1.3	T1
BG.17	Explains the method of use of the equipment and tools according to the quality instruction.	A.3.2	2.1	T1
BG.18	Explains the follow-up procedures of the periodic maintenance and calibration of the devices used in the working processes.	A.1.6	2.1	T1
BG.19	Distinguishes the knowledge and work experience that should be transferred to the employees working with.	C.2.1-2	2.2	T1
BG.20	Explains the basic concepts related to the profession.	C.1.1-3 C.2.1-2	2.2	T1

b) SKILLS AND COMPETENCIES

No	Skill and Competency Expression	UMS Related Section	Qualification Unit Performance Criterion	Assessment Tool
*BY.1	…			

(*) Critical steps that must be accomplished in the performance exam.

21UY0…-4/B1: ELECTRICAL ELECTRONIC SYSTEM AND UNIT MAINTENANCE/REPAIR QUALIFICATION UNIT

1	**QUALIFICATION UNIT NAME**	Electrical Electronic System and Unit Maintenance/Repair
2	**REFERANCE CODE**	21UY0…-4/B1
3	**LEVEL**	4
4	**CREDIT VALUE**	
5	**A) RELEASE DATE**	-
	B) REVISION NO	01
	C) REVISION DATE	-
6	**THE PROFESSIONAL STANDARD THAT RESOURCES THE QUALIFICATION UNIT**	
21UMS0…-4/ Rail Vehicle Systems Maintainer and Repairer (Level 4)		
7	**LEARNING OUTCOMES**	

Learning Outcome 1: Implements OHS, environmental protection and quality requirements.

Sub learning Outcomes:
1.1: Implements OHS measures in the working environment.
1.2: Implements measures to reduce environmental risks.
1.3: Applies the quality requirements of the work.

Learning Outcome 2: Performs maintenance and repair of electrical and electronic systems and hardware.

Sub Learning Outcomes:

2.1: Prepares necessary equipment, hand tools and materials.
2.2: Performs maintenance and repair of electrical and electronic systems, hardware and equipment.

Learning Outcome 3: Performs operations after maintenance/repair.

Sub Learning Outcomes:
3.1: Provides electrical and electronic system and hardware tests.
3.2: Keeps records of maintenance and repair works.

8	**ASSESSMENT AND EVALUTION**

8 a) Theoretical Exam

Multiple Choice Exam (T1): The theoretical exam for the B1 proficiency unit is carried out according to the "Information" checklist specified in Annex B1-2 (T1). In the theoretical exam, candidates are given a 4-option multiple-choice exam with at least 25 (twenty-five) questions, each of which is worth equal points. In the exam organized with multiple choice questions, no points are deducted from the questions answered incorrectly. In the exam, candidates are given an average of two (2) minutes for each question. The candidate who answers at least 70% of the questions correctly in the written exam is considered successful. Exam questions should measure all information statements specified in Annex B1-2 (T1), which are intended to be measured by the theoretical exam in this unit.

Oral Practice (T2): Oral practice for the B1 proficiency unit is carried out according to the "Information" checklist specified in Annex B1-2 (T2). Oral practice should be applied together with the performance-

based exam (P2). Oral practice is intended for the candidate to demonstrate his/her skills and competence in practice only in the studies carried out with the team members and is not considered as a theoretical exam score.

8 b) Performance Based Exam

Performance exam (P1): The performance-based exam for the B1 proficiency unit is carried out according to the skills and competencies specified in the "Skills and Competencies" checklist (P1) in Annex B1-2. The critical steps that must be accomplished by the candidate are determined in the skills and competencies checklist, and the exam is conducted in a real or realistic working environment.
Oral Performance exam (P2): Evaluation of skills and competencies specified in the "Skills and Competencies" checklist (P2) in Annex B1-2; It is carried out by the evaluator by asking the candidate the questions that are specified as T2 in the "a. Information" checklist in Annex B1-2, to demonstrate the skills and competencies of the candidate in practice.
The skills and competencies checklist identifies critical steps that must be accomplished by the candidate. The skills and competencies specified in the "Skills and Competencies" checklist (P2) with the questions asked to the candidates are carried out in a real or realistic working environment. P1 and P2 performance exams are held and evaluated together.

In order for the candidate to be successful in the performance exam, provided that he/she performs successfully in all of the critical steps, he/she must show a minimum of 80% success in the overall exam.

8 c) Other Conditions Regarding Assessment and Evaluation

The candidate must be successful in T1, T2 and P1 exams in order to be considered successful in the said unit.
The validity period of the exams foreseen for the unit is 1 year from the date of success of the exam. The time difference between the exam dates achieved in order to obtain the unit cannot exceed one year.
The validity period of qualification units is 2 years from the date of achievement of the unit. The exam is terminated if the candidate behaves in a way that endanger the safety of himself and others.

9	**INSTITUTION(S) DEVELOPING THE QUALIFICATION UNIT**	VQA Working Group
10	**SECTOR COMMITTEE VERIFYING THE QUALIFICATION UNIT**	VQA Transport, Logistics and Communications Sector Committee

QUALIFICATION UNIT APPENDICES

APPENDIX [B1]-1: Information on Recommended Training for Acquisition of the Qualification Unit

1. OHS and Environmental Protection
   - 1.1. Implementing occupational health and safety instructions in business processes
   - 1.2. Taking precautions against dangers and risks in the working environment
   - 1.3. Selecting and using personal protective equipment in business processes
   - 1.4. Using health and safety signs in business processes
   - 1.5. Safe use of tools and equipment in business processes
   - 1.6. Implementing emergency instructions in business processes
   - 1.7. Implementing environmental protection guidelines in business processes
2. Quality Requirements
   - 2.1. Failures and malfunctions that occurs in business processes
   - 2.2. Record keeping and reporting in business processes
   - 2.3. Applications of business quality requirements
3. Rail System Vehicles Electrical-Electronic Equipment Maintenance and Repair

3.1. Rail system vehicles electrical-electronic equipment and features
3.2. Rail system vehicles electrical-electronic equipment maintenance and repair catalogues
3.3. Signs and symbols in the maintenance and repair catalogues of electrical-electronic equipment of rail system vehicles
3.4. Machinery, equipment and tools used in rail system vehicles electrical-electronic equipment maintenance and repair
3.5. Test and measurement devices used in rail system vehicles electrical-electronic equipment maintenance and repair
3.6. Rail system vehicles electrical-electronic equipment maintenance and repair
3.7. Points to be considered in the maintenance and repair of electrical-electronic equipment of rail system vehicles
3.8. Record keeping and reporting in rail system vehicles electrical-electronic equipment maintenance and repair processes

APPENDIX [B1]-2: Checklist to be used in the Assessment and Evaluation of the Qualification Unit

a) INFORMATION

No	Information Statement	UMS Related Section	Sub learning Outcome	Assessment Tool
BG.1	Explains the signs and symbols of rail system vehicles, electrical and electronic systems.	B.1.1	2.3	T1
BG.2	Explains the maintenance/repair methods and techniques according to the characteristics of the vehicle to be repaired.	B.1.1	2.2	T1
BG.3	Distinguishes the tools, vehicles and equipment used in maintenance and repair of electrical and electronic systems of rail system vehicles.	B.1.1 B.1.3	2.1	T1
BG.4	Lists the material used in maintenance and repair of electrical and electronic systems of rail system vehicles.	B.1.1 B.1.3	2.1	T1
BG.5	Lists the electrical and electronic equipment in the brake system.	B.2.1	2.2	T1
BG.6	Lists the electrical and electronic equipment of the vehicle propulsion system.	B.2.2	2.2	T1
BG.7	Lists passenger door electrical and electronic equipment.	B.2.3	2.2	T1
BG.8	Defines passenger door electrical and electronic equipment.	B.2.3	2.2	T1
BG.9	Lists on-vehicle signal system equipment.	B.2.5	2.2	T1
BG.10	Explains the functions of battery system equipment.	B.2.6	2.2	T1
BG.11	Lists the equipment of the CCTV system.	B.2.7	2.2	T1
BG.12	Explains the electrical and electronic equipment of the air conditioning system.	B.2.8	2.2	T1
BG.13	Lists the electrical and electronic equipment of the air conditioning system.	B.2.8	2.2	T1

No	Information Statement	UMS Related Section	Sub learning Outcome	Assessment Tool
BG.14	Explains the purpose of electrical coupling in Rail System Vehicles.	B.2.9	2.2	T1
BG.15	Defines current collector/energy receiver system.	B.2.10	2.2	T1
BG.16	Lists the electrical and electronic equipment of the current collector/energy receiver system.	B.2.10	2.2	T1
BG.17	Lists the electrical and electronic equipment of the fire detection system.	B.2.12	2.2	T1
BG.18	Explains the working system of the auxiliary power unit.	B.2.13	2.2	T1
BG.19	Lists auxiliary power system equipment.	B.2.13	2.2	T1
BG.20	Lists passenger information system.	B.2.14	2.2	T1
BG.21	Lists driver information system electrical and electronic equipment.	B.2.15	2.2	T1
BG.22	Explains the functions of train control and management system.	B.2.16	2.2	T1
BG.23	Lists the train control and management system electrical and electronic equipment.	B.2.16	2.2	T1
BG.24	Lists possible malfunctions in electrical and electronic equipment of rail system vehicles.	B.2.1-10 B.2.12-14 B.2.16-18 B.2.20-23 B.2.29	2.2	T1
BG.25	Explains the reasons of faults in electrical and electronic equipment of rail system vehicles and how they are fixed.	B.2.1-10 B.2.12-14 B.2.16-18 B.2.20-23 B.2.29	2.2	T1

b) SKILLS AND COMPETENCIES

No	Skill and Competency Statement	UMS Related Section	Sub Learning Outcome	Assessment Tool
*BY.1	Uses personal protective equipment (bump cap, gloves, work clothes, work shoes, etc.) suitable for the job.	A.1.3	1.1	P1
BY.2	Places warning signs and signs about maintenance and repair in the work area.	A.1.2	1.1	P1
BY.3	Collects the wastes generated in the working area by separating them in defined containers.	A.2.4	1.2	P1
BY.4	Prepares tools and equipment to be used in maintenance and repair work.	B.1.3	2.1	P1

No	Skill and Competency Statement	UMS Related Section	Sub Learning Outcome	Assessment Tool
*BY.5	Takes electrical and mechanical safety precautions of the vehicle to be maintained.	B.2.1	2.1	P1
BRAKE SYSTEM MAINTENANCE AND REPAIR				
BY.6	Tests whether the electrical connectors and related components of the brake system performs their functions.	B.2.1	2.2	P1
BY.7	Detects if there is a damage in the electrical wiring of the brake system.	B.2.1	2.2	P1
BY.8	Detects whether there is looseness in the connections of the socket/connector elements in the brake system.	B.2.1	2.2	P1
BY.9	Detects whether the fuse/switches in the brake system are working or not.	B.2.1	2.2	P1
BY.10	Fixes the faults related to the brake system within his/her authority.	B.2.1	2.1 2.2	P1
BY.11	Evaluates previous fault records of the brake electronic control system.	B.2.1	2.2	P1
BY.12	Tests the brake electronic control system units on the vehicle according to the previous fault records.	B.2.1	2.2	P1
BY.13	Fixes the faults related to the brake system within his/her authority.	B.2.1	2.1 2.2	P1
BY.14	Detects whether there is malfunction in the coils of the electro-mechanical valves in the brake system and the related pressure sensors.	B.2.1	2.2	P1
BY.15	Carries out/Ensures the execution of necessary corrective actions regarding the malfunctions detected in the coils and pressure sensors.	B.2.1	2.1 2.2	P1
BY.16	Records the test values related to the brake system into the relevant form by performing the functionality test of the brake system.	B.2.1	2.2	P1
VEHICLE PROPULSION SYSTEM MAINTENANCE/REPAIR				
BY.17	Checks the conformity of the electrical connectors and related components of the vehicle propulsion system according to the reference values.	B.2.2	2.2	P1
BY.18	Evaluates the programs of the vehicle propulsion system and the previous maintenance and repair records of the equipment.	B.2.2	2.1 2.2	P1
BY.19	Performs the necessary tests of the vehicle propulsion system.	B.2.2	2.1 2.2	P1
BY.20	Fixes the faults related to the vehicle propulsion system within his/her authority.	B.2.2	2.1 2.2	P1
DOOR SYSTEM MAINTENANCE AND REPAIR				
BY.21	Tests the operation of the door system	B.2.3	2.1 2.2	P1

No	Skill and Competency Statement	UMS Related Section	Sub Learning Outcome	Assessment Tool
BY.22	Tests the operation of the door security system.	B.2.3	2.1 2.2	P1
BY.23	Changes the electrical equipment in the door system.	B.2.3	2.1 2.2	P1
BY.24	Performs isolation/bypass operations of the door.	B.2.3	2.1 2.2	P1
BY.25	Fixes the malfunctions related to the doors system within his/her authority.	B.2.3	2.1 2.2	P1
BOGIE SYSTEM MAINTENANCE/REPAIR				
BY.26	Checks the conformity of the electrical and electronic equipment in the bogie according to the reference values.	B.2.4	2.1 2.2	P1
BY.27	Checks the conformity of the bogie electrical connections according to the reference values.	B.2.4	2.1 2.2	P1
BY.28	Checks the conformity of the torques of the electrical connection points on the bogies according to the reference values.	B.2.4	2.1 2.2	P1
BY.29	Checks the conformity of the grounding coal per axle according to the reference values.	B.2.4	2.1 2.2	P1
BY.30	Explains how the maintenance and repair processes of traction motors are done by showing them on the traction motor.	B.2.4	2.2	T2
	Carries out the maintenance and repair operations of traction motors according to the relevant maintenance/repair manuals.	B.2.4	2.1 2.2	P2
BY.31	Explains how the bogie electrical equipment and connections are fixed by showing them on the bogie system.	B.2.4	2.2	T2
	Fixes the faults related to the electrical and electronic equipment in the bogie within his/her authority.	B.2.4	2.1 2.2	P2
ON-BOARD SIGNAL SYSTEM MAINTENANCE/REPAIR				
	Explains the assembly and disassembly of the equipment of the on-board signal system by showing them on vehicle.	B.2.5	2.2	T2
BY.32	Makes the assembly and disassembly of the equipment of the on-board signal system.	B.2.5	2.2	P2
BY.33	Checks the conformity of the fasteners of the on-board signal system according to the reference values.	B.2.5	2.2	P1
BY.34	Detects whether there is a damage in the on-board signal system.	B.2.5	2.2	P1
BY.35	Fixes the faults related to the on-board signal system within his/her authority.	B.2.5	2.1 2.2	P1
BATTERY SYSTEM MAINTENANCE AND REPAIR				

No	Skill and Competency Statement	UMS Related Section	Sub Learning Outcome	Assessment Tool
BY.36	Checks the compatibility of the connection elements of the battery system and the connections of the related components according to the reference values.	B.2.6	2.2	P1
BY.37	Detects whether there is a damage in the electrical wiring of the battery system.	B.2.6	2.2	P1
BY.38	Records the battery voltage values in the battery system by doing measurements.	B.2.6	2.1 2.2	P1
BY.39	Performs the controls and measurements of the batteries used in the battery system according to the relevant maintenance instructions.	B.2.6	2.1 2.2	P1
CCTV SYSTEM MAINTENANCE/REPAIR				
BY.40	Tests the functionality of the connectors of the CCTV system and the connections of the related components.	B.2.7	2.2	P1
BY.41	Detects whether there's a damage in the equipment of CCTV System.	B.2.7	2.2	P1
BY.42	Fixes the faults related to the CCTV system within his/her authority.	B.2.7	2.1 2.2	P1
AIR CONDITIONING SYSTEM MAINTENANCE/REPAIR				
BY.43	Tests the functionality of the fasteners of the air conditioning system and the connections of the related components.	B.2.8	2.2	P1
BY.44	Fixes the faults related to air conditioning system within his/her authority.	B.2.8	2.1 2.2	P1
BY.45	Takes the system status and fault records by connecting to the air conditioning system with the computer.	B.2.8	2.1 2.2	P1
VEHICLE PUSH PULL SYSTEM (COUPLING) MAINTENANCE/REPAIR				
BY.46	Detects whether there is a failure in the Vehicle Push Pull System.	B.2.9	2.2	P1
BY.47	Fixes the faults related to the push-pull system within his/her authority.	B.2.9	2.1 2.2	P1
BY.48	Carries out the maintenance and repair of the vehicle push-pull system in accordance with the relevant maintenance and repair instructions.	B.2.9	2.1 2.2	P1
CURRENT COLLECTOR/ENERGY RECEIVER MAINTENANCE/REPAIR				
BY.49	Tests the functionality of current collector /energy receiver system equipment.	B.2.10	2.2	P1
BY.50	Detects whether there is a looseness or damage in the connections of the cable/socket/connector elements in the current collector/energy system.	B.2.10	2.2	P1
BY.51	Tests the electrical and manual operation of the current collector/energy receiver system.	B.2.10	2.2	P1
BY.52	Replaces the current collector/energy receiver system according to the relevant maintenance instructions.	B.2.10	2.1 2.2	P1
FIRE DETECTION AND EXTINGUISHING SYSTEM MAINTENANCE/REPAIR				

No	Skill and Competency Statement	UMS Related Section	Sub Learning Outcome	Assessment Tool
BY.53	Tests the fasteners of the Fire Detector and Extinguishing System.	B.2.12	2.2	P1
BY.54	Detects whether there is a damage in the Fire Detection and Extinguishing system.	B.2.12	2.2	P1
BY.55	Fixes the faults related to the fire detection and extinguishing system within his/her authority.	B.2.12	2.1 2.2	P1
AUXILIARY POWER SYSTEM MAINTENANCE/REPAIR				
BY.56	Detects whether there is a looseness and damage in the connections of the cable/socket/connector elements in the auxiliary power system.	B.2.13	2.2	P1
BY.57	Cleans the auxiliary power system by removing the dust and dirt.	B.2.13	2.2	P1
BY.58	Checks the functionality of the electronic cards and coils in the auxiliary power system according to the reference values.	B.2.13	2.2	P1
BY.59	Checks the conformity of the current and voltage values of the auxiliary power system according to the reference values.	B.2.13	2.2	P1
	Explains by showing how to eliminate possible faults that may occur in the auxiliary power system.	B.2.13	2.1 2.2	T2
BY.60	Explains by showing how to fix the errors related to the auxiliary power system.	B.2.13	2.1 2.2	P2
PASSENGER INFORMATION SYSTEM MAINTENANCE7REPAIR				
BY.61	Tests the functionality of the connections of the fasteners and related components of passenger information system.	B.2.14	2.2	P1
BY.62	Detects whether there is a looseness or faults in the connections of the cable/socket/connector elements of passenger information system.	B.2.14	2.2	P1
BY.63	Checks whether the screen/panel/external routes of the passenger information system work properly.	B.2.14	2.2	P1
BY.64	Checks the audibility of the announcements according to the reference values.	B.2.14	2.2	P1
BY.65	Tests the operation of the passenger compartment emergency intercom units.	B.2.14	2.2	P1
BY.66	Fixes the faults related to the passenger information system within his/her authority.	B.2.14	2.1 2.2	P1
	Explains by showing how to fix possible errors that may occur in the passenger information system.	B.2.14	2.1 2.2	T2
BY.67	Explains by showing how the corrections are made about the errors related to the passenger information system.	B.2.14	2.1 2.2	P2
TRAIN CONTROL AND MANAGEMENT SYSTEM MAINTENANCE/REPAIR				

No	Skill and Competency Statement	UMS Related Section	Sub Learning Outcome	Assessment Tool
BY.68	Checks the conformity of the connections of the train control and management system according to the reference values.	B.2.16	2.2	P1
BY.69	Detects whether there is damage in the electrical witing of train control and management system.	B.2.16	2.2	P1
BY.70	Checks the conformity of the input and output units of the TCMS system according to the reference values.	B.2.16	2.2	P1
BY.71	Tests the operation of driver fault notification screen/area.	B.2.16	2.2	P1
BY.72	Examines and evaluates the faults records of the train control and management system.	B.2.16	2.1 2.2	P1
BY.73	Fixes the faults related to the train control and management system within his/her authority.	B.2.16	2.1 2.2	P1
VEHICLE MAINTENANCE TERMINALS SYSTEM MAINTENANCE/REPAIR				
BY.74	Checks the conformity of the vehicle maintenance terminals according to the reference values.	B.2.17	2.2	P1
BY.75	Fixes the faults related to the vehicle maintenance terminals system within his/her authority.	B.2.17	2.1 2.2	P1
BY.76	Cleans the vehicle maintenance terminals.	B.2.17	2.2	P1
EVENT RECORDING SYSTEM MAINTENANCE/REPAIR				
BY.77	Checks the conformity of the equipment of the event recorder system according to the reference values.	B.2.18	2.2	P1
BY.78	Checks the conformity of the electrical cables in the event recorder system according to the reference values.	B.2.18	2.2	P1
BY.79	Fixes the faults related to the event recorder system within his/her authority.	B.2.18	2.1 2.2	P1
SUBFRAME AND FITTINGS MAINTENANCE/REPAIR				
	Explains the assembly/disassembly of the equipment on the subframe by showing them on the subframe.	B.2.20	2.2	T2
BY.80	Makes the assembly/disassembly of the equipment in the subframe.	B.2.20	2.1 2.2	P2
BY.81	Checks the conformity of the electrical equipment in the subframe according to the reference values.	B.2.20	2.2	P1
BY.82	Fixes the faults related to the subframe connections within his/her authority.	B.2.20	2.1 2.1	P1
PASSENGER SERVICE UNITS MAINTENANCE/REPAIR				
BY.83	Checks the conformity of the electrical equipment of the Passenger Service Units according to the reference values.	B.2.21	2.2	P1

No	Skill and Competency Statement	UMS Related Section	Sub Learning Outcome	Assessment Tool
BY.84	Fixes the faults related to the passenger service units within his/her authority.	B.2.21	2.1 2.2	P1
VEHICLE INTERIOR AND EXTERIOR LIGHTING SYSTEM MAINTENANCE/REPAIR				
BY.85	Tests the functionality of the vehicle interior and exterior lighting system.	B.2.22	2.2	P1
BY.86	Corrects the malfunctions related to the vehicle interior/exterior lighting system within his/her authority.	B.2.22	2.1 2.2	P1
BY.87	Makes replacement of headlight, lamp, bulb	B.2.22	2.1 2.2	P1
GANGWAY AND ARTICULATION ZONE MAINTENANCE/REPAIR				
BY.88	Checks the conformity of the cables in the Gangway and Articulation Zone according to the reference values.	B.2.23	2.2	P1
BY.89	Checks visually the conformity of the fasteners in the Gangway and Articulation Zone according to the reference values.	B.2.23	2.2	P1
BY.90	Fixes the faults related to the Gangway and Articulation Zone within his/her authority.	B.2.23	2.1 2.2	P1
TRANSFORMER MAINTENACE/REPAIR				
BY.91	Checks the functionality of the transformer according to the reference values.	B.2.29	2.2	P1
BY.92	Fixes the faults related to the transformer within his/her authority.	B.2.29	2.1 2.2	P1
BY.93	Transmits vehicle electrical, electronic systems and equipment faults, which are not authorized to be fixed by him/her, to the relevant unit.	B.2.1-10 B.2.12-14 B.2.16-18 B.2.20-23 B.2.29	2.1 2.2	P1
OPERATIONS AFTER MAINTENANCE/REPAIR				
BY.94	Performs the function tests of the system that are maintained and repaired.	B.3.1	3.1	P1
BY.95	Notifies the supervisor that the maintenance and repair works are done.	B.3.2	3.2	P1
BY.96	Cleans the tools and equipment at the end of the work.	B.3.2	3.2	P1
BY.97	Records the work done and materials consumed into the relevant forms.	B.3.3	3.3	P1

(*) Critical steps that must be accomplished in the performance exams.

21UY0…-4/B2: MECHANICAL SYSTEM AND UNIT MAINTENANCE/REPAIR QUALIFICATION UNIT

1	**QULIFICATION UNIT NAME**	Mechanical system and Unit Maintenance/Repair
2	**REFERENCE CODE**	21UY0…-4/B2
3	**LEVEL**	4
4	**CREDIT VALUE**	
5	**A) RELEASE DATE**	-
	B) REVISION NO	01
	C) REVISION DATE	-
6	**THE PROFESSIONAL STANDARD THAT RESOURCES THE QUALIFICATION UNIT**	
21UMS0…-4/Rail System Vehicles Maintainer and Repairer (Level 4)		
7	**LEARNING OUTCOMES**	

Learning Outcome 1: Implements OHS, environmental protection and quality requirements.

Sub Learning Outcomes:
1.1: Implements OHS precautions in the working area.
1.2: Implements precautions to reduce environmental risks.
1.3: Applies the quality requirements of the work.

Learning Outcome 2: Performs mechanical system and unit maintenance and repair.

Sub Learning Outcomes:
2.1: Prepares necessary equipment, hand tools and materials.
2.2: Performs maintenance and repair of mechanical systems, units and equipment.

Learning Outcome 3: Performs operations after maintenance/repair.

Sub Learning Outcomes:
3.1: Performs tests of mechanical systems and equipment.
3.2: Keeps records of maintenance and repair works.

8	**ASSESSMENT AND EVALUATION**

8 a) Theoretical Exam

Multiple Choice Exam (T1): The theoretical exam for the B2 proficiency unit is carried out according to the "Information" checklist specified in Annex B2-2 (T1). In the theoretical exam, candidates must be taken a 4-option multiple-choice exam with at least 25 (twenty-five) questions, each of which is worth equal points. In the exam organized with multiple choice questions, no points are deducted from the questions answered incorrectly. In the exam, candidates are given an average of two (2) minutes for each question. The candidate who answers at least 70% of the questions correctly in the written exam is considered successful. Exam questions should measure all the information statements specified in Annex B2-2 (T1), which are intended to be measured by the theoretical exam in this unit.
Oral Practice (T2): Oral practice for the B2 proficiency unit is carried out according to the "Information" checklist specified in Annex B2-2 (T2). Oral practice should be applied together with the performance-based exam (P2). Oral practice is intended for the candidate to demonstrate his/her skills and competence in practice only in the studies carried out with the team members and is not considered as a

theoretical exam score.
8 b) Performance-based Exam
Performance exam (P1): The performance-based exam for the B2 qualification unit is carried out according to the skills and competencies specified in the "Skills and Competencies" checklist (P1) in Annex B2-2. The critical steps that must be accomplished by the candidate are determined in the skills and competencies checklist, and the exam is conducted in a real or realistic working environment. Oral Performance exam (P2): Evaluation of skills and competencies specified in the "Skills and Competencies" checklist (P2) in Annex B2-2; It is carried out by the evaluator by asking the candidate the questions that are specified as T2 in the "a. Information" checklist in Annex B2-2, to demonstrate the skills and competence of the candidate in practice. The skills and competencies checklist identifies critical steps that must be accomplished by the candidate. With the questions directed to the candidates, the candidates perform the skills and competencies specified in the "Skills and Competencies" checklist (P2) in a real or realistic working environment. P1 and P2 performance exams are held and evaluated together. In order for the candidate to be successful in the performance exam, he/she must show at least 80% success in the overall exam, provided that he/she performs successfully in all of the critical steps.
8 c) Other Conditions Regarding Assessment and Evaluation
The candidate must be successful in T1, T2 and P1 exams in order to be considered successful in the said unit. The validity period of the exams foreseen for the unit is 1 year from the date of success of the exam. The time difference between the exam dates achieved in order to obtain the unit cannot exceed one year. The validity period of qualification units is 2 years from the date of achievement of the unit. The exam is terminated if the candidate behaves in a way that endanger the safety of himself and others.

9	**INSTITUTION(S) DEVELOPING THE QUALIFICATION UNIT**	VQA Working Group
10	**SECTOR COMMITTEE VERIFYING THE QUALIFICATION UNIT**	VQA Transport, Logistics and Communications Sector Committee

QUALIFICATION UNIT APPENDICES

APPENDIX [B1]-1: Information on Recommended Training for Acquisition of the Qualification Unit

1. OHS and Environmental Protection
   - 1.1. Implementing occupational health and safety instructions in business processes
   - 1.2. Taking precautions against dangers and risks in the working environment
   - 1.3. Selecting and using personal protective equipment in business processes
   - 1.4. Using health and safety signs in business processes
   - 1.5. Safe use of tools and equipment in business processes
   - 1.6. Implementing emergency instructions in business processes
   - 1.7. Implementing environmental protection guidelines in business processes
2. Quality Requirements
   - 2.1. Failures and malfunctions that occurs in business processes
   - 2.2. Record keeping and reporting in business processes
   - 2.3. Applications of business quality requirements
3. Rail System Vehicles Mechanical Parts Maintenance and Repair
   - 3.1. Rail system vehicles mechanical parts and features
   - 3.2. Rail system vehicles mechanical parts maintenance and repair catalogues

3.3. Signs and symbols in the maintenance and repair catalogues of the mechanical parts of rail system vehicles
3.4. Machinery, equipment and tools used in maintenance and repair of mechanical parts of rail system vehicles
3.5. Test and measurement devices used in maintenance and repair of mechanical parts of rail system vehicles
3.6. Rail system vehicles mechanical parts maintenance and repair
3.7. Points to be considered in the maintenance and repair of mechanical parts of rail system vehicles
3.8. Record keeping and reporting in maintenance and repair processes of mechanical parts of the rail system vehicles

APPENDIX [B1]-2: Checklist to be used in the Assessment and Evaluation of the Qualification Unit

a) INFORMATION

No	Information Statement	UMS Related Section	Sub Learning Outcomes	Assessment Tool
BG.1	Explains the maintenance/repair methods and techniques according to the characteristics of the vehicle to be mechanically repaired.	B.1.1	2.1	T1
BG.2	Explains the signs and symbols related to the mechanical systems of the rail system vehicles.	B.1.1-3	2.1	T1
BG.3	Distinguishes the tools and equipment used in the maintenance and repair of the mechanical systems of the rail system vehicles.	B.1.1 B.1.3	2.1	T1
BG.4	Lists the materials used in the maintenance and repair of the mechanical systems of the rail system vehicles.	B.1.1 B.1.3	2.1	T1
BG.5	Defines the mechanical equipment in the brake system.	B.2.1	2.2	T1
BG.6	Explains the function s of mechanical equipment in the brake system.	B.2.1	2.2	T1
BG.7	Explains how to assemble/disassemble the traction motor over the bogie.	B.2.2	2.2	T1
BG.8	Lists the maintenance-repair activities of power transmission equipment.	B.2.2	2.2	T1
BG.9	Defines power transmission equipment.	B.2.2	2.2	T1
BG.10	Defines the passenger door mechanical equipment.	B.2.3	2.2	T1
BG.11	Lists the passenger door mechanical equipment.	B.2.3	2.2	T1
BG.12	Explains the mechanical maintenance/repair of passenger doors.	B.2.3	2.2	T1
BG.13	Defines bogie equipment.	B.2.4	2.2	T1
BG.14	Lists bogie equipment.	B.24	2.2	T1
BG.15	Lists the steps to be taken in the assembly and disassembly of the bogie.	B.24	2.2	T1

No	Information Statement	UMS Related Section	Sub Learning Outcomes	Assessment Tool
BG.16	Explains the assembly/disassembly of the bogie equipment.	B.24	2.2	T1
BG. 17	Defines the mechanical equipment of the coupling system.	B.2.4	2.2	T1
BG. 18	Lists the operation steps in assembly/disassembly of the coupling.	B.2.4	2.2	T1
BG. 19	Lists the current collector/energy receiver systems.	B.2.10	2.2	T1
BG.20	Lists the steps of assembly/disassembly of the current collector/energy receiver system.	B.2.10	2.2	T1
BG. 21	Lists pneumatic/hydraulic operating systems.	B.2.11	2.2	T1
BG. 22	Explains the functions of the bellows and articulation area.	B.2.23	2.2	T1
BG. 23	Explains the flat wheel, vibration, noise, etc. control processes under operation.	B.2.28	2.2	T1
BG.24	Lists possible malfunctions in the mechanical equipment of the rail system vehicles.	B.2.1-4 B.2.8-9 B.2.11 B.2.19-20 B.2.23	2.2	T1
BG.25	Explains the causes of the malfunctions in the mechanical equipment of the rail system vehicles and how they are fixed.	B.2.1-4 B.2.8-9 B.2.11 B.2.19-20 B.2.23	2.2	T1

b) SKILL AND COMPETENCIES

No	Skill and Competency Statement	UMS Related Section	Sub learning Outcomes	Assessment Tool
*BY.1	Uses personal protective equipment (Bump cap, gloves, work clothes, work shoes, etc.) suitable for the job.	A.1.3	1.1	P1
BY.2	Places warning signs and signs about maintenance and repair in the work area.	A.1.2	1.1	P1
BY.3	Separates the wastes generated in the working environment and collects them in defined containers.	A.2.4	1.2	P1
BY.4	Prepares tools and equipment to be used in maintenance and repair work.	B.1.2 B.1.3	2.1	P1
*BY.5	Takes electrical and mechanical safety precautions of the equipment to be maintained.	B.1.1	2.1	P1
	BRAKE SYSTEM MAINTENANCE/REPAIR			
BY.6	Checks the conformity of the brake system elements and related connections according to the reference values.	B.2.1	2.2	P1

No	Skill and Competency Statement	UMS Related Section	Sub learning Outcomes	Assessment Tool
BY.7	Detects cracks, scratches, damage etc. on friction surfaces (brake disc, SABO,etc.)	B.2.1	2.2	P1
BY.8	Measures the wear amount of brake pads.	B.2.1	2.2	P1
BY.9	Replaces the brake pads which are out of reference values.	B.2.1	2.1 2.2	P1
BY.10	Performs the functionality check of the brake system in accordance with the instruction.	B.2.1	2.2	P1
BY.11	Fixed the errors that he/she detects within his/her authority.	B.2.1	2.1 2.2	P1
MECHANICAL POWER TRANSMISSION EQUIPMENT MAINTAINANCE/REPAIR				
BY.12	Checks the compliance of mechanical power transmission equipment and related connections according to the reference values.	B.2.2	2.2	P1
BY.13	Checks the conformity of the oil level of Gear Box according to the reference values.	B.2.2	2.2	P1
BY.14	Detects whether is there is an oil leak in the Gear Box.	B.2.2	2.2	P1
BY.15	Fixes the faults that he/she detected within his/her authority.	B.2.2	2.1 2.2	P1
DOOR SYSTEM MAINTENANCE/REPAIR				
BY.16	Tests the functionality of the cover/doors.	B.2.3	2.2	P1
BY.17	Checks the compliance of the fasteners of the cover/doors according to the reference values.	B.2.3	2.2	P1
BY.18	Checks the compliance of the settings of the cover/doors according to the reference values.	B.2.3	2.2	P1
BY.19	Fixes the malfunctions related to the cover/doors that he/she detects within his/her authority.	B.2.3	2.1 2.2	P1
BY.20	Checks the compliance of the door rubbers according to the reference values.	B.2.3	2.2	P1
BY.21	Tests the functionality of the emergency brake/door release levers.	B.2.3	2.2	P1
BY.22	Performs the jam protection test of the Passenger Door.	B.2.3	2.2	P1
BY.23	Performs the isolation/ bypass operations of the Passenger Door.	B.2.3	2.2	P1
BY.24	Performs the maintenance of the cover/doors according to the relevant maintenance manuals.	B.2.3	2.1 2.2	P1
BY.25	Fixes the malfunctions related to the cover/doors that he/she detects within his/her authority.	B.2.3	2.1 2.2	P1

No	Skill and Competency Statement	UMS Related Section	Sub learning Outcomes	Assessment Tool
BOGIE SYSTEM MAINTENANCE/REPAIR				
BY.26	Checks the compliance of bogie equipment according to the reference values.	B.2.4	2.2	P1
BY.27	Detects whether there is a damage on the bogie chassis.	B.2.4	2.2	P1
BY.28	Checks the conformity of the mechanical connection points on the bogie frame.	B.2.4	2.2	P1
BY.29	Detects damage and oil leakage on the shock absorbers (dampers) on the bogie.	B.2.4	2.2	P1
BY.30	Makes the height adjustment (levelling adjustment) of the Wagon/Module above the rail level. (Door sill height adjustment)	B.2.4	2.2	P1
BY.31	Checks for a damage on the primary and secondary bogie suspensions.	B.2.4	2.2	P1
BY.32	Checks the compliance of the wheel bearing surface according to the reference values.	B.2.4	2.2	P1
BY.33	Measures the wheel flange (boden) height and thickness with the measuring apparatus.	B.2.4	2.1 2.2	P1
	Explains by showing how corrections related to the faults that are out of tolerance in wheel measurement are made.	B.2.4	2.1 2.2	T2
BY.34	Carries out the corrective activities regarding the faults that are out of tolerance in the wheel measurement.	B.2.4	2.1 2.2	P2
BY.35	Performs the maintenance of traction motor cooling system according to the relevant instruction.	B.2.4	2.1 2.2	P1
BY.36	Performs the relevant lubrication operations according to the maintenance instructions.	B.2.4	2.1 2.2	P1
BY.37	Fixes the faults related to the bogie system that he/she detects within his/her authority.	B.2.4	2.1 2.2	P1
AIR CONDITIONING SYSTEM MAINTENANCE/REPAIR				
BY.38	Checks the compliance of the Air Conditioning System according to the reference values.	B.2.8	2.2	P1
BY.39	Performs the functionality test of the Air Conditioning System.	B.2.8	2.2	P1
BY.40	Fixes the faults related to the air-conditioning system that he/she detects within his/her authority.	B.2.8	2.1 2.2	P1
VEHICLE PUSH PULL SYSTEM (COUPLE) MAINTENANCE/REPAIR				
BY.41	Checks the compliance of Vehicle Push Pull System according to the reference values.	B.2.9	2.2	P1
BY.42	Performs the cleaning and lubrication activities of the Vehicle Push Pull System equipment.	B.2.9	2.2	P1

No	Skill and Competency Statement	UMS Related Section	Sub learning Outcomes	Assessment Tool
BY.43	Detects rust and corrosion on Vehicle Push Pull System equipment.	B.2.9	2.2	P1
BY.44	Tests the functionality of the Vehicle Push Pull System.	B.2.9	2.2	P1
BY.45	Fixes the faults related to the Push Pull System that he/she detects within his authority.	B.2.9	2.1 2.2	P1
PNEUMATIC/HYDRAULIC SYSTEM MAINTENANCE/REPAIR				
BY.46	Checks the compliance of the pneumatic/hydraulic system equipment according to the reference values.	B.2.11	2.2	P1
BY.47	Performs the maintenance and repair of the pneumatic/hydraulic system in accordance with the relevant maintenance and repair instructions.	B.2.11	2.1 2.2	P1
BY.48	Performs the tests related to the detecting pneumatic/hydraulic system according to the maintenance and repair instructions.	B.2.11	2.1 2.2	P1
BY.49	Fixes the faults related to the detecting pneumatic/hydraulic system within his/her authority.	B.2.11	2.1 2.2	P1
CAR BODY AND SIDE EQUIPMENT MAINTENANCE/REPAIR				
BY.50	Detects whether there is a damage on the roof, interior partitions, floor, under and outside of the vehicle.	B.2.19	2.2	P1
BY.51	Checks the compliance of the vehicle windows to the reference values.	B.2.19	2.2	P1
BY.52	Tests the functionality of the windshield wiper.	B.2.19	2.2	P1
BY.53	Checks the conformity of mechanical equipment of the driver section according to the reference values.	B.2.19	2.2	P1
BY.54	Checks the functionality of vehicle drainage system according to the instructions.	B.2.19	2.2	P1
BY.55	Checks the compliance of the cabinets inside, outside, side, under and above the vehicle to the reference values.	B.2.19	2.2	P1
BY.56	Checks the functionality of the door locks of the cabinets inside, outside, side, under and above the vehicle.	B.2.19	2.2	P1
BY.57	Checks the compliance of the in-vehicle emergency hammers to the reference values.	B.2.19	2.2	P1
BY.58	Tests the functionality of the passenger emergency brakes.	B.2.19	2.2	P1
BY.59	Detects the damage of the passenger handles.	B.2.19	2.2	P1
BY.60	Checks the compliance of the passenger handle pipes to the reference values.	B.2.19	2.2	P1

No	Skill and Competency Statement	UMS Related Section	Sub learning Outcomes	Assessment Tool
BY.61	Detects the damage of the passenger seats.	B.2.19	2.2	P1
BY.62	Fixes the malfunctions related to the car body and side equipment system that he/she detects within his/her authority.	B.2.19	2.1 2.2	P1
LOWER CHASSIS AND CONNECTIONS MAINTENANCE/REPAIR				
BY.63	Checks the compliance of the lower chassis (subframe) and its connections to the reference values.	B.2.20	2.2	P1
BY.64	Fixes the faults related to the subframe connections that he/she detects within his/her authority.	B.2.20	2.1 2.2	P1
GANGWAY (BELLOWS) AND ARTICULATION ZONE MAINTENANCE/REPAIR				
BY.65	Checks the conformity of the fasteners in the Bellows and Articulation Zone according to the reference values.	B.2.23	2.2	P1
BY.66	Performs the maintenance and repair of the Bellows and Articulation Zone in accordance with the relevant maintenance and repair instructions.	B.2.23	2.1 2.2	P1
BY.67	Fixes the faults related to the bellows and articulation zone that he/she detects within his/her authority.	B.2.23	2.1 2.2	P1
BY.68	Forwards the mechanical system and equipment faults, which are not within his/her authority, to be corrected in the relevant unit.	B.2.1-4 B.2.8-9 B.2.11 B.2.19-20 B.2.23	2.1 2.2	P1
OPERATIONS AFTER MAINTENANCE/REPAIR				
BY.69	Performs the function tests of the maintenance and repair system.	B.3.1	3.1	P1
BY.70	Notifies the supervisor that the maintenance and repair works are completed.	B.3.2	3.2	P1
BY.71	Cleans the equipment and tools at the end of the job.	B.3.2	3.2	P1
BY.72	Records the works done and the materials consumed on the relevant forms.	B.3.3	3.3	P1

(*) Critical steps that must be accomplished in the performance exams.

21UY0…-4/B3: DIESEL ENGINE MAINTENANCE/REPAIR QUALIFICATION UNIT

1	**QUALIFICATION UNIT NAME**	Diesel Engine Maintenance/Repair
2	**REFERENCE CODE**	21UY0…-4/B3
3	**LEVEL**	4
4	**CREDIT VALUE**	
5	**A) RELEASE DATE**	-
	B) REVISION NO	01
	C) REVISION DATE	-
6	**THE PROFESSIONAL STANDARD THAT RESOURCES THE QUALIFICATION UNIT**	
21UMS0…-4/ Rail System Vehicles Maintainer and Repairer (Level 4)		
7	**LEARNING OUTCOMES**	

Learning Outcome 1: Implements OHS, environmental protectcion and quality requirements.

Sub-learning Outcomes:
1.1: Implements OHS precautions in the working area.
1.2: Implements precautions to reduce environmental risks.
1.3: Applies the quality requirements of the work.

Learning Outcome 2: Performs mechanical system and unit maintenance and repair.

Sub-learning Outcomes:
2.1: Prepares necessary equipment, hand tools and materials.
2.2: Performs the maintenance and repair of diesel engine.

Learning Outcome 3: Performs operations after maintenance/repair.

Sub-learning Outcomes:
3.1: Performs test of diesel engine.
3.2: Keeps records of maintenance and repair works.

8	**ASSESSMENT AND EVALUATION**

8 a) Theoretical Exam

Multiple Choice Exam (T1): The theoretical exam for the B3 proficiency unit is carried out according to the "Information" checklist specified in Annex B3-2 (T1). In the theoretical exam, candidates must be taken a 4-option multiple-choice exam with at least 25 (twenty-five) questions, each of which is worth equal points. In the exam organized with multiple choice questions, no points are deducted from the questions answered incorrectly. In the exam, candidates are given an average of two (2) minutes for each question. The candidate who answers at least 70% of the questions correctly in the written exam is considered successful. Exam questions should measure all the information statements specified in Annex B3-2 (T1), which are intended to be measured by the theoretical exam in this unit.
Oral Practice (T2): Oral practice for the B3 proficiency unit is carried out according to the "Information" checklist specified in Annex B3-2 (T2). Oral practice should be applied together with the performance-based exam (P2). Oral practice is intended for the candidate to demonstrate his/her skills and competence in practice only in the studies carried out with the team members and is not considered as a

theoretical exam score.

8 b) Performance-based Exam

Performance exam (P1): The performance-based exam for the B3 proficiency unit is carried out according to the skills and competencies specified in the "Skills and Competencies" checklist (P1) in Annex B3-2. The critical steps that must be accomplished by the candidate are determined in the skills and competencies checklist, and the exam is conducted in a real or realistic working environment.

Oral Performance exam (P2): Evaluation of skills and competencies specified in the "Skills and Competencies" checklist (P2) in Annex B3-2; Annex B3-2 "a. Information" is carried out by asking the candidate by the evaluator the questions, which are specified as T2 in the checklist, to show the candidate's skills and competencies in practice.

In the skills and competencies checklist, it is identified the critical steps that must be accomplished by the candidate. With the questions directed to the candidates, the skills and competencies specified in the "Skills and Competencies" checklist (P2) are carried out in a real or realistic working environment. P1 and P2 performance exams are held and evaluated together.

In order for the candidate to be successful in the performance exam, he/she must show at least 80% success in the overall exam, provided that he/she performs successfully in all of the critical steps.

8 c) Other Conditions Regarding Assessment and Evaluation

The candidate must be successful in T1, T2 and P1 exams in order to be considered successful in the said unit.

The validity period of the exams foreseen for the unit is 1 year from the date of success of the exam. The time difference between the exam dates achieved in order to obtain the unit cannot exceed one year.

The validity period of qualification units is 2 years from the date of achievement of the unit. The exam is terminated if the candidate behaves in a way that endanger the safety of himself and others.

9	**INSTITUTION(S) DEVELOPING THE QUALIFICATION UNIT**	VQA Working Group
10	**SECTOR COMMITTEE VERIFYING THE QUALIFICATION UNIT**	VQA Transport, Logistics and Communications Sector Committee

APPENDIX [B1]-1: Information on Recommended Training for Acquisition of the Qualification Unit

1. OHS and Environmental Protection
   - 1.1. Implementing occupational health and safety instructions in business processes
   - 1.2. Taking precautions against dangers and risks in the working environment
   - 1.3. Selecting and using personal protective equipment in business processes
   - 1.4. Using health and safety signs in business processes
   - 1.5. Safe use of tools and equipment in business processes
   - 1.6. Implementing emergency instructions in business processes
   - 1.7. Implementing environmental protection guidelines in business processes
2. Quality Requirements
   - 2.1. Failures and malfunctions that occur in business processes
   - 2.2. Record keeping and reporting in business processes
   - 2.3. Applications of business quality requirements
3. Rail System Vehicles Diesel Engine Maintenance and Repair
   - 3.1. Rail system vehicles diesel engine equipment and features
   - 3.2. Rail system vehicles diesel engine maintenance and repair catalogues
   - 3.3. Signs and symbols in the maintenance and repair catalogues of diesel engine in rail system vehicles

3.4. Machinery, equipment and tools used in rail system vehicles diesel engine maintenance and repair
3.5. Test and measurement devices used in rail system vehicles diesel engine maintenance and repair
3.6. Rail system vehicles diesel engine maintenance and repair
3.7. Points to be considered in the maintenance and repair of diesel engine rail system vehicles
3.8. Record keeping and reporting in rail system vehicles diesel engine maintenance and repair processes.

APPENDIX [B1]-2: Checklist to be used in the Assessment and Evaluation of the Qualification Unit

a) INFORMATION

No	Information Statement	UMS Related section	Sub-learning Outcomes	Assessment Tool
BG.1	Explains the maintenance/repair methods and techniques according to the characteristics of the vehicle to be repaired for the diesel engine.	B.1.2	2.1	T1
BG.2	Explains the tools and equipment used in diesel engine maintenance and repair of rail system vehicles.	B.1.1 B.1.3	2.1	T1
BG.3	Knows the materials used in diesel engine maintenance and repair of rail system vehicles.	B.1.1 B.1.3	2.1	T1
BG.4	Explains the working principle of diesel engine intake and exhaust equipment.	B.2.11	2.2	T1
BG.5	Lists the parts of intake and exhaust equipment.	B.2.11	2.2	T1
BG.6	Explains the working principle of diesel engine fuel equipment.	B.2.12	2.2	T1
BG.7	Sorts fuel equipment parts.	B.2.12	2.2	T1
BG.8	Explains the working principle of diesel engine cooling equipment.	B.2.23	2.2	T1
BG.9	Sorts the cooling equipment parts.	B.2.23	2.2	T1
BG.10	Explains the working principle of diesel engine lubrication equipment.	B.2.23	2.2	T1
BG.11	Sorts the lubrication equipment parts.	B.2.23	2.2	T1
BG.12	Explains the properties that motor lubricating oils should have.	B.2.23	2.2	T1
BG.13	Lists the diesel engine parts.	B.2.23	2.2	T1
BG.14	Explains the cylinders jackets and liners, pistons, piston rods and rings.	B.2.23	2.2	T1
BG.15	Explains the working principal of crankshaft, camshaft and rocker mechanism.	B.2.23	2.2	T1
BG.16	Lists the parts that make up the cylinder head.	B.2.23	2.2	T1

No	Information Statement	UMS Related section	Sub-learning Outcomes	Assessment Tool
BG.17	Explains the working principle of diesel engine command-control system.	B.2.23	2.2	T1
BG.18	Lists the duties of the diesel engine regulator.	B.2.23	2.2	T1
BG.19	Explains the concept of engine speed.	B.2.23	2.2	T1
BG.20	Explains the working principle of hydraulic transmission.	B.2.20	2.2	T1
BG.21	Explains the working principle of axle gearboxes.	B.2.20	2.2	T1
BG.22	Explains the working principle of hydrostatic system.	B.2.11	2.2	T1
BG.23	Explains working principle of auxiliary power system.	B.2.13	2.2	T1
BG.24	Lists possible malfunctions in diesel engines and equipment of rail system vehicles.	B.2.2 B.2.11-13 B.2.20 B.2.23	2.2	T1
BG.25	Explains the causes of malfunctions in diesel engines and equipment of rail system vehicles and how to fix them.	B.2.2 B.2.11-13 B.2.20 B.2.23	2.2	T1

c) SKILL AND COMPETENCIES

No	Skill and Competency Statement	UMS Related Section	Sub-learning Outcomes	Assessment Tool
*BY.1	Uses personal protective equipment (bump cap, gloves, work clothes, work shoes, etc.) suitable for the job.	A.1.3	1.1	P1
BY.2	Places warning signs and signs about maintenance and repair in the work area.	A.1.2	1.1	P1
BY.3	Separates the wastes generated in the working environment and collects them in defined containers.	A.2.4	1.2	P1
BY.4	Prepares tools and equipment to be used in maintenance and repair work.	B.1.3	2.1	P1
BY.5	Takes the electrical safety precautions of the diesel engine vehicle to be serviced.	B.2.1	2.1	P1
BY.6	Checks the compliance of the transmission system to the reference values.	B.2.11	2.2	P1
BY.7	Changes transmission oil and oil filter.	B.2.11	2.2	P1
	Explains how the transmission system works by showing it on the transmission.	B.2.11	2.2	T2

No	Skill and Competency Statement	UMS Related Section	Sub-learning Outcomes	Assessment Tool
BY.8	Performs the maintenance and repair of the transmission system according to the instructions.	B.2.11	2.2	P2
	Explains by showing how speed and power control elements work.	B.2.11	2.2	T2
BY.9	Performs the function test of the speed and power control system.	B.2.11	2.2	
BY.10	Controls the oil of the diesel engine regulator according to the reference values..	B.2.11	2.2	P1
BY.11	Fixes the faults related to the speed and power control systems that he/she detects within his/her authority.	B.2.11	2.2	P1
	Explains by showing how hydrostatic system circuit elements work.	B.2.11	2.2	T2
BY.12	Controls the hydrostatic system according to the reference values.	B.2.11	2.2	P2
BY.13	Performs the functionality test of the hydrostatic system.	B.2.11	2.2	P2
BY.14	Controls the hydraulic oil level according to reference values.	B.2.11	2.2	P2
BY.15	Fixes the malfunctions related to the hydrostatic system that he/she detects within his/her authority.	B.2.11	2.2	P2
	Explains by showing how the compressed air generation elements work.	B.2.11	2.2	T2
BY.16	Controls the compressed air generation system according to the reference values.	B.2.11	2.2	P2
BY.17	Performs the functionality test of the compressed air generation system.	B.2.11	2.2	P2
BY.18	Performs maintenance and repair of the compressed air generation system according to the instructions.	B.2.11	2.2	P2
	Explains by showing how the auxiliary circuit elements using compressed air work.	B.2.11	2.2	T2
BY.19	Performs maintenance and repair of auxiliary circuit elements using compressed air according to the instructions.	B.2.11	2.2	P2
BY.20	Fixes the malfunctions related to the compressed air generation system that he/she detects within his/her authority.	B.2.11	2.2	P2
	Explains by showing how the auxiliary power system elements work.	B.2.13	2.2	T2
BY.21	Controls the auxiliary power system according to the reference values.	B.2.13	2.2	P2

No	Skill and Competency Statement	UMS Related Section	Sub-learning Outcomes	Assessment Tool
BY.22	Performs the functionality test of the auxiliary power system.	B.2.13	2.2	P2
BY.23	Performs the maintenance and repair of the auxiliary power system according to the instructions.	B.2.13	2.2	P2
BY.24	Fixes the faults related to the auxiliary power system that he/she detects within his/her authority.	B.2.13	2.2	P2
	Explains by showing how the components of intake and exhaust equipment work.	B.2.11	2.2	T2
BY.25	Controls the intake and exhaust equipment according to the reference values.	B.2.11	2.2	P2
BY.26	Performs the functionality test of intake and exhaust equipment.	B.2.11	2.2	P2
BY.27	Performs maintenance and repair of the intake and exhaust equipment according to the instructions.	B.2.11	2.2	P2
BY.28	Fixes the malfunctions related to the intake and exhaust equipment that he/she detects within his/her authority.	B.2.11	2.2	P2
	Explains by showing how fuel equipment elements work.	B.2.12	2.2	T2
BY.29	Controls the fuel equipment according to the reference values.	B.2.12	2.2	P2
BY.30	Tests the functionality of the fuel equipment.	B.2.12	2.2	P2
BY.31	Performs maintenance and repair of fuel equipment according to the instructions.	B.2.12	2.2	P2
BY.32	Fixes the faults related to the fuel equipment that he/she detects within his/her authority.	B.2.12	2.2	P2
	Explains by showing how cooling equipment elements work.	B.2.23	2.2	T2
BY.33	Controls the cooling equipment according to the reference values.	B.2.23	2.2	P2
BY.34	Tests the functionality of the cooling equipment.	B.2.23	2.2	P2
BY.35	Performs maintenance and repair of cooling equipment according to the instructions.	B.2.23	2.2	P2
BY.36	Fixes the faults related to the cooling equipment that he/she detects within his/her authority.	B.2.23	2.2	P2
	Explains by showing how the lubrication elements work.	B.2.23	2.2	T2

No	Skill and Competency Statement	UMS Related Section	Sub-learning Outcomes	Assessment Tool
BY.37	Checks the lubrication equipment according to the reference values.	B.2.23	2.2	P2
BY.38	Performs the functionality test of lubrication equipment.	B.2.23	2.2	P2
BY.39	Performs maintenance and repair of the lubricating equipment according to the instructions.	B.2.23	2.2	P2
BY.40	Fixes the faults related to the lubrication equipment that he/she detects within his/her authority.	B.2.23	2.2	P2
	Explain by showing how non-engine parts work.	B.2.23	2.2	T2
BY.41	Checks the non-engine parts according to the reference values.	B.2.23	2.2	P2
BY.42	Performs functionality test of non-engine parts.	B.2.23	2.2	P2
BY.43	Performs maintenance and repair of non-engine parts according to the instructions.	B.2.23	2.2	P2
BY.44	Corrects the faults related to the non-engine equipment parts that he/she detects within his/her authority.	B.2.23	2.2	P2
BY.45	Transmits the diesel engine faults that are not within his/her authority to be fixed, to the relevant unit.	B.2.2 B.2.11-13 B.2.20 B.2.23	2.1 2.2	P1
OPERATIONS AFTER MAINTENANCE/REPAIR				
BY.46	Performs the functionality tests of diesel engine that has been repaired.	B.3.1	3.1	P1
BY.47	Notifies the supervisor that the maintenance and repair works are completed.	B.3.2	3.2	P1
BY.48	Cleans the tools and equipment at the end of the work.	B.3.2	3.2	P1
BY.49	Records the work done and the materials consumed on the relevant forms.	B.3.3	3.3	P1

(*) Critical steps that must be accomplished in the performance exams.

COMPETENCY APPENDICES

APPENDIX 1: Members of the National Qualification Preparation Team and Technical Working Group

No	Name-Surname	Education* (Date – Educational Institution/Department Name)	Experience* (Date – Workplace – Title)
1.	Cüneyt TÜRKKUŞU	1995, TCDD Eskisehir Vocational High School 2000, Gazi Unv. Industrial Technology Education, Bachelor's degree	2010 – still continue, TCDD, In-Service Training Manager 2016 – 2018, Eskişehir Technical University, Instructor (Rail Systems) 2004 – 2010, TCDD, In-Service Training Program Development and Trainer 1996 – 2004, TCDD, Sürveyan, Railway Signalling Maintenance
2.	Kamil Esen	1998, Railway Vocational High School 2004, Cumhuriyet University, Mechanical Associate Degree 2009, Anadolu University, Economics, Bachelor's Degree 2017, Istanbul University, Industrial Engineering, Bachelor's Degree	2011-Still continue, TCDD Taşımacılık Inc., Traction Branch Teacher, 2016 – 2018, Eskişehir Technical University, Instructor (Rail Systems) 1999-2011 TCDD, Machinist
3.	Emin Ekici	1997, Railway Vocational High School 2000, Kocatepe University, Associate Degree 2005, Anadolu University, Public Administration, Bachelor's degree	2007-Still continue, TCDD Taşımacılık Inc., Traction Branch Teacher 2010-2012 Gazi Vocational and Technical Anatolian High School, Teacher 2016 – 2018, Eskişehir Technical University, Instructor (Rail Systems) 1997-2007 TCDD, Machinist
4.	Çağdaş Görgülü	1997, Railway Vocational High School 2003, Anadolu University, Business Administration, Bachelor's degree 2008, Dumlupınar University, Construction, Bachelor's degree, 2016, Ahmet Yesevi University, Bachelor's degree	2017- Still continue, TCDD Taşımacılık Inc., Engineer-Quality and Certification Manager 2006-2017 Still continue, TCDD Taşımacılık Inc., Engineer 2011-2016 Railway Traffic Branch Teacher 2010-2012 Gazi Vocational and Technical Anatolian

			High School, Teacher 2016 – 2018, Eskişehir Technical University, Instructor (Rail Systems) 2009-2011 SAP Integration Module Analyst-Module Leader 2005-2007 Station Chief / Station Manager Assistant 1997-2005 Dispatcher
5.	**Dr. Kerim ÇOLAK**	**2013, New York University, Electrical Eng., Doctoral degree 2003, Gebze Technical University, Energy Systems Eng., Master's degree 1998, İTÜ, Electrical Eng., Bachelor's degree**	**2015-Still continue, Metro İstanbul, Training Chief 2013-2015, Metro İstanbul, R&D Engineer 2009-2013, New York University, Research Assistant 2005-2008, Metro İstanbul, System Safety Chief 1998-2005, Metro İstanbul, R&D Engineer**
6.	**Bayram AKÇAY**	**2018, Yıldız Technical University, Education Management and Supervision, Master's degree 1997, Ankara University, Library science**	**2007-Still continue, Metro İstanbul, Technical Training Specialist 2020-Still continue, Beykoz University, Lecturer (Rail Systems Management) 2016-2018, İETT, General Manager Education Consultant 2012-Still continue, TÜRKAK, Technical Expert-Auditor 2012-Still continue, VQA, Technical Expert-Auditor 1995-2007, BUGSAŞ-Ankaray, Technical Trainer**
7.	**Bilal ÖZCAN**	**2005 Trakya University, Faculty of Engineering and Architecture, Department of Mechanical Engineering**	**2018- Still continue, Metro İstanbul, - Metro Vehicle Mechanical Equipment Chief 2017-2018, Metro İstanbul, M3 Line Vehicle Maintenance Chief 2015-2017 Metro İstanbul, Metro Vehicle Heavy Maintenance Specialist Engineer 2010-2015, Metro İstanbul, Vehicle Maintenance Engineer**
8.	**Turgay KADIOĞLU**	**2020, Istanbul Commerce University, Urban Systems and Transportation Management, Master's degree**	**2018-Still continue, Metro İstanbul, T4 Vehicle Maintenance Chief 2016-2018 Metro İstanbul, Zeytinburnu Vehicle**

		2005, Yıldız Technical University, Electrical Engineering	**Workshop Chief 2015-2016, Metro Istanbul, Chief of R&D Electrical-Electronic Systems 2014-2015 Metro Istanbul, Electrical Systems Production and Control Chief 2013-2014, Metro Istanbul, Chief of R&D Electrical-Electronic Systems 2007-2013 Metro Istanbul, Workshop Engineer 1998-2001 Enmar Engineering, Project Specialist 2003-2006 Bombardier Transportation, Site Support-Site Manager**
9.	**Erhan SEZGİN**	**2001, Kocaeli University, Faculty of Engineering, Electronics and Communication Engineering, Bachelor's degree**	**2016 – Still continue, ESTRAM, Vehicle Assistant Manager 2018 – Still continue, TÜRSİD, Chairman of the Vehicle Committee 2004-2016 ESTRAM, Electrical - Electronics Maintenance Chief**
10.	**Eyyüp ONAT**	**1987, H.Ü. Science and Science Ins. (Statistics), Master's Degree 1983, H.Ü. Faculty of Science (Statistics), Bachelor's degree**	**2016 – Still continue, VQA, Moderator 2010-2016 EDUSER, UMS-UY Moderation and Assessment-Evaluation Specialist 1983-1997 ÖSYM, Computer Programmer, Assessment-Evaluation Specialist**

** Only education/experience information related to the profession will be included.*

APPENDIX 2: Persons, Institutions and Organizations Requested for Opinion

APPENDIX 3: VQA Sector Committee Members and Experts

APPENDIX 4: VQA Board of Directors