NATIONAL OCCUPATIONAL STANDARD

RAIL VEHICLES ELECTRICAL TECHNICIAN
LEVEL 4

REFERENCE CODE / 12UMS0279-4

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Occupation	**RAIL VEHICLES ELECTRICAL TECHNICIAN**
Level	**4[I]**
Reference Code	**12UMS0279-4**
Standard Developed By	**The Foundation for Development of TCDD (Turkish State Railways) and Solidarity and Cooperation of TCDD Personnel**
Standard Verified By	**VQA (Vocational Qualifications Authority) Transportation, Logistics and Communication Sector Committee**
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[I]Qualification level of the occupation is determined as level four (4) out of a level matrix of eight (8).

TERMS, SYMBOLS AND ABBREVIATIONS

COUPLING: A special electrical connection unit that transfers power between the wagons.

ALTERNATOR: An electrical device that produces alternative current by means of the spinning motion it receives.

BOW: The pantograph component that conducts electricity to the tractive vehicles by contacting the catenary wire.

ATC (Automatic Train Control): Automatic train control system.

BUSHING: High voltage connection point.

TRACTION VEHICLE (TRACTIVE VEHICLE): Locomotive and rail-car operated by driving power of in-built motor.

TRACTION MOTOR: Electric motor driving the vehicle.

TRACTION: Traction.

RAILWAY: a pair of rail sequence and all facilities forming this sequence, on which the vehicle sequence consisting of towing and towed vehicles act;

DISCHARGE: Discharging of the load on batteries or a circuit/circuit element,

CIRCULATION: The component enabling full and continuous circulation.

DYNAMO: Generator.

DJ (Vacuum circuit breaker): the high vacuum circuit breaker,

ELECTRICAL COUPLER: Power and signal connection element,

ELECTROLYTE: liquid in the battery cell,

INDUCTOR: a fixed part that allows the formation of a magnetic field in generators and direct current electric motors,

ARMATURE: Rotating part of generator and direct current electric motor where the induction occurs (that electrical-mechanical energy conversion occurs),

INVERTER: packet switch that changes the direction of rotation of the traction motors by changing the current direction,

EVAPORATOR: the unit in the cooling system where coolant fluid enters and evaporates so that the liquid is taken as gas from the substance

FREQUENCY: the measurements of how often an event occurs and how many times have been repeated in a unit of time,

SPEED RECORD SYSTEM: the system that shows and saves information such as the speed made in vehicle rail system, and road

ISCO: International Standard Classification of Occupations.

AIR CONDITIONING: The system for heating, cooling and ventilation processes.

INVERTER: the device that turns direct current (DC) to alternating current at various frequencies (AC),

OHS: Occupational Health & Safety.

GENERATOR CAR: Railway vehicle which generates the electric energy (with a diesel/generator group) which lighting, air conditioning and other auxiliary hardwares need and transfers them to the passenger cars

COUPLING: Connector transmitting one motion to other equipment.

CLUTCH: The part connecting two components.

SHORT CIRCUIT: The completion of electric current through another conductor circuit connection before reaching the receiver

PERSONAL PROTECTIVE EQUIPMENT (PPE): All kinds of tools, instruments, appliances and devices which are worn, put on or hold by the worker and which protect the worker from one or more hazards arising from the work and effect the health and safety of the worker, and which are designed to suit such purpose.

COMPRESSOR: The unit pressurizing air and gases.

CONDENSER: The part where heat-absorbing cooling fluid turns into gas after entering cooling system through giving its heat,

CONTACTS: part for cutting and giving the voltage in electrical circuits,

CONTACTOR: electromechanical device that allows the receiver energized or cutting the energy off in electrical circuits

CONVERTER: Energy device that convert the energy any current type to another form;

COUPLING: electricity transmission cable between the locomotive and wagon,

LOCOMOTIVE: Rail system vehicle driven by mechanical power applied on its wheels and moving hauled vehicles attached to its front or back by this movement.

MAGNET: ferromagnetic material,

PRESSURE GAUGE: Pressure gauge.

SELF-STARTER: The mechanism for starting the engine.

NEUTRAL: No load (without being energized) area,

SURGE ARRESTER: The element transferring overvoltage occurred in the power supply system to the ground to protect the rail vehicle system

PINION: Traction motor gear.

PNEUMATIC: Compressed air.

PT (PANTOGRAPH): In the electrical traction systems, the equipment transmitting the electric energy required by the traction vehicle from the power line (catenary) to the traction vehicle.

RAIL TURNING ELEMENT: The element attached to the axle that allows electrical energy l taken from the energy supply system to complete its circuit through the rail by means of axles and wheels in rail vehicles running on electricity

RAIL SYSTEM VEHICLE: General term for all the vehicles (train, metro, tram, maglev etc.) moving on railway.

RECTIFIER: the device that converts alternating current (AC) to direct current (DC).

REGULATOR: Regulating component.

RISK: Potential of loss, injury or other damages to arise from hazards.

ROTOR: Rotating part of the alternator and AC electric motors,

RELAY: Electromagnetic switching element running electromechanical ,

DISCONNECTOR: The unit separating and cutting power

SENSOR: Electronic flow, weight, speed and capacity sensor.

SERGELE: The element that providing electrical and mechanical balance and connection between bow and pantograph body,

HOT - ACTIVE: Traction vehicle’s operative / active mode.

HEATING: heating in the cars

COOL - INACTIVE: Traction vehicle’s inoperative / inactive mode

STATOR: the fixed part of the alternator and electric motors where electromagnetic field is generated;

CHARGE: the electrical load of the battery,

SHUNTING (Transition): The procedure increasing the speed and torque of traction motor by connecting parallel resistance at certain speed values to inductor winding of DC traction motors,

DRIVE: Driving.

DANGER: Potential of damage or injury likely to affect the worker or work place and likely to exist in the workplace or to be caused externally.

THERMOSTAT: The component controlling the temperature at the requested values in a system.

DISTRIBUTION BOARD: Electrical distribution panel,

DRIVER EMERGENCY BRAKE: The train security system which is automatically activated and drives the train's brake system in case the driver becomes incapable of driving the train for any reason.

TRAIN SET (train sequence): The set combination consisting of railcar /railcars and integral cars that have been designed in accordance with these railcars,

TRAIN: rail system vehicle consisting of one or more traction cars with carriages or one or more traction vehicles

PROCESS: Cleansing the water, residue etc. in the oil of transformer with vacuum and oil purification system

THIRD RAIL SHOE: The equipment that provides taking power from the third rails used to provide electricity for rail vehicles

VALVE: The system controlling liquid pass.

CARGO RHEOSTAT: the adjustable resistance controlled by the diesel engine regulator in diesel electric rail vehicles, which controls the main alternator warning,

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1. INTRODUCTION

National occupational standard titled Rail Vehicles Electrical Technician (Level 4) was prepared by the Software Industrialists Association (YASAD) and the Information Sector Association (TÜBİDER), under the coordination of Istanbul Chamber of Commerce assigned by the Vocational Qualifications Authority (VQA), according to the provisions of the VQA Law no. 5544 and "Regulations on Drawing up National Occupational Standards" and "Regulations on the Establishments, Duties, Operation Procedures and Principles of the VQA Sector Committees" issued pursuant to the aforementioned Law.

National occupational standard titled Rail Vehicles Electrical Technician (Level 4) was assessed by receiving the opinions of the relevant institutions and organizations in the sector, and approved by the VQA Board of Directors following the evaluation by the VQA Information Technology Sector Committee.

2. INTRODUCTION TO THE OCCUPATION

2.1. Description of the Occupation

Rail System Vehicles Electrical Technician (Level 4) is the qualified person in terms of knowledge and experience who is able to do service maintenance and periodical maintenance of rail system vehicles in order them to be ready to use and who is able to detect and repair breakdowns on his own or in a team in certain period of time in the framework of Occupational Health & Safety, environmental protection, quality rules and methods.

Rail System Vehicles Electrical Technician (Level 4), is responsible for the accuracy, timing and quality of the control, maintenance, assembly and disassembly works carried out under his supervision. In the performance of works, he works in accordance with the work instructions and informs the failures and defects outside his area of responsibility to the relevant persons in charge.

2.2. Occupational Reference within the International Classification Systems

ISCO 08: 7412 (Electrical mechanics and repairers)

2.3. Regulations on Health, Safety and Environment

Environmental Law No. 2872
Labour Law No. 4857
Social Security and General Health Insurance Law No. 5510
Energy Efficiency Law No. 5627
Occupational Health & Safety Law No. 6331
Regulation on Heavy and Dangerous Works
Notification on Vocational Education of Workers in Heavy and Dangerous Work
Regulation on Packaging Waste Control
Regulation on Waste Oils Control
Regulation on the General Principles of Waste Management
Regulation on Procedures and Principles of Occupational Health and Safety Trainings of the Employees
Regulation on Authorities, Duties and Responsibilities of Electrical Engineers
Regulation on Electrically Powered Current Facilities
Regulation on Manual Handling Works
Regulation on Noise
Regulation on Safety and Health Signs
Regulation on Preparation, Completion and Cleaning Works
Regulation on Conditions of Health and Safety in Using Work Equipment

Regulation on Health and Safety Measures to be taken in the Workplace Buildings and Additional Buildings
Regulation on Control of Solid Wastes
Regulation on Health and Security Measures for Working with Chemicals
Regulation on Use of Personal Protective Equipment in the Workplace
Machinery Safety Directive (2006/42/EC)
Regulation on Preventing the Personnel from the Hazards of the Explosive Environments

Furthermore, it is essential to obey laws, statutory rules and regulations on occupational health and safety and environment; and to perform risk analysis regarding this issue.

2.4. Other Legislations Related to the Occupation

Decree Law Concerning Regulation of State Economic Enterprises Personnel System Law No. 399 and Repealing Some Articles of Decree Law No. 233
Government Employee Unions and Collective Bargaining Law No. 4688
Law on Trade Unions and Collective Bargaining Agreements No. 6356
Public Servants Law No. 657

And it is essential to obey other current legislations, laws, statutory rules and by-laws related to occupation.

2.5. Working Environment and Conditions

Rail Vehicles Electrical Technician (Level 4) has risk to pick up occupational diseases arising from work environment and working conditions. Working in every hour of the day and in the bank holidays is in the question. It is an occupation requiring an intensive care and it is necessary to show awareness and pay attention to obey the occupational health and security rules without exception. Rail Vehicles Electrical Technician (Level 4) cooperates with the employees carrying out different works and uses the appropriate personal protective equipment during his operations.

2.6. Other Occupation Related Requirements

Rail Vehicles Electrical Technician (Level 4) shall have a medical certificate on physical qualifications necessary for his duty and “Form of Initial Entrance and Periodical Medical Examination for Workers in Heavy and Dangerous Work”.

3. OCCUPATIONAL PROFILE

3.1. Duties, Tasks and Performance Criteria

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
A	To apply occupational health and safety, fire and emergency rules	**A.1**	To apply legal and workplace rules regarding occupational health and safety	**A.1.1**	Gets information from authorised occupational health and safety personnel on regulations and instructions about workplace, occupational health and security.
				A.1.2	Uses the work clothes and personal protective equipment suitable for the work performed.
				A.1.3	Renders first aid; uses firefighting tools such as use of fire extinguisher.
				A.1.4	Places warning signs and templates related to the work performed in accordance with the instructions and protects such warning signs and templates during the performance of work and contributes to the safety of work area and personnel.
				A.1.5	Takes and applies the measures for keeping the work area and equipment used in order and clean.
		A.2	To decrease risk factors	**A.2.1**	Contributes to the activities related to determination of risks.
				A.2.2	Prepares report to relevant personnel about the risk factors he encounters or possibly encounters during the work.
				A.2.3	Contributes to the activities for decreasing risk factors.
		A.3	To apply emergency procedures in case of emergency	**A.3.1**	Coordinates the activities of taking measures to determine the cases of emergency and eliminate them rapidly.
				A.3.2	Informs the cases of emergency which are impossible to eliminate instantly to the authorities.
				A.3.3	Carries out the works described in the emergency procedure.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
B	To fulfil the provisions of environmental protection legislation	**B.1**	To assess environmental hazards	**B.1.1**	Carries out environmental impact assessment related to the performed activities and assesses potential risks.
				B.1.2	Participates in periodic trainings for environmental protection requirements and practices.
				B.1.3	Carries out the activities related to elimination of determined environmental hazard sources and risk factors.
		B.2	To take environmental protection measures	**B.2.1**	Takes the measures for the environmental impacts to occur during the performance of work processes in accordance with the company's instructions.
				B.2.2	Ensures that the wastes occurred during the performance of work processes are disposed in accordance with the company's instructions.
				B.2.3	Takes measures related to safe and healthy operation of device, equipment and tools used against negative environmental impacts to occur.
		B.3	To save on the consumption of operating assets	**B.3.1**	Uses the operating assets economically and efficiently.
				B.3.2	Conducts detection and planning work in order to using the operating assets efficiently.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
C	To work in accordance with the quality management system regulations	**C.1**	To control the quality of works performed	**C.1.1**	Applies the quality assurance principles and methods in accordance with the company's instructions stated in the task forms.
				C.1.2	Ensures that the devices and tools used in the work processes are operated in accordance with the conditions described in the quality assurance rules and methods.
				C.1.3	Supervises the conformity of the tasks performed to the standards.
				C.1.4	Fills in the quality management system forms related to the work.
		C.2	To participate in the activities related to prevention of faults and defects determined in the processes	**C.2.1**	Informs the faults and defects determined during the works to the relevant chief/authority.
				C.2.2	Participates in the research and assessment activities related to determination of reasons for faults and defects.
				C.2.3	Submits his and his team's observations, ideas and suggestions for improvement of work processes and elimination of faults to the relevant authority in accordance with the company's rules and methods.
				C.2.4	Applies and ensures the application of the company's rules and methods related to the fault and defect repairs.
				C.2.5	Informs the faults and defects outside his authority or he fails to repair to the relevant authority.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
D	To make pre-work preparations (to be continued)	**D.1**	To make personal preparations	**D.1.1**	Carries out his personal care and cleaning
				D.1.2	Is present in the workplace at the time stated in the work legislation before the work starts.
				D.1.3	Carries out the tasks related to the control documents of work attendance
				D.1.4	Wears appropriate attire according to the work rules, puts identification symbols and signs on his work clothes, is equipped with protective material.
		D.2	To start working	**D.2.1**	Receives work schedule
				D.2.2	Gathers information from the person who has assigned him in case of on-going works.
				D.2.3	Discusses the work schedule with the other employees included in the team in case of team works.
		D.3	To determine characteristics of the work area	**D.3.1**	Inspects work area for continuous and proper work
				D.3.2	Contributes to recovery of negative aspects of work area.
				D.3.3	Ensures the order with regard to type and method of work.
				D.3.4	Keeps under control of the non-conforming tool and material area and ensure its order.
		D.4	To prepare the tool, equipment and material for work	**D.4.1**	Prepares the proper material and equipment for work.
				D.4.2	Checks the operating state of material and equipment.
				D.4.3	Adjusts the equipment before work according to related work.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
D	To make pre-work preparations	**D.5**	To inspect the workableness status of the equipment	**D.5.1**	Inspects the status of working equipment and operability of security mechanisms on a periodic basis according to the instructions.
				D.5.2	Stops working in the event that there is an inappropriate situation or when foresees that there will be an inappropriate situation during the work
				D.5.3	Informs relevant personnel for replacement or repairing the malfunctioning equipment and tools.
				D.5.4	Fixes the problems and failures of tools and equipment in his authority.
		D.6	To make the work organization	**D.6.1**	Checks the vehicle, taking into consideration the forms filled by relevant personnel,
				D.6.2	Assesses existing problems and complaints.
				D.6.3	Determines completion duration of work.
				D.6.4	Determines the parts the maintenance and repair of which is not possible and need to be replaced.
				D.6.5	Gives information about work flow.
		D.7	To determine the vehicle's maintenance/repair procedures and techniques.	**D.7.1**	Determines the type of the maintenance on the basis of vehicle's total km/examination date.
				D.7.2	Controls the vehicle's failure/damage status and keeps records about the failures/damages in relevant form.
				D.7.3	Examines the technical scheme of the vehicle's electrical system.
				D.7.4	Determines maintenance/repair order.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.1**	To carry out periodic maintenance of pantograph	**E.1.1**	Visually inspects the parts of pantograph (main body, equalizer bar, pushing tool, springs) in order to determine whether they are non-damaged and steady.
				E.1.2	Visually inspects fasteners in order to determine whether they are complete, non-damaged and steady; checks fasteners with proper wrenchs whether they are tight or not.
				E.1.3	Visually inspects rod end bearings of the pantograph and oiltight hatch covers and checks if they are non-damaged and steady.
				E.1.4	Greases joints and bearings of the pantograph in accordance with the catalogue values.
				E.1.5	Listens to the noise of the pantograph engine and checks it by inspecting visually.
				E.1.6	Greases the piston/bearing of the pantograph engine.
				E.1.7	Visually inspects the pantograph whips and checks whether they are non-damaged and steady or not.
				E.1.8	Visually inspects bow coali, bending iron and connecting piece of the pantograph and checks whether they are non-damaged and steady or not.
				E.1.9	Measures bow coal of the pantograph and compares with the catalogue values.
				E.1.10	Powers on the pantograph and checks whether electrovalve is working or not.
				E.1.11	Measures maximum opening distance of the pantograph and compares it with the catalogue values.
				E.1.12	Tests rise and fall time of the pantograph and compares it with the catalogue values.
				E.1.13	Measures pressure force of the pantograph on the catenary wire and compares it with the catalogue values.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.2**	To carry out the periodic maintenance of third rail current collectors	**E.2.1**	Inspects the third rail current collectors and controls that they are damage free and in sound condition.
				E.2.2	Inspects fastening, terminal and pneumatic connectors and controls that they are complete, damage free and in sound condition.
				E.2.3	Controls leverage of the third rail current collectors.
				E.2.4	Controls shoe gear by measuring.
		E.3	To carry out periodic maintenance of insulators	**E.3.1**	Visually inspects the insulators and controls that they are damage free and in sound condition.
				E.3.2	Inspects fastening and bus connectors of the insulators and controls that they are complete, damage free and in sound condition and tightened by examining with the appropriate wrench.
				E.3.3	Cleans the rusty and oxidised parts of the insulator connecting terminals.
				E.3.4	Cleans the insulators with water or predetermined cleaner.
		E.4	To carry out periodic maintenance of surge arrester	**E.4.1**	Controls the soundness of the surge arrester with the special control device of the manufacturer.
				E.4.2	Inspects bearings of the surge arresters and their fittings and controls that they are complete, damage free and in sound condition.
				E.4.3	Inspects fittings fastening the heading and bearing of the surge arresters to the insulator and controls that they are complete, damage free and in sound condition.
				E.4.4	Inspects line and grounding fittings and controls that they are complete, damage free and in sound condition.
				E.4.5	Examines the fittings of the surge arresters with the appropriate wrench and controls that they are tightened.
				E.4.6	Cleans rusty and oxidised parts of the fittings.
				E.4.7	Cleans the insulator of the surge arresters with water or predetermined cleaner.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.5**	To carry out periodic maintenance of vacuum circuit breaker	**E.5.1**	Cleans the vacuum circuit breaker by cleansing it form dirt, dust and grease.
				E.5.2	Switches on the ignition of the vacuum circuit breaker.
				E.5.3	Inspects ignition switches and ignition springs and controls that they are damage free and in sound condition.
				E.5.4	Inspects fittings of the ignition mechanism and controls that they are complete, damage free and in sound condition.
				E.5.5	Examines fittings of the ignition mechanism with the appropriate wrench and controls that they are tightened.
				E.5.6	Tests that the ignition switches moves easily and rotates in their normal axes.
				E.5.7	Inspects line and grounding fittings and controls that they are complete, damage free and in sound condition.
				E.5.8	Examines the fittings with the appropriate wrench and controls that they are tightened.
				E.5.9	Controls that joints, ratchets, tappets, shafts, rods, springs and other parts of the mechanism are in sound condition.
				E.5.10	Lubricates the movable ignition switches and mechanism with the grease compatible with the catalogue values.
				E.5.11	Controls the air lost by visually inspecting and listening.
				E.5.12	Tests the operation of the electro valves.
		E.6	To carry out periodic maintenance of the disconnector (to be continued)	**E.6.1**	Cleans the dirt, dust and grease from the separator.
				E.6.2	Inspects the blades and ignition switches and controls that they are in sound condition.
				E.6.3	Inspects line and grounding fittings and controls that they are complete, damage free and in sound condition.
				E.6.4	Examines the fittings with the appropriate wrench and controls that they are tightened.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.6**	To carry out periodic maintenance of the disconnector	**E.6.5**	Inspects the motion rods and tappets and controls that they are in sound condition.
				E.6.6	Lubricates the motion rods and tappets with the grease compatible with the catalogue values.
				E.6.7	Inspects the locking assembly and controls that it is in sound condition.
				E.6.8	Tests the locking assembly and controls the operation of it.
				E.6.9	Switches on and off the separator a few times and controls that ignition switches contacts safely.
		E.7	To carry out periodic maintenance of the transformers located on the vehicle (to be continued)	**E.7.1**	Listens to the sound of the main transformer and controls if it makes another sound other than its vibration sound in normal service.
				E.7.2	Visually inspects metal body and base and controls that they are damage free and in sound condition.
				E.7.3	Inspects the fastening system fittings of the main transformer and controls that they are complete, damage free and in sound condition.
				E.7.4	Examines the fastening system fittings of the main transformer with the appropriate wrench and controls that they are tightened.
				E.7.5	Cleans the main grease tank, grease expansion tank and contacting pipe of the main tank.
				E.7.6	Cleans the cooling radiators.
				E.7.7	Cleans the cooling fans with the pressured air.
				E.7.8	Controls the grease lost by visually inspecting.
				E.7.9	Cleans the grease temperature and coiling temperature thermometer.
				E.7.10	Cleans the grease level gauge and grease pomp flow gauge.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.7**	To carry out periodic maintenance of the transformers located on the vehicle	**E.7.11**	Tests operation values of the thermometers and thermostats located on the vehicle.
				E.7.12	Visually inspects the absorption assembly pipes and controls that they are in sound condition.
				E.7.13	Controls the colour of the dehumidifier in the absorption assembly and replaces the discoloured material.
				E.7.14	Gets sample from the grease of the transformer and tests it based on humidity, acidity, and dielectric.
				E.7.15	Purifies the grease.
				E.7.16	Inspects bushings and controls that they are in sound condition.
				E.7.17	Cleans the bushings with water or predetermined water.
				E.7.18	Inspects the bushing terminal fittings and grounding fittings and controls that they are in sound condition and in normal tightness.
				E.7.19	Measures insulation resistance between insulation megger and coiling; coiling and tank.
				E.7.20	Measures Schering bridge and dielectric dissipation factor.
				E.7.21	Tests the operation of protection relays (safety pressure valve relay, grease level relay, Buchholz relay).
				E.7.22	Replaces the parts expiring their catalogue life and transformer greases whose dielectric value is low and whose acid value is high.
		E.8	To carry out periodic maintenance of alternators and dynamos. (to be continued)	**E.8.1**	Inspects alternators and dynamos and controls that they are in sound and good condition.
				E.8.2	Does the general cleaning of the alternators and dynamos and cleanses them from dust, dirt and grease.
				E.8.3	Listens to the sound of the alternators and dynamos and controls if they make any sound other than their normal operation sound.
				E.8.4	Inspects alternator fittings and controls that they are complete and in sound condition.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.8**	To carry out periodic maintenance of alternators and dynamos	**E.8.5**	Examines the alternator fittings with the appropriate key and controls that they are tightened.
				E.8.6	Inspects elastic coupling and vibration damper of the alternator and controls that they are in sound and good condition.
				E.8.7	Inspects alternator shroud and controls that it is in sound condition.
				E.8.8	Inspects cooling fan and controls that it is in sound condition.
				E.8.9	Controls air channels, cleans and unclogs the clogged ones.
				E.8.10	Inspects bearings and controls that they are damage free and in good condition.
				E.8.11	Lubricates bearings of alternators and dynamos with the grease compatible with the catalogue values.
				E.8.12	Inspects belts and pulleys of the drive system and controls that they are in sound and good condition.
				E.8.13	Measures run out of the belts and pulleys of the drive system.
				E.8.14	Inspects pulleys and fittings of the pulleys of the drive system and controls that they are in sound and good condition.
				E.8.15	Measures coiling of the armature/rotor and inductor/stator, controls disconnected parts, short circuit and leakage on the body.
				E.8.16	Inspects rotor shaft, surface of the commutator, brushes and whips, brush holders and pressure springs and controls that they are damage free and in sound condition.
				E.8.17	Replaces coals reaching the limiting value.
				E.8.18	Inspects terminal fittings and controls that they are complete and in sound condition and examines with the appropriate wrench and controls that they are tightened.
				E.8.19	Controls voltage regulator by measuring operating voltage.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.9**	To carry out periodic maintenance of traction electric power straightening and processing units	**E.9.1**	Makes the overall cleaning of the rectifier chamber, purifies from dust, dirt and oil.
				E.9.2	Controls and visually inspects diodes, capacitors,thyristor and resistors in rectifier chamber are intact
				E.9.3	Controls terminal fittings in rectifier compartment that they are complete and intact and tightened by examining with appropriate wrenches
				E.9.4	Controls retaining straps in rectifier chamber by examining with appropriate wrenches that they are complete and intact and tightened
				E.9.5	Makes the overall cleaning of correcting self and harmonic filter reactors, purifies from dust, dirt and oil.
				E.9.6	Checks retaining straps of harmonic filter reactors and correcting self by examining with proper wrenches that they are complete, undamaged and tightened well.
				E.9.7	Checks terminal connection elements of harmonic filter reactors and correcting self by examining with proper wrenches that they are complete, undamaged and tightened well.
				E.9.8	Makes the overall cleaning of the command and control unit of traction electricity, purifies from dust, dirt and oil.
				E.9.9	Examines warning regulator and controls if it is undamaged and intact or not..
				E.9.10	Checks terminal fittings and retaining straps of warning regulator control if it is complete, undamaged and intact or not.

				E.9.11	Controls power switches if they are intact or not.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.10**	To carry out traction electric power control units	**E.10.1**	Cleans contacts of the power contactors.
				E.10.2	Visually inspects the determination and terminal fasteners and checks whether they are complete and non-damaged or not.
				E.10.3	Visually inspects and controls aurals of air-operated connections air leaks
				E.10.4	Tests whether pneumatic electrovalves are working or not.
				E.10.5	Inspects inverter drum and its contacts and checks whether it is steady or nor.
				E.10.6	Visually inspects inverter determination and terminal fasteners and checks whether they are complete and steady or not.
				E.10.7	Greases the inverter with the protective grease in accordance with the catalogue values.
				E.10.8	Inspects cancelation arms of the traction engine, relays and relay sockets and checks whether they are non-damaged and steady or not.
				E.10.9	Incpects speedometer contacts of the shunting system and shunting contact and checks whether they are non-damaged and steady or not.
				E.10.10	Measures shunting resistance.
				E.10.11	Inspects dynamic brake cooling fans and checks whether they are steady or not.
				E.10.12	Measures dynamic brake resistances.

				E.10.13	Tests back-up exciting circuit switch and its relay.
				E.10.14	Inspects power cables and bars and checks whether they are steady or not.
				E.10.15	Visually inspects fasteners of the power cables and bars and checks whether they are complete and steady.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.11**	To carry out periodic maintenance of traction engines	**E.11.1**	Carries out general cleaning of the traction engines and removes dust, dirt and grease from them.
				E.11.2	Inspects bearings and checks whether they are steady and in a good condition or not.
				E.11.3	Greases bearings of the traction engines in accordance with the catalogue values.
				E.11.4	Measures armature/rotor and inductor/stator bobbins, checks whether there is disconnection and short circuit and conducts leak test for the body.
				E.11.5	Conducts balance control for the armature/rotor or ensures that it is conducted.
				E.11.6	Inspects brush, whips, brush holders, pressure springs and surface and checks whether they are steady or not.
				E.11.7	Inspects terminal fasteners, checks whether they are complete and steady or not and controls them with the appropriate switches to see if they are tight or not.
		E.12	To carry out periodic maintenance of diesel engine driving-command system	**E.12.1**	Inspects diesel engine regulator's couplings and stop button and checks whether they are steady or not.
				E.12.2	Conducts general cleaning of load rheostat and removes dust, dirt and grease from it.
				E.12.3	Visually inspects the determination and terminal fasteners of the load rheostat and checks whether they are complete and steady or not.
				E.12.4	Measures the resistance of load rheostat.

				E.12.5	Tests the settings of the load rheostat according to engine speeds.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.13**	To carry out periodic maintenance of diesel engine starting system	**E.13.1**	Removes the determination and terminal fasteners of the starting engine.
				E.13.2	Removes it from the vehicle and puts it on the work table.
				E.13.3	Conducts general cleaning and removes dust, dirt and grease.
				E.13.4	Inspects bearings and checks whether they are non-damaged and steady or not.
				E.13.5	Greases bearings in accordance with the catalogue values.
				E.13.6	Visually inspects pinion, milling cutter gear and clutch assembly of the starting engine and checks whether they are non-damaged and steady or not.
				E.13.7	Rotate the starter motor gear in both directions, to test if it goes free in a direction and lock in the other direction.
				E.13.8	Examines bearings and makes wear control
				E.13.9	Examines, measures and detects broken, short circuit and faulty body of Bendix winding, towing and securing windings of the unloader types of starter solenoid, armature and inductor windings; replace the defective part
				E.13.10	Measures and detects leak check on broken, short circuit and faulty body of armature and inductor
				E.13.11	Controls the tilt of armature shaft by measuring with the comprator,

				E.13.12	Examines cooling fans, brush and whip, brush holders, pressure strings and collector surface and checks that they are undamaged and intact..
				E.13.13	Checks the return of the pinion and attract and retain coils with no-load running tests.
				E.13.14	Measures the current taken with ammeter
				E.13.15	Makes retaining strap and terminal connections and mounts on the car.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.14**	To carry out periodical maintenance of magnetic coupling diesel engine cooling fan	**E.14.1**	Does the overall cleaning of magnetic coupling diesel engine cooling fans, removes their dusts, dirt and greases.
				E.14.2	Tests whether thermostats and fan resistance are non-damaged and sound.
				E.14.3	Tests fan resistance.
				E.14.4	Controls brushes and whips, brush holders, pressure spring and collector surface of magnetic coupling fans whether they are non-damaged and sound.
				E.14.5	Measure bobbins and checks whether a disconnection, short circuit and leak in the body exist.
				E.14.6	Tests the operation of magnetic coupling diesel engine cooling fans.
		E.15	To carry out periodical maintenance of electric motor	**E.15.1**	Dismantles coupling, retaining strap and terminal junction of electric engine.
				E.15.2	Puts necessary portable electric engines down from the vehicle and puts them on the worktable.
				E.15.3	Does the overall cleaning and removes the dust, dirt and grease.

				E.15.4	Checks ball bearings and greases them in accordance with the values on the catalog.
				E.15.5	Measures armature/rotor and inductor/stator and checks whether a disconnection, short circuit and leak in the body exists.
				E.15.6	Tests cooling fan and checks whether it is non-damaged and sound.
				E.15.7	Inspects brushes and whips, brush holders, pressure spring and collector surface of slip-ring type electric engines and checks whther they are non-damaged and sound.
				E.15.8	Tests the operation of electric engine.
				E.15.9	Makes coupling, retaining strap and terminal junction and mounts them on the vehicle.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.16**	To carry out periodic maintenance of accumulator and charge circuits	**E.16.1**	Inspects the accumulator and checks whether it is safe and sound.
				E.16.2	Inspects cell stoppers of the accumulator and checks whether they are safe and sound.
				E.16.3	Loosens cell stoppers of the accumulator and checks acid level.
				E.16.4	Measures and checks accumulator's charge level.
				E.16.5	Cleans oxidisation on the surface of accumulator connection.
				E.16.6	Inspects accumulator cables and checks whether they are safe and sound.
				E.16.7	Inspects retaining straps and electric cable connections and checks whether they are safe and sound by controlling them with suitable keys.
				E.16.8	Inspects jumpers between accumulators and checks whether they are safe and sound.

				E.16.9	Makes the measurement of accumulator charging regulator and charging curcuit
				E.16.10	Implements capacity test.
				E.16.11	Inspects and checks whether accumulator charging regulator and its retaining strap and terminal junction are non-damaged and sound.
		E.17	To carry out periodic maintenance of control circuits (to be continued)	**E.17.1**	Does overall cleaning of control panel and removes dusts, dirt and grease.
				E.17.2	Checks keys, button, circuit breaker and key switch in the control panel and their retaining strap and terminal junction.
				E.17.3	Tests glove lamps and warning beeps in the control panel by giving energy.
				E.17.4	Tests illumination elements of control panel with test button.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.17**	To carry out periodic maintenance of command control circuits	**E.17.5**	Inspects analogue and digital indications and their determination and terminal junctions and checks whether they are non-damaged and steady or not.
				E.17.6	Inspects engine speed control lever, direction finding lever and dynamic brake lever and their determination and terminal fasteners and checks whether they are non-damaged and steady or not.
				E.17.7	Inspects analogue time/speed indicator, recorder and their determination and terminal fasteners and, checks whether they are non-damaged and steady or not.
				E.17.8	Starts the wiper motor and checks whether it runs or not.
				E.17.9	Starts window defoggers and checks whether they heat the window or not by touch.
				E.17.10	Conducts visual and functional checks of the ATC equipment (ATC antenna, oedometer/tachometer, ATC box, radar).
				E.17.11	Conducts visual and functional checks of ATC equipment in the driver's cab (button, switch, instrument panel/screen, warning signs).

		E.18	To carry out periodic maintenance of protective circuits (to be continued)	**E.18.1**	Visually inspects float valve, electrovalve, relay, relay socket, detector, button, pedal and cancellation switches in the protective circuits and checks whether they are non-damaged and steady or not.
				E.18.2	Removes detectors and checks them on the test stand.
				E.18.3	Installs detectors that he/she test to the vehicle.
				E.18.4	Tests protective circuits either by giving energy to the relays or by de-energizing them according to relay types.
				E.18.5	Tests whether overrotation prevention circuits of diesel engine run or not.
				E.18.6	Tests whether water level circuit, water temperature circuit and water pressure circuit run or not.
				E.18.7	Tests whether grease temperature circuit, inner-bonnet temperature circuit and grease pressure circuit run or not.
				E.18.8	Tests whether pressure circuit of filter division and overcurrent circuit of dynamic brake run or not.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.18**	To carry out periodic maintenance of protective circuits	**E.18.9**	Tests whether main alternator bearing temperature circuit, residual current protective circuit and overcurrent protective circuit run or not.
				E.18.10	Tests whether spinning telling circuit and spinning prevention circuit run or not.
				E.18.11	Tests whether starting motor protective circuit, sanding circuit and driving emergency brake circuit run or not.
				E.18.12	Measures and checks diode and resistance of self-induction protective circuit.
		E.19	To carry out periodic maintenance of lighting circuits	**E.19.1**	Inspects electrical panels and closets and their determination and terminal fasteners and checks whether they are non-damaged and steady or not.
				E.19.2	Inspects braker, switch, button, glove lamps, relay, voltmeter, frequency meter, ammeter, connecting terminals in the electrical panel and closets and checks whether they are non-damaged and steady or not.

				E.19.3	Inspects switches and sockets and checks whether they are non-damaged and steady or not.
				E.19.4	Visually inspects projector, stop lamps, interior and exterior lightings and checks whether they are non-damaged and steady or not.
				E.19.5	Inspects economic circuit coupler and sockets and checks whether they are non-damaged and steady or not.
		E.20	To carry out the periodic maintenance of air conditioning (to be continued)	**E.20.1**	Inspects electric heating coupling devices and checks whether they are non-damaged and steady or not.
				E.20.2	Carries out general cleaning of equipment boxes of air conditioning system and removes dust, dirt and grease.
				E.20.3	Visually inspects braker, switch, contactor and relays of air conditioning system and checks whether they are non-damaged and steady or not.
				E.20.4	Sprays grease-free contact spray on the air conditioning units' contacts and ensures that they run efficiently.
				E.20.5	Inspects thermostats and checks whether they are non-damaged and steady or not.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems (to be continued)	**E.20**	To carry out the periodic maintenance of air conditioning	**E.20.6**	Tests thermostats whether they are running or not.
				E.20.7	Tests heat detectors.
				E.20.8	Inspects the resistances of the convection heating system and their determination and terminal fasteners and checks whether they are non-damaged and steady or not.
				E.20.9	Inspects evaporator unit of the air conditioning and heating unit and checks whether they are non-damaged and steady or not.
				E.20.10	Conducts functioning test for smoke detectors of the air conditioning units.
				E.20.11	Changes air filters of the air conditioning evaporator and heating units.

				E.20.12	Inspects air conditioning condenser unit and compressor and checks whether they are non-damaged and steady or not.
				E.20.13	performs signs of decay (bubble) and signs of moisture (discoloration) control by examining refrigerant from fluid line watch glass in air conditioning system
				E.20.14	Conducts refrigerant leak test with the gas leak detector in the air conditioning system.
				E.20.15	Checks lube grease level of air conditioning compressor.
				E.20.16	Inspects the determination and terminal junctions of ventilating fans and checks whether they are complete, non-damaged and steady or not.
				E.20.17	Inspects fresh air suction damper and checks whether it is non-damaged and steady or not.
				E.20.18	Inspects louvers, louver electrovalves and louver air line and checks whether they are non-damaged and steady or not.
				E.20.19	Tests whether convection heating system, air conditioning system and ventilating system run or not.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out periodic maintenance of rail system vehicles' electrical systems	**E.21**	To carry out periodic maintenance of electrical connections on the vehicle	**E.21.1**	Visually inspects electrical coupling pins and cleans rusted and oxidized pins.
				E.21.2	Checks and cleans electrical connections and connectors on the bogie.
		E.22	To carry out periodic maintenance of door control units	**E.22.1**	Carries out functioning check of the door control unit.
				E.22.2	Carries out visual and functioning check of door electric motor.
				E.22.3	Visually inspects door electrical connections.
				E.22.4	Carries out visual and functioning check of obstacle detection sensor and compression detection sensor circuits.

				E.22.5	Carries out visual and functioning checks of door control elements (relay, button, switch, key).
		E.23	To replace the parts of the vehicle whose periodic maintenance is carried out	**E.23.1**	Replaces expired parts of which he/she carries out periodic maintenance.
				E.23.2	Sets parts being out of adjustment according to catalogue value.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.1**	To detect and repair failures in pantograph	**F.1.1**	Inspects pantograph pieces (main body, stabilizer bar, pushing arm, springs) and detect damaged ones and replaces them if necessary.
				F.1.2	Inspects pantograph fasteners and detects missing, damaged and loose ones.
				F.1.3	Inspects pantograph joint bearings, detects damaged ones, replaces them if necessary and greases replaced bearings with the grease compatible with the catalogue values.
				F.1.4	Detects damages by inspecting and listening to pantograph engine, replaces the damaged one and greases the piston/bearing of the engine with the grease compatible with the catalogue values.

				F.1.5	Replaces sealing components and eliminates air leakage.
				F.1.6	Inspects pantograph whips, detects damaged ones and replaces them.
				F.1.7	Inspects pantograph bow coals, bending iron and connecting piece; detects damaged ones and replaces them.
				F.1.8	Measures pantograph bow coals compares them with the catalogue values and replaces the ones that are not compatible with the catalogue values.
				F.1.9	Turns on the pantograph and checks whether electrovalve is running or not and replaces the damaged electrovalve.
				F.1.10	Identifies non-compliance of the maximum opening of pantograph with the catalog value, measures pressure force to catenary wire, takeoff and landing time
				F.1.11	Adjusts maximum opening distance with the adjustment lever according to the catalog value.
				F.1.12	Adjusts pressure force to catenary wire with setting bolts on safety catch according to the catalog values
				F.1.13	Adjusts takeoff and landing time with control valve according to the catalog value

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.2**	To detect and repair third rail slipper failures	**F.2.1**	Visually inspects third rail slipper equipment, detects damaged pieces and replaces them.
				F.2.2	Visually inspects determination, terminal and pneumatic fasteners and detects missing, damaged, loose, rusted and oxidized ones.
				F.2.3	Measures and detects spring leverage of the third rail slipper which is not compatible with the catalogue values and adjusts the leverage.
				F.2.4	Measures or visually detects the worn rail slipper which is not compatible with the catalogue values and replace it.
				F.2.5	Measures and checks third rail slipper height setting; takes it in tolerance if it is out of tolerance.

		F.3	To detect and repair insulator failures	**F.3.1**	Inspects insulators and detects damaged and dirty ones, replaces damaged ones.
				F.3.2	Cleans the insulators with water or a cleanser determined in advance.
				F.3.3	Inspects insulator's determination and bus bar fasteners and detects missing, damaged, loose, rusted and oxidized ones.
		F.4	To detect and repair surge arrester failures	**F.4.1**	Detects surge arrester which is out of order (burst) with the manifacturer's special control device and replaces it.
				F.4.2	Visually inspects and detects damaged surge arrester's support and replaces damaged support.
				F.4.3	Examines line and grounding fasteners, fittings that connect the surge arrester to bracket, and arrester header and its bracket to the insulator with eyes; detects damaged, loose, rusty and oxidized ones
				F.4.4	Visually inspects and detects damaged and dirty surge arrester insulator and replaces damaged insulator.
				F.4.5	Cleans the dirty insulator with water or a cleanser determined in advance.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.5**	To detect and repair circuit breaker failures	**F.5.1**	Inspects determination, line and grounding fasteners and detects missing, damaged, loose, rusted and oxidized ones.
				F.5.2	Detects air leakage by inspecting sealing components visually and by listening, replaces sealing components.
				F.5.3	Tests whether pneumatic electrovalves and high-voltage circuit breaker are running or not via relay and replaces the ones that are not running.
				F.5.4	Removes broken high-voltage circuit breaker from the vehicle and takes it to the test stand.

				F.5.5	Turns on the high-voltage circuit breaker contacts, removes dirt, dust and grease and replaces damaged contacts and contact springs.
				F.5.6	Replaces damaged bearings, latches, crank-handles, shafts, rods and springs in the mechanism.
				F.5.7	Makes mechanical settings in order to ensure that contacts can move easily and normally on the axis.
				F.5.8	Greases replaced moving contacts and their mechanism with the grease compatible with the catalogue values.
				F.5.9	Installs the circuit breaker on the vehicle and tests whether it is running or not.
		F.6	To detect and repair disconnector failures	**F.6.1**	Inspects determination, line and grounding fasteners and detects missing, damaged, loose, rusted and oxidized ones.
				F.6.2	Visually inspects motion bars, crank-handles, lock assembly, blades and contacts and detects damaged, dirty and dusty ones.
				F.6.3	Replaces damaged motion bars, crank-handles, lock assembly, blades and contacts and cleans dirty and dusty ones.
				F.6.4	Greases the replaced motion bars and crank-handles with the grease compatible with the catalogue values.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.7**	To detect and repair transformer failures on the vehicle	**F.7.1**	By listening to the main transformer sound,detects the sound caused by loose connections other than the one comes from the vibration under normal service
				F.7.2	Examines bushings breathing apparatus pipes, radiators, fans, oil tanks by eyes; detects damaged ones and replace damaged parts
				F.7.3	Visually inspects the main transformer detection system, bushing terminal connections and grounding fasteners and detects damaged, missing, loose, rusty

					and oxidized ones
				F.7.4	Cleans rusted and oxidized parts of the transformer; visually inspects oil loss, change the seal compunds
				F.7.5	Detects and changes oil temperature and winding temperature thermometers which do not show any value
				F.7.6	Visually inspects and detects color changing desiccant in breathing apparatus and changes if necessary
				F.7.7	Take samples from transformer oil.
				F.7.8	Visually inspects and compares oil color (the darker colors as a result of pollution)with catalog value
				F.7.9	Makes the dielectric, moisture, and acid tests of oil, compares the test results with the catalog value.
				F.7.10	Changes oil that does not comply with the catalog value
				F.7.11	Tests performance of protection relays (relay safety pressure valve, oil level relay, Buchholz relay)with relay testing device, detects faulty relay and replace the defective ones
				F.7.12	Measures the insulation resistance between the windings and between the windings and the tank by insulation megger device.
				F.7.13	Measures the dielectric loss factor by Schering (Seringa) bridge
				F.7.14	Replaces windings, and burnt, broken, short-circuited transformers

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in	**F.8**	To detect alternator and	**F.8.1**	Visually inspects damaged alternator and dynamos and changes them

	rail system vehicles (to be continued)		dynamo faults and repair	**F.8.2**	Listens to the sound of alternator and dynamo that make another voices apart from the ones in normal service and identifies which parts are making noise and tightens the component connections
				F.8.3	Visually inspects range hood, elastic coupling and vibration damper, cooling fan, bearings, armature and inductor windings, the rotor shaft, brush and whips, brush holders, compression springs, belts, pulleys and shafts in the drive system; detects damaged ones and replace damaged parts
				F.8.4	Lubricate the bearings he changed in accordance with catalog values
				F.8.5	Detects brushes that completed catalogue life cycle with(coal), measure and changes them
				F.8.6	Visually inspects and detects collector surface defects and removes defects by sanding or turning machine.
				F.8.7	Visually inspects retaining, terminal and shaft fasteners; detects damaged, missing, loose, rusty and oxidized ones..
				F.8.8	Cleans rusted and oxidized parts of the alternator and dynamo.
				F.8.9	Measures shaft and pulleys of drive system with axis, detects and changes them
				F.8.10	Detects. measures and changes broken, short circuit and faulty body armature / rotor and the inductor /stator windings
				F.8.11	Visually inspects air ducts and detects dirty and clogged ones, clean and opens dirty and clogged air vents.
				F.8.12	Detects regulators that do not give catalog voltage values by measuring operating voltage of voltage regulator; and replace the faulty voltage regulator.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**

F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.9**	To detect forwarding and processing traction electric units and repair	**F.9.1**	Controls and visually inspects diodes, capacitors, thyristor and resistors in rectifier chamber if they are intact or not.
				F.9.2	Measures diodes, capacitors, thyristor and resistors in rectifier chamber and detect damaged ones.
				F.9.3	Detects and measures harmonic filter reactors and correcting self with broken windings, short circuit and body fault and changes those damaged harmonic filter reactors and correcting self.
				F.9.4	Visually checks retaining straps and terminal connection elements of harmonic filter reactors and correcting self in rectifier chamber and detects missing, damaged, loose,rusty and oxidized ones.
		F.10	To detect and repair faults of the traction electrical energy command and control units	**F.10.1**	Examines inverter drum, inverter contact, power contactors, contact and pressure safety catch,air-operated electro-valves, traction motor cancelation arms, detects damaged ones and changes them.
				F.10.2	Visual and aural check of air leaks of air-operated connections, removes air leaks by tightening connections.
				F.10.3	Examines relay and relay sockets, detects damaged ones, and replaces them.
				F.10.4	Examines speed indicator contacts of shunting system and shunting contact, detect damaged ones and replaces damaged contacts.
				F.10.5	Measures shunting resistance and detect faulty(burnt) ones
				F.10.6	Measures dynamic breaker resistance and detect faulty(burnt) ones and replaces them.
				F.10.7	Examines cooling fans of dynamic breaker and detect faulty ones.
				F.10.8	Tests backup warning circuit switch, replaces broken ones.
				F.10.9	Detects damaged power cables and busbars,replaces damaged power cables and busbars
				F.10.10	Examines the retaining and terminal fittings of traction electricity in its command and control unit, detects missing, damaged, loose,rusty and oxidized ones..

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.11**	To identify traction motor faults and making repairs	**F.11.1**	Examines the terminal fittings and detects missing, damaged, loose, rusty and oxidized ones.
				F.11.2	Detects broken, short circuit and faulty body armature / rotor and the inductor /stator winding; changes disjointed, short circuit and faulty body armature / rotor and the inductor /stator windings
				F.11.3	Fixes problems of armature / rotor balancing
				F.11.4	Detects brushes that completed catalogue life cycle by measuring (coal) and changes them.
				F.11.5	Visually inspects and detects collector surface defects with proper device and removes defects by sanding.
				F.11.6	Removes defects with turning machine that can not be resolved by sanding.
				F.11.7	Opens lamella spacing of milled traction motor collector according to the catalog value
				F.11.8	Performs the chamfering work of the collector which has open lamella spacing
				F.11.9	Examines bearings, armature / rotor and the inductor / stator windings, the rotor shaft, brush and whips, brush holders, pressure springs, forced cooling system bellows; detects damaged ones and replace damaged parts.
				F.11.10	Lubricate the bearings he changed in accordance with catalog values.
				F.11.11	Remove terminal connections of traction motor in changing axles and damaged traction motors.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.12**	To detect and repair diesel engine part failures	**F.12.1**	Examines and detects coupling of the diesel engine regulator and stop button, detects and change the damaged coupling and stop button.
				F.12.2	Examines terminal and retaining fittings of load rheostat; detects missing, damaged, loose, rusty and oxidized ones.
				F.12.3	Detects and measures load rheostat coal that completed its catalogue life cycle and changes them
				F.12.4	Measures the resistance of the load rheostat, changes defective (burnt) resistance
				F.12.5	Tests load rheostat with the load (by closing the warning fuse) and loaded (by opening the warning fuse)
				F.12.6	Adjusts load rheostat which does not go under the loadaccording to the catalog value in accordance with engine speed with adjusting bolt
		F.13	To detect the faults of diesel engine starter system and making repairs (to be continued)	**F.13.1**	Removes terminal and retaining connections of the starter motor
				F.13.2	Examines bearings, pinion gears, gear milling and clutch assembly, bushing bearings, armature and inductor windings, cooling fans, brush and whip, brush holders,compression spring; detects damaged ones, replace any damaged parts
				F.13.3	Lubricate the bearings he changed in accordance with catalog values.
				F.13.4	Rotates the starter motor gear in both directions, to test if it goes free in a direction and lock in the other direction.
				F.13.5	Change the starter gear and equipments that do not lock or lock two-way
				F.13.6	Examines, measures and detects broken, short circuit and faulty body of Bendix winding, towing and securing windings of the unloader types of starter solenoid, armature and inductor windings; replace the defective part.
				F.13.7	By measuring the comprator, detects skewed armature shaft, corrects the curved armature shaft in turning machine.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.13**	To detect the faults of diesel engine starter system and making repairs	**F.13.8**	Detects surface defects by examining the collector surface,removes surface defects by sanding ,removes disorders with turning machine that can not be resolved by sanding.
				F.13.9	Checks the return of the pinion and attract and retain coils with no-load running tests
				F.13.10	Measures the current taken with ammeter
				F.13.11	Makes retaining strap and terminal connections and mounts on the car.
		F.14	To detect cooling fan faults of magnetic clutch diesel engine and make repairs	**F.14.1**	Examines and detects thermostats, contactors, relays, fan resistance, brush and whip, brush holders, compression springs, replaces damaged parts
				F.14.2	Measure the resistance fan, changes the defective (burnt) resistance.
				F.14.3	Detects brushes that completed catalogue life cycle (coal) measures and changes them
				F.14.4	Detects collector surface defects and removes defects by sanding
				F.14.5	Detects broken, short circuit and faulty body coil and replace broken, short circuit, faulty body coils
				F.14.6	Tests thermostats on the test stand, checks relays with relay test device. Change the thermostat and relay that do not work.
		F.15	To identify electric motor failures and making the repair (to be continued)	**F.15.1**	Examines coupling and terminal fittings and detects missing, damaged, loose, rusty and oxidized ones.
				F.15.2	Examines damaged bearings, armature / rotor and the inductor / stator windings, the rotor shaft, cooling fan, replace damaged parts..
				F.15.3	Lubricate the bearings he changed in accordance with catalog values
				F.15.4	Detects and measures broken, short circuit and faulty body armature / rotor and the inductor /stator windings and changes them.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.15**	To identify electric motor failures and making the repair	**F.15.5**	Examines brush and whips, brush holders, pressure springs in electric motors of ring type, detects damaged ones.
				F.15.6	Determines and replaces the brushes (coal) that are out of their lifetimes.
				F.15.7	Determines the surface defects by visual inspection, eliminates them by sanding, and uses the turning method to eliminate the problems that could not be eliminated by sanding.
		F.16	To detect and repair faults of the battery and charging circuits	**F.16.1**	Determines and replaces the damaged batteries by visual inspection.
				F.16.2	Determines and replaces the damaged cell plugs by visual inspection.
				F.16.3	Opens the battery cell plugs and checks the electrolyte level.
				F.16.4	Measures and checks the battery charge level.
				F.16.5	Determines and replaces the damaged cables by visual inspection.
				F.16.6	Determines the deficient, damaged, loose, rusty and oxidized battery detection units, cables and bridge connector units between the batteries, by visual inspection.
				F.16.7	Determines and replaces the damaged bridge connectors between the batteries by visual inspection.
				F.16.8	Determines the battery charge regulators that do not have the same voltage value as in the catalog, by measuring their operation voltages, and replaces them.
				F.16.9	Performs capacity tests.

				F.16.10	Charges the battery with a proper method.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.17**	To detect faults of the command circuit and make repairs	**F.17.1**	Determines and replaces damaged keys, buttons, fuses, switches, engine speed controllers, direction controllers, dynamic brake controllers, analog time/speed indicators and recorders on the control panel, analog and digital indicators and wiper motors.
				F.17.2	Determines the damaged, loose, rusty and oxidized detection connections and terminal connections of the components on the control panel.
				F.17.3	Tests the lighting units on the control panel with the test button, and replaces the dysfunctional ones.
				F.17.4	Tests the warning lamps and bells on the control panel by supplying the power to them, and replaces the dysfunctional ones.
				F.17.5	Checks if the wiper motors work properly and replaces the dysfunctional ones.
				F.17.6	Checks if there are glasses with defective defoggers (rezistans) and replaces them.
				F.17.7	Checks the functionality of the defoggers on the glass.
		F.18	To detect faults of the protection circuit and make repairs (to be continued)	**F.18.1**	Determines and replaces the damaged float valves, electrovalves, relays, relay sockets, detectors, buttons, pedals and cancellation keys on the protection circuits.
				F.18.2	Tests the operation of the detectors at the test stand and replaces the dysfunctional ones.
				F.18.3	Tests the protection circuits by supplying or cutting the power to them according to the relay type.
				F.18.4	Tests the operation of the excessive speed prevention circuit of the diesel engine.

				F.18.5	Tests the operation of the water level circuit, water temperature circuit, and the water pressure circuit.
				F.18.6	Tests the operation of the oil temperature circuit, the hatch interior temperature circuit, and the oil pressure circuit.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.18**	To detect faults of the protection circuit and make repairs	**F.18.7**	Tests the operation of the filter compartment pressure circuit, the dynamic brake overcurrent circuit and the main alternator ball bearing temperature circuit.
				F.18.8	Tests the operation of the fault current protection and overcurrent protection circuits.
				F.18.9	Tests the operation of the slip warning and slip prevention circuits.
				F.18.10	Tests the operation of protection circuit, blasting circuit and the dead man (dead-man) circuit of starter motor.
				F.18.11	Fixes his own fault in protection circuit he tested,and informs about the others to the relevant units
				F.18.12	Measure the resistance and diode in the self-induction protection circuit and replace the burned resistance and diode that broke out
		F.19	To detect lighting circuit failures and make repairs (to be continued)	**F.19.1**	Visually inspects electrical panels and cabinets and detects and clean dusty and dirty ones.
				F.19.2	Detects and examines fuses, switches, buttons, keys, warning lights, relays, voltmeter, frequency meter, ammeter in electrical panels and cabinets, changes damaged ones.
				F.19.3	Examines retaining and terminal fastener components in electrical panels and cabinets and detects incomplete, damaged, loose, rusty and oxidized ones.
				F.19.4	Measures disconnection, short circuit, insulation resistance and earth resistance in electrical installations (with megger, voltmeter or multimeter); determines the line segments that need to be changed, replaces the installation in line segments that need to be changed.
				F.19.5	Tests fuses, switches, buttons and keys if they turn on and off the circuit in electrical panels and cabinets, detects defective ones, change the damaged ones.

				F.19.6	Tests warning lights in electrical panels and cabinets by giving energy and change the burnt warning lamp.
				F.19.7	Examines voltmeter, frequency meter, ammeter in electrical panels and cabinets, detects and replaces those that do not show any values.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.19**	To detect lighting circuit failures and make repairs	**F.19.8**	Examines switches, sockets, lighting lamps, taillights, projector, sockets and detects damaged fixtures, replace the damaged parts.
				F.19.9	Tests lamps and switches by turning stop, projector and lighting switches on and off, changes those are not working.
				F.19.10	Controls outlets with test light, detects the defective items and changes them
				F.19.11	Examines damaged economic circuit couplers and changes them.
		F.20	To identify air-conditioning circuit failures and making repairs (to be continued)	**F.20.1**	Examines and detects damaged coupling devices for electric heating, replaces damaged parts
				F.20.2	Examines equipment chest of air conditioning system, detects dusty and dirty equipment, clear dusty and dirty equipment chest.
				F.20.3	Examines all retaining and terminal connections in the equipment chest of air conditioning system, accessories in the chest, all hardware of convection heating and air conditioning system; detects missing, damaged, loose, rusty and oxidized ones.
				F.20.4	Examines fuse switch, contactors and relays in air conditioning system equipment chest, and detect damaged ones.
				F.20.5	Measures disconnection, short circuit, insulation resistance and earth resistance in electrical installations (with megger,voltmeter or multimeter) ;determines the line segments that need to be changed, replaces the installation in line segments that need to be changed
				F.20.6	Examines thermostats and temperature sensors, detects damaged ones and change them.

				F.20.7	Tests thermostats and temperature sensors on test stand, changes thermostats and temperature sensors that do not work.
				F.20.8	Examines the resistance of convective heating system, detects and replace defective heating elements.
				F.20.9	Tests convection heating resistors by heating, changes resistor that does not perform heating.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To detect and repair electrical system failures in rail system vehicles (to be continued)	**F.20**	To identify air-conditioning circuit failures and making repairs	**F.20.10**	Examines air conditioning evaporator unit, underfloor heating of air conditioning unit chassis, air conditioning condenser unit and the air conditioning compressor, detects damaged ones and replace them.
				F.20.11	Performs signs of decay (bubble) and signs of moisture (discoloration) control by examining refrigerant from fluid line watch glass in air conditioning system.
				F.20.12	If there is a decrease sign (bubble), controls refrigerant gas leak detector if it leaks in the air conditioning system, removes the leaks by tightening the connection and replacing damaged pipes
				F.20.13	Gives refrigerant into air conditioning, changes the cooling gas if signs of moisture (discoloration) seen.
				F.20.14	Controls the lube oil level in air conditioning compressor, completes the oil if missing.
				F.20.15	Examines ventilation fans, clean air intake dampers, shutter vents, shutter electro-valves, shutter air lines, detects damaged ones, replace any damaged parts.
		F.21	To detect the failures of electrical connections mounted on vehicles and making repairs	**F.21.1**	Visually examines and detects damaged electrical coupling pins and changes damaged ones
				F.21.2	Visually inspects electrical connections and connectors on the bogies and detects damaged ones, changes them.
		F.22	To identify door control units	**F.22.1**	Examines and detects door electric motor and replace damaged ones.

			failures and repairing		
				F.22.2	Makes the control of door electrical connection, renew broken lines.
				F.22.3	Examines obstacle sensor, jam detector circuits, detects damaged ones and changes them.
				F.22.4	Examines door control elements (relays, pushbuttons, switches, keys), detects damaged ones, and replace damaged parts.
		F.23	To detect and repair faults during routine operations	**F.23.1**	Completes missing fasteners, replace any damaged fasteners, tighten loose fasteners, cleans rusted and oxidized parts.
				F.23.2	Makes the hardware control after repairs are made.

Duties		**Tasks**		**Performance Criteria**	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
G	To carry out the completion processes	**G.1**	To control the performance of daily work schedule	**G.1.1**	Reviews his daily work schedule.
				G.1.2	Controls whether missing works remain in accordance with his daily work schedule.
				G.1.3	Determines reasons why the duty is uncompleted.
				G.1.4	Informs his superiors on uncompleted duties.
		G.2	To carry out the cleaning of equipment and work area at the end of work	**G.2.1**	Leaves working area tidy and clean.
				G.2.2	Maintains devices and tools he used by the end of work.
				G.2.3	Replaces materials, devices and tools he used.
				G.2.4	Pays attention to the use of materials that may damage occupational safety and stores them in predetermined places accordingly.
		G.3	To keep record of works performed	**G.3.1**	Keeps records of works done in relevant forms.
				G.3.2	Keeps records of consumable materials in relevant forms.
		G.4	To provide information about	**G.4.1**	Prepares report about works done.

			works done	**G.4.2**	Informs his superior about works he did.
				G.4.3	Informs personnel to whom he will hand in the work about on-going works.
H	To participate in occupational development activities	**H.1**	To carry out activities regarding individual occupational development	**H.1.1**	Carries out due research activities regarding occupational and individual development.
				H.1.2	Follows up new technologies and developments related to rail system vehicles' electrical maintenance and repair.
		H.2	To provide occupational training to professional training students and other personnel	**H.2.1**	Shares his knowledge and experiences with his colleagues.
				H.2.2	Gets restricted level of information and training about rail system vehicles' electrical maintenance and repair.

3.2. Tools, Appliances and Equipment Used

1. Battery charger and cables
2. Battery tester
3. Ammeter
4. Intra/extravehicular protective covers
5. Vehicle service book
6. Waste oil disposal and collecting unit
7. Fasteners (bolt, nut, screw, rivet, etc.)
8. Maintenance forms
9. Maintenance channels and stands
10. Biological and chemical water treatment systems
11. Hydrometer
12. Trolley hoist
13. Hammer
14. Various wrench sets (open-end wrench, cross-recess, allen, socket set, etc.)
15. Types of safety stand and chock
16. Grease pump and lubrication units
17. Safety instruction information and warning writings
18. Hydraulic, electric and pneumatic hand tools
19. Hydrometer
20. Communication devices (radio, telephone, mobile phone)
21. First-aid equipment
22. Denatured alcohol
23. Insulation materials
24. Megger
25. Types of lifting rope and slingshot
26. Types of solid and liquid fuel (coal, diesel fuel, gasoline, kerosene)
27. Chemical cleaning and rust remover agents
28. Personal protective equipment (helmet, protective toe boots, working gloves, gas mask, ear plugs, visors, safety glasses, dust mask, protective clothing)
29. Compressor and air distribution unit
30. Voltage tester
31. Test lights
32. Types of lifting jack
33. Soldering paste
34. Soldering gun and equipment
35. Types of material (steel, iron, brass, copper, aluminium, plastic, rubber, polyamide sheet, pipe, rod, cable etc.) and handling cart
36. Pressure gauge
37. Methyl alcohol
38. Various electrical materials
39. Various spare parts
40. Multimeter

41. Special type analogue and digital measurement instruments and devices
42. Pliers types
43. Redressor (current rectifier and voltage divider)
44. Refractometer
45. Relay tester
46. Bearing puller
47. Portable lamp and flashlight
48. Sealing elements
49. Jumps leads
50. Repair, maintenance and parts catalogue/data programmes
51. Diagnostic tester
52. Portable analogue and digital measurement instruments and devices
53. Rag
54. Stand-type analogue and digital measurement instruments and devices
55. Voltmeter
56. Types of grease
57. Fire extinguishing equipment and materials
58. Washing machine and units (water, air and chemical)

3.3. Knowledge & Skills

1. Knowledge of emergency
2. Knowledge of battery maintenance
3. Analytical thinking skills
4. Tools, appliances and equipment knowledge
5. Lighting system maintenance and repair knowledge
6. Basic first-aid knowledge
7. Knowledge of filling information and evaluation forms
8. Knowledge of environmental protection methods
9. Team working skills
10. Manual skill
11. Knowledge of manual and visual inspection principles
12. Knowledge of electric-electronic measurement
13. Knowledge of electric-electronic machine motors
14. Industrial control systems knowledge
15. General knowledge of occupational health and safety
16. Knowledge of recyclable wastes
17. Knowledge of maintenance and repair of power supply elements
18. Working organization knowledge
19. Knowledge of workplace procedures
20. Decision making skills
21. Knowledge of catalogue using
22. Record keeping and reporting skills

23. Knowledge of materials
24. Knowledge of using occupational computer programmes
25. Knowledge of mathematics, terminology and foreign language at occupational level
26. Knowledge of occupational technological developments
27. Knowledge of application order of repair works
28. Skill of learning and being able to share what s/he learned
29. Knowledge and skills of disassembling methods
30. Problem solving skills
31. Knowledge of rails system vehicles
32. General mechanical knowledge of rail system vehicles mechanical maintenance and repair works
33. Oral and verbal communications skills
34. Knowledge of standard measurements
35. Stress and crisis management skills
36. Skills of safely use of handling and immobilization installation
37. Knowledge of hazardous waste and hazardous waste triage skills
38. Knowledge of technical drawing
39. Basic knowledge of working legislation
40. Knowledge of basic geometry
41. Basic security systems knowledge
42. Basic communication systems knowledge
43. Basic machine tools electrical systems knowledge
44. Knowledge of use and interpretation of testers
45. Knowledge of fire prevention and fire fighting
46. Knowledge of spare parts
47. Good time management skills

3.4. Attitudes and Behaviours

1. Being cold blooded and calm under emergency and stressful situations
2. Informing superiors properly and in time
3. Making decisions within knowledge and experience
4. Using her/his time effectively and efficiently in accordance with work orders
5. Adopting regulations set forth in environmental, quality, and OHS legislation
6. Sharing experience with associates
7. Being sensitive on possible changes which may arise during operation
8. Being sensitive on use and recovery of resources
9. Behaving in accordance with hierarchical structure of workplace
10. Ensuring his/her own safety and safety of other people
11. Being willing to research for professional development
12. Working planned and systematically
13. Being sensitive on risk factors
14. Knowing his/her responsibilities and fulfilling the same
15. Obeying instructions and guidelines accordingly

16. Informing relevant people of dangerous situations
17. Taking care of cleanness, tidiness, and order of workplace
18. Sharing information effectively, clearly and accurately during shift changes
19. Being open to innovations and adapting to changing conditions
20. Informing concerned people about the malfunctions which are not under his/her authority

4. TESTING, ASSESSMENT AND CERTIFICATION

Testing and assessment for certification with respect to national qualifications based on Rail System Vehicles Electrical Technician (Level 4) Occupational Standard shall be held in written and/or oral forms, theoretically and practically, in testing and assessment centres where required conditions are met.

Testing and assessment method and practice principles shall be detailed with national qualifications to be drawn up pursuant to this occupational standard. Activities regarding testing, assessment and certification shall be conducted within the framework of Vocational Qualification Authority, Testing and Certification Regulation.

Annex: Institutions that participated in the Occupational Standard Preparation Process

1. Professional Standards Team of Institution Preparing Professional Standard:

İsa APAYDIN	Deputy General Manager, TCDD
Murat ŞENEKEN	Education and Training Department Head, TCDD
Yavuz KIRAN	General Manager of TCDD Foundation
Fatma Ülker YETGİN	Project Coordinator
Pınar DEMİREKLER	Quality Process Manager
Mehmet EKTAŞ	Branch Manager (Education and Training Department, TCDD)
Feyzi SIVACI	Branch Manager (Education and Training Department, TCDD)
Ekrem ARSLAN	Office Chief (Education and Training Department, TCDD)
Kenan KÜTÜKDE	Moderator (MoNE, Teacher at Gazi Technical and Industrial Vocational High School)

2. Technical Work Group Members:

Emrullah ÖZKALDI	Occupation Group Coordinator (Deputy Head of Traction Dept., TCDD)
Mustafa KARAKOYUN	Wagon Maintenance and Repair Atelier Manager, TCDD
Ahmet ÇİYİLTEPE	Depot Chief, TCDD
Adnan AVCI	Depot Chief, TCDD
Özer GÜRSOY	Expert Technician, TCDD
Erol CEYLAN	Foreman, TCDD

3. People, Institutions, and Organisations Asked for Opinion:

Ministry of Labour and Social Security

MoNE Occupational and Technical Education Directorate General

MoNE Life-long Learning Directorate General

MoNE Innovation and Education Technologies Directorate General

Ministry of Science, Industry and Technology

Ministry of Transportation, Maritime Affairs and Communications

Turkish Labour Institution (İŞKUR)

Turkish Statistical Institute (TÜİK)

Council of Higher Education (CoHE)

State Personnel Administration

Small and Medium Enterprises Development Organization (KOSGEB)

Confederation of Revolutionary Trade Unions of Turkey (DİSK)

HAK-İŞ Trade Union Confederation

Confederation of Turkish Tradesmen and Craftsmen (TESK)

Confederation of Turkish Trade Unions (TÜRK-İŞ)

Turkish Confederation of Employer Associations (TİSK)

Turkish Union of Chambers and Exchange Commodities (TOBB)

Turkish Exporters Assembly (TİM)

Ankara Chamber of Industry (ASO)

Ankara Chamber of Trade (ATO)

Istanbul Chamber of Trade (İTO)

Aegean Region Chamber of Industry (EBSO)

Istanbul Transportation Inc.

Bursa Rail Operation Centre (BURULAŞ)

Eskişehir Light Rail System Enterprise (ESTRAM)

Ankaray

İzmir Metro Inc.

Antalya Metropolitan Municipality

Konya Metropolitan Municipality

The Turkish Employers Association of Construction Industries (İNTES)

Yapıray

Rhomberg Kalebozan Demiryolu Building Trade Inc.

Alarko Group of Companies

Yüksel Project Corporation

Olmuksa

Petkim

Tüpraş

Eti Mining Enterprise

İskenderun Steel & Iron Plant Enterprise (ISDEMIR)

Ereğli Steel & Iron Plant Enterprise (ERDEMIR)

Mechanical and Chemical Industry Corporation (MKE)

Sümer Holding (Iron&Steel)

Yıldız Entegre (Tügsaş)

Demiryolu Lojistik Müh.San.Tic.Ltd.Şti.

Kayseray

Turkish Transportation Sector Public Workers Trade Union (TUS)

United Transportation Workers Trade Union (BTS)

Transportation Sector Public Servants Trade Union (UÇMS)

Transportation Active Public Servants Trade Union Faal-Sen (UFS)

Independent Transportation Services Public Workers Trade Union (BUS)

Transportation Workers Right Trade Union (Ulaşım-Hak-Sen)

Transportation Workers Trade Union (Ulaşım-Bir-Sen)

Transportation and Railway Workers Right Trade Union (Udem-Hak-Sen)

Association of Railway Vocational School Graduates

Association of Railway Machinists and Wagon Technicians

Association of Railway Train Professionals

Association of Railway Transportation

Association of Rail Transportation Systems

Turkish State Railways (TCDD) Railway Department

Turkish State Railways (TCDD) Traction Department

Turkish State Railways (TCDD) Premises Department

Turkish State Railways (TCDD) Personnel and Administrative Affairs Department

Turkish State Railways (TCDD) Traffic Department

Turkish State Railways (TCDD) Ankara Training Centre

Turkish State Railways (TCDD) Eskişehir Training Centre

Turkish State Railways (TCDD) Sivas Training Centre

Turkish Locomotive and Motor Industry Corporation

Turkey Railway Machinery Industry Corporation

Turkish Railway Car Industry Corporation

Central Technical and Industrial Vocational High School

Anatolian Technical Vocational High School

Atatürk Anatolian Industrial Vocational High School

Haydarpaşa Anatolian Technical Vocational High School

Fatih Anatolian Vocational High School

Gazi Anatolian Vocational High School

Şehit Kemal Özalper Anatolian Vocational High School

Anadolu University Porsuk Vocational School

Erzincan University Refahiye Vocational High School Rail Systems Programme

4. VQA Sector Committee Members and Experts

Prof. Dr. Mustafa KARAŞAHİN,	President (Council of Higher Education)
Şeyhamit Ünal SARIBAŞ,	Vice President (Ministry of National Education)
Aykut KARAKAVAK,	Member (Ministry of Labour and Social Security)
Edip TÜRKAY,	Member (Ministry of Energy and Natural Resources)
Damla Ebru ESEN,	Member (Ministry of Industry and Trade)

Burak ERDEM,	Member (Turkish Confederation of Employer Associations)
Mehmet KARABÜBER,	Member (HAK Trade Unions Confederation)
Hakan BEZGİNLİ,	Member (Turkish Union of Chambers and Exchange Commodities - TOBB)
Nizamettin ATEŞ,	Member (Confederation of Turkish Tradesmen and Craftsmen - TESK)
Dilek TORUN,	Member (Vocational Qualifications Authority)
Firuzan SİLAHŞÖR,	Department Head (Vocational Qualifications Authority)
Fatma GÖKMEN,	Sector Committee Representative (Directorate General for Persons with Disabilities and Elderly Services)

5. VQA Executive Board

Bayram AKBAŞ	Representative of Ministry of Labour and Social Security, President
Assoc. Prof. Ömer AÇIKGÖZ	Representative of Ministry of National Education, Deputy President
Prof. Dr. Mahmut ÖZER	Representative of Council of Higher Education, Member
Bendevi PALANDÖKEN	Representative of Professional Organizations, Member
Mustafa DEMİR	Representative of Confederation of Employer Associations, Member
Dr. Osman YILDIZ	Representative of Trade Union Confederations, Member