



NATIONAL OCCUPATIONAL STANDARD

ELECTRONIC SERVICEMAN AND ELECTRICIAN FOR RAILWAY VEHICLES

LEVEL 4

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TERMS, SYMBOLS AND ABBREVIATIONS

ANTENNA: Electromagnetic signal receiver and buzzer for communication in the rail system cars.

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

ATP (Automatic Train Protection): Automatic train protection system.

ATS (Automatic Train Stop): Automatic train stop system.

FEEDING UNIT: Unit which generates voltage necessary for the operation of electronic systems.

FLANGE GREASING UNIT: Unit which enables to spray oil in order to reduce friction between rail guide above railway vehicle's wheel and rail.

CCTV (Closed Circuit Television): Closed circuit television system.

TRACTION CONVERTER: Electronic system which provides power supply to traction motors.

IMPULSE GENERATOR (ODOMETER, TACHOMETER): An apparatus which provides speed information to speed recorder device.

DCU (Door Control Unit): Electronic door control unit in railway vehicles.

DISCHARGE RESISTOR: Resistance which enables to discharge DC voltage in power electronics converter and inverter units.

ELECTRONIC CONTROL: Electronic systems which control railway vehicle.

ERTMS (European Railway Traffic Management System): European Railway Traffic Management System.

FILTER CONDENSER: Electronic circuit component which stores rectified voltage used in power electronics systems and enables proper input.

GPS (Global Positioning System): Global positioning system.

GSM-R (Global System for Mobile Communications - Railway): Mobile communications system which enables data communication of sound and signalling system between railway operation personnel and trains.

GTO (Gate Turn Off Thyristor): Semi-conductor component of electronic power circuit.

SPEED LOG SYSTEM: System which displays and records information such as speed, distance of railway vehicles.

IGBT (Insulated Gate Bipolar Transistor): Insulated polar bipolar transistor.

IPM (Intelligent Power Module): Intelligent power module.

ISCO: International Standard Classification of Occupations.

AIR CONDITIONING: A system which carries out heating, cooling and ventilating actions.

INVERTER: A device which transforms DC voltage into AC voltage in various frequencies.

ISH: Occupational Health and Safety.

PERSONAL PROTECTIVE EQUIPMENT: All tools, equipments, devices, appliances which protect employees against risks that may incur due to their work, and affect their health and safety, which are worn, put on or held by them, and which are designed to this end.

CONTACTOR: An electromechanic device which enables to energise or deenergise receiver in electric circuits.

CONVERTER: A device which transforms energy from any current form to another current form.

RAILWAY VEHICLE: A general name given to all vehicles (train, subway train, tramway, maglev, etc.) which travel on railway track.

RISK: Possibility of occurrence of loss, injury or other harmful consequences that may occur due to danger.

RELAY: Electromechanic keying element which works electromagnetically.

SENSOR: A device which perceives variables such as flow, weight, temperature, speed, capacity, etc. electronically and mechanically.

DRIVER DISPLAY UNIT: A screen of train control and monitoring system of railway vehicles used by driver.

SHUNT (TRANSITION): To increase rotation speed and moment of traction motors by connecting parallel resistance to inductor winding of DC traction motors at certain speed values.

TCMS (Train Control and Monitoring System): Train control and monitoring system of railway vehicles.

DANGER: A damage potential which may affect employees and workplace and which may exist within a workplace or come from outside.

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1. INTRODUCTION

National occupational standard titled Electronic Serviceman and Electrician for Railway Vehicles (Level 4) was issued by the Turkish State Railways (TCDD) Development & TCDD Personnel Solidarity and Assistance Foundation assigned by Vocational Qualifications Authority as per the provisions of Vocational Qualifications Authority (VQA) Law No. 5544 and “Bylaw on Drawing up National Occupational Standards” and “Regulation on the Establishment, Duties and Operation Procedures and Principles of the Sector Committees of Vocational Qualification Authority” introduced pursuant to the aforementioned Law.

National occupational standard titled Electronic Serviceman and Electrician for Railway Vehicles (Level 4) was assessed upon receiving the opinions of the related institutions and organisations in the sector, and approved by VQA Board of Directors upon examination of the VQA Transportation, Logistics and Communication Sector Committee.

2. INTRODUCTION OF THE OCCUPATION

2.1. Definition of the Occupation

Electronic Serviceman and Electrician for Railway Vehicles (Level 4) is the qualified person in terms of knowledge and experience who has the ability to carry out periodic maintenance of electronic hardware and systems in order for railway vehicles to be ready for use, and identification and repair of failures occurring in vehicles by his/her own or within a team in the framework of ISG, environmental protection, quality procedures and management.

Electronic Serviceman and Electrician for Railway Vehicles (Level 4) is responsible for accurateness, timing and quality of works he/she carries out with regards to checks, maintenance and repair under his/her partial supervision. He/she works in accordance with operating procedures and informs related individuals about failures and errors outside his/her scope of responsibility.

2.2. Place of the Occupation in International Classification System

ISCO 08: 7421 (Electronics mechanics and servicers)

2.3. Regulations on Health, Safety and Environment

Environmental Law No. 2872

Labour Law No. 4857

Social Insurance and Universal Health Insurance Law No. 5510

Energy Efficiency Law No. 5627

Occupational Health and Safety Law No. 6331, Regulation on Heavy and Dangerous Works

Communique on Vocation Training of Employees to be Employed in Heavy and Dangerous Works

Regulation on Control of Packaging Waste

Regulation on Control of Waste Oil

Regulation on the General Principles of Waste Management

Regulation on Principles and Procedures of Occupational Health and Safety Training of Employees

Regulation on Authorities, Duties and Responsibilities of Electrical Engineers

Regulation on High Tension Installations

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 Equipments 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 Legislation regarding the Occupation

Decree Law Regarding 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

Trade Unions and Collective Labour Agreements Law 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

Electronic Serviceman and Electrician for Railway Vehicles (Level 4) is under the risk of occupational diseases caused by working environment and conditions. He/she works throughout the day and in bank holidays. It is an occupation that requires attention, and sensitivity and attention is required for unexceptional obedience with occupational health and safety rules. Electronic Serviceman and Electrician for Railway Services (Level 4) cooperates with other employees carrying out other tasks and deploys due personal protective equipments.

2.6. Other Requirements Regarding The Occupation

Electronic Serviceman and Electrician for Railway Vehicles (Level 4) is required to obtain medical report regarding his physical competency that his work requires and "Form of Initial Entrance and Periodic Medical Examination for Workers in Heavy and Dangerous Work" report".

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	Obtains information about arrangements and directions regarding workplace occupational health and safety from occupational health and safety officers.
				A.1.2	Uses work clothes and personal protective equipments suitable for the work performed.
				A.1.3	Uses emergency response vehicles such as first-aid kits and eye wash, and fire extinguisher.
				A.1.4	Contributes to the safety of work area and other employees by placing and protecting the warning signs related to the work in accordance with the company's instructions.
				A.1.5	Implements measures taken to keep working environment and equipments used tidy and clean.
		A.2	To decrease risk factors	A.2.1	Contributes to the activities related to risk assessment.
				A.2.2	Reports risk factors he/she faces and may face while working to related authorities.
				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 work in accordance with environmental protection legislation	B.1	To assess environmental hazards	B.1.1	Contributes to the environmental impact assessment related to performed activities and assessment of potential risks.
				B.1.2	Participates in periodic trainings for environmental protection requirements and practices.
				B.1.3	Contributes to activities related to elimination of assessed environmental hazard sources and risk factors.
		B.2	To implement environmental protection measures	B.2.1	Ensures that due measures are taken for environmental impacts that may occur during performance of work processes in accordance with enterprise's instructions.
				B.2.2	Ensures that wastes generated during the performance of work processes are disposed in accordance with enterprise's instructions.
				B.2.3	Takes measures related to safe and healthy operation of devices, equipments and tools against their negative environmental impacts that may occur.
		B.3	To act economically regarding consumption of enterprise's resources	B.3.1	Uses enterprise's resources economically and efficiently.
				B.3.2	Carries out necessary assesment and planning regarding efficient use of enterprise's resources.

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 quality assurance principles and methods in accordance with the enterprise's instructions stated in task forms.
				C.1.2	Works in compliance with conditions defines in quality assurance rules and methods of devices and tools uses during work processes.
				C.1.3	Supervises conformity of the tasks he/she performs 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 failures and defects determined during processes	C.2.1	Informs failures and defects identified during the works to the relevant chief/authority.
				C.2.2	Participates in the research and assessment activities related to determination of reasons for failures and defects, and duties assigned.
				C.2.3	Submits his and his team's observations, ideas and suggestions for improvement of work processes and elimination of failures to the relevant authority in accordance with the enterprise's rules and methods.
				C.2.4	Applies implementation of the enterprise's rules and methods related to failure and defect repairs.
				C.2.5	Informs failures and defects outside the scope of his authority or he fails to repair to the relevant authority.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
D 2	To make work preparations (To be continued)	D.1	To make personal preparation	D.1.1	Pays attention to personal care and hygiene.
				D.1.2	Be present in the workplace in due time before commencement of work as indicated on legislation
				D.1.3	Carries out check document tasks regarding his continuity to work.
				D.1.4	Wears clothes in compliance with workplace working procedures, wears introductory symbols and signs over his clothes, and wears protective equipments.
		D.		D.2.2	
		D.3	To start work	D.2.1	Takes the work schedule. Gathers information from the person who has handed over on-going works to him.
				D.2.3	Discusses his work schedule with other members of the team. Inspects work site in order to sustain continuous and proper operation.
				D.3.1	Çalışmaların kesintisiz ve uygun şekilde sürdürülmesi için iş alanını inceler. Contributes to amendment of negative features of work site.
				D.3.2	
D.3.3	To determine features of work site	D.3.3	Ensures order in compliance with type of work and working method.		
		D.3.4	Controls non-conforming components or materials area and ensures its order.		

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Title
D	To make work preparations	D.4	To get equipment and material he will use ready for work	D.4.1	Selects and prepares materials, tools and devices suitable for his work.
				D.4.2	Controls if materials, tools and devices are operative or not.
				D.4.3	Uses control and inspection devices and tools according to tasks specified.
		D.5	To carry out work organisation	D.5.1	Controls vehicle by also taking forms filled out by related personnel into consideration.
				D.5.2	Evaluates existing problems and complaints.
				D.5.3	Determines completion period of work.
				D.5.4	Identifies components which cannot be maintained and repaired, and need to be replaced.
				D.5.5	Informs relevant departments about work flow.
		D.6	To identify features of vehicle that will be maintained and repaired	D.6.1	Identifies distance covered (in km) by vehicle to be maintained and repaired.
				D.6.2	Controls systems of vehicle to be maintained / repaired, which are under his responsibility, regarding physical damage.
				D.6.3	Inspects equipment structure and circuit diagram of vehicle to be maintained / repaired.
				D.6.4	Complies with operation sequence to be pursued during maintenance/repair, pursues periodic maintenance instructions.
		D.7	To take safety measures before maintenance & repair	D.7.1	Removes unauthorised people, foreign materials and dangerous substances away from working site.
				D.7.2	Lays protective covers to relevant parts of vehicle to be maintained & repaired.
				D.7.3	Prepares and uses protective materials suitable for operation he will perform.
				D.7.4	Carries out due grounding operation for vehicle to be maintained & repaired.
				D.7.5	Carries out discharge operations for systems to operate.
				D.7.6	Switches on and off due power switches and fuses.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
E	To carry out periodic maintenance of electronic hardware and systems of railway vehicles (To be continued)	E.1	To carry out periodic maintenance of electronic control cabinets	E.1.1	Removes card groups within electronic control cabinets of vehicle to be maintained & repaired out of vehicle.
				E.1.2	Cleans inner side of cabinet using compressed air.
				E.1.3	Carries out visual control of circuit elements within electronic control cabinet.
				E.1.4	Carries out visual control of connecting cable, terminal and connectors.
				E.1.5	Removes dust from card group and case using compressed air.
				E.1.6	Carries out visual control of electronic cards.
				E.1.7	Observes indicators in electronic cards and card groups by pushing test button.
				E.1.8	Reassembles electronic card groups.
				E.1.9	Removes components and cards which are identified to be out of order.
		E.2	To carry out periodic maintenance of traction converter (To be continued)	E.2.1	Dissambles and cleans dust filters within converter unit.
				E.2.2	Cleans inner parts of divisions and cabinets using compressed air.
				E.2.3	Carries out maintenance of ventilators within divisions, cabinets and units.
				E.2.4	Carries out visual control of power electronics components (IGBT, GTO, IPM, etc.) and filter condensers within converter and inverter units.
				E.2.5	Visually examines cooling components of power electronics.
E.2.6	Carries out visual control of main converter overvoltage circuit breaker system's circuit components.				

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
E	To carry out periodic maintenance of electronic hardware and systems of railway vehicles (To be continued)	E.2	To carry out periodic maintenance of traction converter	E.2.7	Carries out visual control of traction converter unit's relay and power supply components.
				E.2.8	Carries out visual control of traction control unit.
				E.2.9	Controls and removes dust and dirt from electronic cards of traction control unit.
				E.2.10	Controls batteries within cards of traction control unit and replaces them if necessary.
				E.2.11	Controls system softwares of traction control unit and reinstalls defective softwares.
				E.2.12	Controls system parameters and corrects defective parameters.
				E.2.13	Visually controls traction converter system connecting cable, terminal and connectors.
				E.2.14	Controls fiber optic cables and data links.
		E.2.15	Replaces traction converter unit equipments which are identified to be out of order.		
			To carry out periodic maintenance of auxiliary power supply units (To be continued)	E.3.1	Disassembles all dust filters within the unit and cleans them properly.
				E.3.2	Removes dust and dirt from the inner part of the unit using compressed air.

		E.3			
			E.3.3	Carries out maintenance of ventilators within the unit.	
			E.3.4	Carries out visual control of power electronics components of auxiliary power supply system.	
			E.3.5	Visually controls filtration condenser and coils.	

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
E	To carry out periodic maintenance of electronic hardware and systems of railway vehicles (To be continued)	E.3	To carry out periodic maintenance of auxiliary power supply units	E.3.6	Carries out visual control of discharge and load resistance of auxiliary power supply system.
				E.3.7	Removes dust and dirt from electronic cards.
				E.3.8	Controls batteries within system and replaces them if necessary.
				E.3.9	Controls system softwares and reinstalls defective softwares.
				E.3.10	Controls system parameters and corrects defective parameters.
				E.3.11	Visually controls connecting cables, terminals and connectors.
				E.3.12	Replaces auxiliary power supply unit equipments which are detected to be out of order.
		E.4	To carry out periodic maintenance of communications system (radio, GSM-R)	E.4.1	Carries out visual control of transceiver module of communications system.
				E.4.2	Controls antenna cable and connectors between transceiver module and antenna.
				E.4.3	Carries out visual control of antenna module.
				E.4.4	Controls communications microphone, speakers and sound quality.
				E.4.5	Carries out visual control of connecting cable, terminal and connectors.
				E.4.6	Removes dust and dirt from communications equipments.
				E.4.7	Replaces communications system equipments which are detected to be out of order.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
E	To carry out periodic maintenance of electronic hardware and systems of railway vehicles (To be continued)	E.5	To carry out periodic maintenance of flange greasing system	E.5.1	Carries put visual control of electronic unit of flange greasing system.
				E.5.2	Cleans electronic card box.
				E.5.3	Carries out visual control of circuit components of electronic card.
				E.5.4	Controls adjustment mechanisms of electronic cards and replaces defective ones according to references.
				E.5.5	Replaces defective electronic unit of flange greasing system.
		E.6.	To carry out periodic maintenance of electronic brake control unit	E.6.1	Carries out visual control of electronic brake control unit.
				E.6.2	Takes system card group out of vehicle and removes dust and dirt.
				E.6.3	Cleans division of card group.
				E.6.4	Controls connectors of system.
				E.6.5	Carries out visual control of electronic cards.
				E.6.7	Controls system softwares and reinstalls defective softwares.
				E.6.8	Backs up failure loggings recorded in system system memory to be examined by relevant personnel.
				E.6.9	Tests and controls electronic brake reference values.
				E.6.10	Replaces defective electronic brake control unit equipments.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
E	To carry out periodic maintenance of electronic hardware and systems of railway vehicles (To be continued)	E.7	To carry out periodic maintenance of speed log system	E.7.1	Carries out visual control of speed log unit.
				E.7.2	Takes speed log unit out of vehicle and cleans it.
				E.7.3	Cleans the part where module is situated.
				E.7.4	Controls connectors.
				E.7.5	Carries out visual control of speed log impulse generator and controls connectors.
				E.7.6	Controls functions of impulse generator.
				E.7.7	Reads and backs up records from speed log.
				E.7.8	Controls system softwares and reinstalls defective softwares.
				E.7.9	Controls system parameters and corrects defective parameters.
				E.7.10	Replaces defective speed log system equipments.
		E.8	To carry out periodic maintenance of passenger announcement and information system (To be continued)	E.8.1	Carries out visual control of electronic control unit.
				E.8.2	Carries out sound adjustment and visual controls of speakers.
				E.8.3	Carries out visual control of passenger information displays.
				E.8.4	Takes passenger information system electronic unit out of vehicle and cleans it.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
E	To carry out periodic maintenance of electronic hardware and systems of railway vehicles (To be continued)	E.8	To Carry out periodic maintenance of passenger announcement and information system	E.8.5	Controls system softwares and reinstalls defective softwares.
				E.8.6	Controls system parameters and corrects defective parameters.
				E.8.7	Controls operation of announcement microphone.
				E.8.8	Controls emergency announcement system between passenger compartments and control compartment.
				E.8.9	Controls connecting cables and connectors.
				E.8.10	Replaces defective equipments of passenger announcement and information system.
		E.9	To carry out periodic maintenance of passenger door system	E.9.1	Carries out visual control of electronic control unit of door system (DCU).
				E.9.2	Controls connecting cable and connectors.
				E.9.3	Controls electronic cards and replaces defective ones.
				E.9.4	Carries out function test of sensors within door system.
				E.9.5	Takes door control unit out of vehicle and cleans it.
				E.9.6	Controls system softwares and reinstalls defective softwares.
				E.9.7	Controls system parameters and corrects defective parameters.
				E.9.8	Replaces defective equipments of passenger door system.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
E	To carry out periodic maintenance of electronic hardware and systems of railway vehicles (To be continued)	E.10	To carry out periodic maintenance of train control and monitoring systems (TCMS)	E.10.1	Carries out visual control of electronic control unit and input-output units.
				E.10.2	Takes electronic control unit and input-output units out of vehicle and cleans them.
				E.10.3	Controls connecting cables, connectors and driver display unit.
				E.10.4	Carries out visual control of electronic cards within system.
				E.10.5	Controls system softwares and reinstalls defective softwares.
				E.10.6	Controls system parameters and corrects defective parameters.
				E.10.7	Evaluates records by connecting system and backs them up.
				E.10.8	Replaces defective equipments of train control and monitoring system.
		E.11	To carry out periodic maintenance of closed circuit television system (CCTV)	E.11.1	Carries out visual control of video recording and server units.
				E.11.2	Takes video recording and server units out of vehicle and cleans them.
				E.11.3	Carries out visual control of cameras within system and cleans them.
				E.11.4	Controls connecting cables and connectors.
				E.11.5	Controls system softwares and reinstalls defective softwares.
				E.11.6	Controls parameters of video recording and server units and replaces defective ones.
E.11.7	Replaces defective equipments of CCTV system.				

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
E	To carry out periodic maintenance of electronic hardware and systems of railway vehicles (To be continued)	E.12	To carry out periodic maintenance of electronic equipments of air-conditioning system	E.12.1	Carries out general overview of electronic control unit and cleans it.
				E.12.2	Carries out visual control of electronic control unit cards and circuit components.
				E.12.3	Controls connecting cables and connectors.
				E.12.4	Controls system softwares and reinstalls defective softwares.
				E.12.5	Controls portable test equipments and operation parameters, and corrects defective parameters.
		E.13	To carry out periodic maintenance of signalisation systems (ATS, ATP, ERTMS)	E.13.1	Carries out visual control of system antennas.
				E.13.2	Carries out visual control of connectors within system.
				E.13.3	Carries out visual control of electronic control unit.
				E.13.4	Takes electronic control unit out of vehicle and cleans it.
				E.13.5	Carries out visual control of driver control units.
				E.13.6	Tests system and controls its functions.
				E.13.7	Reads records over control unit and backs them up.
				E.13.8	Controls system softwares and reinstalls defective softwares.
E.13.9	Replaces defective equipments within system.				

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
E	To carry out periodic maintenance of electronic hardware and systems of railway vehicles	E.14	To carry out periodic maintenance of fire detection system	E.14.1	Carries out visual control of detectors and control unit of fire detection system.
				E.14.2	Cleans detectors and control unit of fire detection system.
				E.14.3	Controls connecting cables and connectors.
				E.14.4	Controls portable test equipments and operation parameters, and corrects defective parameters.
		E.15	To carry out periodic maintenance of electronic equipments of other systems on vehicle	E.15.1	Carries out visual control of control units and electronic cards of systems.
				E.15.2	Cleans control units and electronic cards of systems.
				E.15.3	Carries out visual control of sensors and other electronic equipments.
				E.15.4	Controls connecting cables and connectors.
				E.15.5	Tests system and controls its functions.
				E.15.6	Reads records over control unit and backs them up.
				E.15.7	Controls system softwares and reinstalls defective softwares.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
F	To carry out troubleshooting and repair of electronic hardware and systems of railway vehicles (To be continued)	F.1	To carry out troubleshooting in electronic control cabinets	F.1.1	Controls damage failures of system equipments.
				F.1.2	Controls input-output voltage of power supply units.
				F.1.3	Controls damage failure and colour of electronic cards.
				F.1.4	Controls system operation displays on electronic cards.
				F.1.5	Measures input-output signals of electronic cards.
				F.1.6	Measures and controls relay and contactors commanded from electronic cards.
				F.1.7	Carries out measurements of electronic circuit components.
				F.1.8	Controls warning and safety circuit components.
				F.1.9	Controls damage failures and looseness of connecting cable, terminal and connectors and fastens loose ones.
		F.2	To carry out troubleshooting in traction converter system (To be continued)	F.2.1	Controls damage failures of system equipments.
				F.2.2	Measures power electronics components.
				F.2.3	Carries out measurement of input-output values of power supply unit.
				F.2.4	Measures discharge and overvoltage circuit components.
				F.2.5	Connects to traction control unit and inspects system operation.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
F	To carry out troubleshooting and repair of electronic hardware and systems of railway vehicles (To be continued)	F.2	To carry out troubleshooting in traction converter system	F.2.6	Measures input-output signals of traction control unit.
				F.2.7	Examines previous converter operation and failures through test equipments.
				F.2.8	Controls damage failure and colour of electronic cards.
				F.2.9	Tests relay and contactors.
				F.2.10	Controls cooling components.
				F.2.11	Controls damage failures and looseness of connecting cable, terminal and connectors and fastens loose ones.
		F.3	To carry out troubleshooting in auxiliary power supply unit system (To be continued)	F.2.12	Controls temperature and speed sensors which provide reference information to traction control unit.
				F.3.1	Controls damage failures of system equipments.
				F.3.2	Measures and controls power electronics components of converter and inverter units.
				F.3.3	Measures and controls filtering condensor and coils.
				F.3.4	Measures input-output values of supply unit.
				F.3.5	Controls damage failure and colour of electronic cards.
				F.3.6	Measures input and output signals of electronic cards and controls functioning of the card.
F.3.7	Tests relay and contactors.				

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
F	To carry out troubleshooting and repair of electronic hardware and systems of railway vehicles (To be continued)	F.3	To carry out troubleshooting in auxiliary power supply unit system	F.3.8	Examines failure detection memory or system operation displays.
				F.3.9	Controls cooling components.
				F.3.10	Controls damage failures and looseness of connecting cable, terminal and connectors.
				F.3.11	Fastens loose connecting cables, terminal and connectors.
		F.4	To carry out troubleshooting in communications system (radio, GSM-R)	F.4.1	Controls failure of system equipments.
				F.4.2	Measures and controls power supply unit's input-output values.
				F.4.3	Tests communications microphone and speakers.
				F.4.4	Controls transceiver unit of communications system.
				F.4.5	Measures and controls communications antenna cable and connector, and communications antenna module.
				F.4.6	Controls damage failures and looseness of connecting cable, terminal and connectors and fastens loose ones.

Duties		Tasks		Performance Criteria	
Cod	Title	Code	Title	Code	Title
F	To carry out troubleshooting and repair of electronic hardware and systems of railway vehicles (To be continued)	F.5	To carry out troubleshooting in flange greasing system	F.5.1	Controls damage failure of system equipments.
				F.5.2	Controls damage failures and looseness of connecting cable, terminal and connectors.
				F.5.3	Fastens loose connecting cables, terminal and connectors.
				F.5.4	Controls input and putput voltage of power supply unit.
				F.5.5	Controls damage failure and colour of electronic cards.
				F.5.6	Measures input and output signals of electronic cards and controls functioning of the card.
				F.5.7	Controls condition of system operation displays on electronic cards.
		F.6	To carry out troubleshooting in electronic brake control unit	F.6.1	Controls damage failure of system equipments.
				F.6.2	Controls input and output voltage of power supply unit.
				F.6.3	Controls damage failures and looseness of connecting cable, terminal and connectors.
				F.6.4	Fastens loose connecting cables, terminal and connectors.
				F.6.5	Controls damage failure and colour of electronic cards within control unit.
				F.6.6	Controls failure detection memory within control unit.
				F.6.7	Controls control unit input and output signals.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
F	To carry out troubleshooting and repair of electronic hardware and systems of railway vehicles (To be continued)	F.7	To carry out troubleshooting in speed log system	F.7.1	Controls damage failure of system equipments.
				F.7.2	Controls damage failures and looseness of connecting cable, terminal and connectors and fastens loose ones.
				F.7.3	Controls input and output voltage of power supply unit.
				F.7.4	Controls system operation displays and failure detection memory within speed log unit.
				F.7.5	Measures and controls impulse generator.
				F.7.6	Controls damage failure and colour of electronic cards within speed log unit.
				F.7.7	Measures input and output signals of electronic cards and controls functioning of the card.
		F.8	To carry out troubleshooting in passenger announcement and information system	F.8.1	Controls damage failure of system equipments and replaces physically damaged and spoiled equipments.
				F.8.2	Controls damage failures and looseness of connecting cable, terminal and connectors and fastens loose ones.
				F.8.3	Controls input and output voltage of power supply unit.
				F.8.4	Controls damage failure and colour of electronic cards within electronic control unit.
				F.8.5	Measures input and output signals of electronic cards and controls functioning of the card.
				F.8.6	Controls announcement microphone and speakers within system on vehicle.
				F.8.7	Controls passenger information panels.
F.8.8	Tests emergency announcement system between passenger compartments and control compartment.				

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
F	To carry out troubleshooting and repair of electronic hardware and systems of railway vehicles (To be continued)	F.9	To carry out troubleshooting in passenger door system	F.9.1	Controls damage failure of system equipments.
				F.9.2	Controls damage failures and looseness of connecting cable, terminal and connectors and fastens loose ones.
				F.9.3	Controls input and output voltage of power supply unit.
				F.9.4	Controls damage failure and colour of electronic cards within electronic control unit.
				F.9.5	Measures input and output signals of electronic cards and controls functioning of the card.
				F.9.6	Controls system operation displays and failure detection memory within control unit.
				F.9.7	Measures and controls sensors within door system.
		F.10	To carry out troubleshooting in train control and monitoring system (TCMS)	F.10.1	Controls damage failure of system equipments.
				F.10.2	Controls damage failure and looseness of connecting cable, terminal and connectors and fastens loose ones.
				F.10.3	Controls input and output voltage of power supply unit.
				F.10.4	Controls damage failure and colour of electronic cards within electronic control unit.
				F.10.5	Measures input and output signals of electronic cards and controls functioning of the card.
				F.10.6	Controls system display unit.
				F.10.7	Controls system operation displays and failure detection memory within control unit.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Title
F	To carry out troubleshooting and repair of electronic hardware and systems of railway vehicles (To be continued)	F.11	To carry out troubleshooting in closed circuit television system (CCTV)	F.11.1	Controls damage failure of system equipments.
				F.11.2	Replaces physically damaged and spoiled equipments.
				F.11.3	Controls damage failure and looseness of connecting cable, terminal and connectors.
				F.11.4	Fastens loose connecting cables, terminal and connectors.
				F.11.5	Controls input and output voltage of power supply unit.
				F.11.6	Controls damage failure and colour of electronic cards within video recording and server units.
				F.11.7	Controls display unit and replaces defective display unit.
				F.11.8	Controls camera operations through display unit's screen.
				F.11.9	Controls video recording unit.
				F.11.10	Controls video server unit.
				F.11.11	Controls cooling components.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
F	To carry out troubleshooting and repair of electronic hardware and systems of railway vehicles (To be continued)	F.12	To carry out troubleshooting in electronic equipments of air conditioning system	F.12.1	Controls damage failure of system equipments.
				F.12.2	Controls damage failure and looseness of connecting cable, terminal and connectors.
				F.12.3	Fastens loose connecting cables, terminal and connectors.
				F.12.4	Controls input and output voltage of power supply unit.
				F.12.5	Controls damage failure and colour of electronic cards within electronic control unit.
				F.12.6	Measures input and output signals of electronic cards and controls functioning of the card.
				F.12.7	Controls system sensors.
				F.12.8	Controls cooling components of electronic control unit.
				F.12.9	Controls contactors and relays on air conditioning control panel.
		F.13	To carry out troubleshooting in signalisation system (ATS, ATP, ERTMS etc.) (To be continued)	F.13.1	Controls damage failure of system equipments.
				F.13.2	Replaces physically damaged and spoiled equipments.
				F.13.3	Measures and controls system antennas.
				F.13.4	Measures and controls input and output values of power supply unit.
				F.13.5	Controls damage failure and looseness of connecting cable, terminal and connectors and fastens loose ones.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
F	To carry out troubleshooting and repair of electronic hardware and systems of railway vehicles (To be continued)	F.13	To carry out troubleshooting in signalisation system (ATS, ATP, ERTMS etc.)	F.13.6	Controls electronic control unit.
				F.13.7	Controls damage failure and colour of electronic cards.
				F.13.8	Measures input and output signals of electronic cards and controls functioning of the card.
				F.13.9	Controls cooling components of electronic control unit.
				F.13.10	Examines previous converter operation and failures through test equipments.
				F.13.11	Controls system display units.
				F.13.12	Controls system operation displays and failure detection memory within control unit.
		F.14	To carry out troubleshooting fire detection system	F.14.1	Measures and controls detectors of fire detection system.
				F.14.2	Controls electronic units within fire detection system.
				F.14.3	Controls connecting cables and connectors.
		F.15	To carry out troubleshooting in electronic equipments of other systems on vehicle	F.15.1	Controls damage failure of system equipments.
				F.15.2	Controls input and output signals of control units.
				F.15.3	Controls failure detection memory within control unit.
				F.15.4	Controls sensors and other electronic equipments and connecting cables and connectors.

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Description
F	To carry out troubleshooting and repair of electronic hardware and systems of railway vehicles	F.16	To repair system failures	F.16.1	Repairs components detected to be out of order in line with instructions and reassembles them.
				F.16.2	Replaces components which are impossible to be repaired with new ones.
				F.16.3	Reports failures which cannot be repaired to related authorities in line with described procedures.
		F.17	To install system softwares	F.17.1	Selects service programme which is suitable for system.
				F.17.2	Makes due connections to install software and carries out software installation tasks in line with procedures.
				F.17.3	Controls accuracy of installation process through service programme.
		F.18	To make calibration adjustments	F.18.1	Identifies current parameters of system by carrying out their measurements or reading them through displays on device.
				F.18.2	Compares parameters identified with reference values.
				F.18.3	Adjusts parameters which are not in compliance with reference values using system software or adjustment mechanisms.
		F.19	To carry out functioning tests	F.19.1	Controls and measures systems and components which were repaired without using energy.
				F.19.2	Supplies energy to system in line with instructions.
				F.19.3	Carries out functioning tests in accordance with input and output values of system or equipment.
				F.19.4	Investigates nonconformity reasons in functioning tests and evaluates its conclusions.
		F.20	To read system circuit diagrams	F.20.1	Reads circuit diagram of relevant system and recognises circuit components.
F.20.2	Follows up failures by reading circuit diagram of relevant system.				

Task

3.2. Tools, Appliances and Equipments Used

1. Ammetre
2. Wrench set (Allen wrench, **açık, yıldız**, socket set, torque, etc.)
3. Multimetre
4. Regulated DC power supply
5. Adjustable pliers
6. Computer, related software and hardware components
7. Lensatic bench lamp
8. Workshop hoist
9. Hammer
10. Steel rope
11. Decoupage
12. Hacksaw
13. Decibelmetre
14. Circuit breakers
15. Riffler set
16. Flashlight
17. Electricitygrounding and isolation materials
18. Electric / electronic circuit components, testing and measurement devices
19. Electrical hand tools and motors
20. Phase pencil/voltage tester controlling device
21. Brush (wire, hair pencil)
22. Appliances such as plug, rail, bolt, loaf, etc.
23. Galvanometre
24. Communications cable measuring/testing device
25. Soldering iron set (soldierng ironsoldering wire, soldering paste, soldering pump)
26. Warning signs
27. Communication tools (telephone, radio, etc.)
28. Insulating tape
29. Insulated cord end terminal
30. Generators
31. Cable apparatus (cable terminal cap, cable cutting machine, cable terminal wringing claw, cable terminal apparatus, cable peeling apparatus)
32. Lifting and handling equipments
33. Calibrators/ calibration devices
34. Short circuit testing device
35. Personal protective equipments (hard hat, steel toe shoes, protective gloves, safety belt and lock,protective glasses, sandbag, ear protection, dust/gas mask, highly visible protective vest, etc.)
36. Electric terminal
37. Contact cleaners

38. Krone knife (telephone electric terminal wringing device)
39. Control panels
40. Compass
41. Soldering machine
42. Lever
43. Manometre
44. Shackle
45. Marking label
46. Marking pencil
47. Drill
48. Ladder
49. Measurement devices (milliohmme, multimeter, micrometer, ohmmeter, oscilloscope, clamp metre, voltmeter, wattmeter)
50. Rust solvents
51. Programming devices
52. RCL bridge / Wheatstone bridge
53. Redressor
54. Relays
55. Piston ring pliers
56. Sensors
57. Portable lamps
58. Row electric terminal
59. Liquid seal
60. Silicon and silicon gun
61. Signal converters (RS-232, RS-485, RJ-45, etc.)
62. Signal generator
63. Spiral rock
64. Safety catch (cable guide)
65. Switch, contactor, etc.
66. Tachometre
67. Basic hand tools
68. Cleaning solvent, alcohol, etc.
69. Thermal camera
70. Test tube
71. Grounding cable or rod
72. Vacuum loss testing device
73. Insulation materials
74. Sandpaper
75. Chain

3.3. Knowledge and Skills

1. Knowledge on emergency
2. Analytical thinking skill
3. Vehicle, device and equipment knowledge
4. Basic first-aid knowledge
5. 3D drawing skill
6. Knowledge of operation and quality procedures
7. Knowledge and skill of environmental protection implementations
8. Skill of drawing circuit diagram
9. Skill of working within a team
10. Knowledge of electronic circuit components
11. Knowledge of electronic colour codes and symbols
12. Skill of eye-hand coordination
13. Knowledge of industrial switching and sensors
14. Knowledge of deenergising and energising procedures
15. Knowledge of occupational health and safety
16. Knowledge of recyclable waste
17. Knowledge of workplace procedures
18. Decision making skill
19. Record keeping and reporting skill
20. Skill of and knowledge of soldering
21. Skill of use of manipulation, handling and stabilising equipments
22. Knowledge of vocational terms and terminology
23. Skill of learning and transferring what is learned
24. Problem solving skill
25. Knowledge of railway vehicles
26. General electronic knowledge about electronic maintenance and repair of rail systems
27. Knowledge and skill of reading plans and projects relatd to electronic systems and devices of rail systems
28. Basic knowledge of maintenance and repair of electronic systems and devices of rail systems
29. Oral and written communications skill
30. Knowledge and skill of use of switch equipments
31. Knowledge of hazardous waste
32. Knowledge of technical drawing
33. Knowledge of technical specifications
34. Computer knowledge and skill
35. Knowledge of basic labour legislation
36. Knowledge of basic power electronics
37. Knowledge of basic security systems
38. Knowledge of basic communications systems
39. Knowledge of basic PLC technology

40. Knowledge of basic pneumatics
41. Knowledge of basic level microcontrollers
42. Knowledge and skill of fire prevention and fire fighting
43. Time management skill

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 his/her 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 his/her experience with associates
7. Being sensitive on possible changes which may arise during operation
8. Being sensitive on use and recycling of resources
9. Behaving in accordance with hierarchical structure of workplace
10. Ensuring his/her own safety and safety of other people
11. Being eager to explore for career development
12. Being planned and organised
13. Being sensitive on risk factors
14. Being aware of his/her responsibilities and fulfilling them
15. Obeying strictly to instructions and guidelines
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 innovative and open to occupational developments
20. Informing concerned people about 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 Electronic Serviceman and Electrician for Railway Vehicles (Level 4) Occupational Standard shall be held in written and/or oral forms, theoretically and practically, in testing and assessment centers 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.

Appendix: Those 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), moderator
Ekrem ARSLAN	Office Chief (Education and Training Department, TCDD)
Kenan KÜTÜKDE	Moderator (Ministry of National Education Gazi Technical and Industrial Vocational High School Teacher)

1. Technical Work Group Members:

Emrullah ÖZKALDI	Occupation Group Coordinator (TCDD Deputy Chair of Traction Department)
Fatih KAYGISIZ	TCDD Engineer Msc
Süleyman KILIÇ	TCDD Chief Technician
Serkan ÖZDEMİR	TCDD Worker

2. People, Institutions, and Organizations Asked for Opinion:

Ministry of Labour and Social Security

Ministry of National Education General Directorate of Vocational and Technical

Ministry of National Education General Directorate of Life-Time Learning

Ministry of National Education General Directorate of Innovation and Education Technologies

Ministry of Science, Industry and Technology

Ministry of Transportation, Maritime Affairs and Communications

Turkish Employment Agency (İŞKUR)

Turkish Statistical Institute (TÜİK)

Council of Higher Education (YÖK)

State Personnel Presidency

Small and Medium Enterprises Development Organisation (KOSGEB)

Confederation of Progressive Trade Unions of Turkey (DİSK)

Hak-İş Confederation

Confederation of Turkish Tradesmen and Craftsmen (TESK)

Confederation of Turkish Trade Unions (TURK-İŞ)

Confederation of Turkish Employer Associations (TİSK)

The Union of Chambers and Commodity Exchanges of Turkey (TOBB)

Turkish Exporters Assembly (TİM)

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Ankara Chamber of Industry (ASO)

Ankara Chamber of Commerce (ATO)

Istanbul Chamber of Commerce (İTO)

Aegean Region Chamber of Industry (EBSO)

Istanbul Transportation Incorporated

Bursa Rail Operation Center (BURULAS)

Eskisehir Light Rail System Enterprise (ESTRAM)

Ankaray

Ankara Underground

İzmir Underground Inc.

Antalya Metropolitan Municipality

Konya Metropolitan Municipality

Turkish Employers Association of Construction Industries (İNTES)

Yapıray

Rhomberg Kalebozan Railway Construction, Industry and Trade Inc.

Alarko Group of Companies

Yüksel Project Corporation

Olmuksa Petkim

Tüpraş

Eti Mining Enterprise

İskenderun Steel & Iron Plant Enterprise

Ereğli Steel & Iron Plant Enterprise

Mke

Sümer Holding (Iron & Steel)

Yıldız Entegre (Tügsaş)

Demiryolu Lojistik Müh.San.Tic.Ltd.Şti. (Railway Logistics, Engineering, Industry and Trade Co. Ltd.)

Kayseray

Turkish Transportation Sector Public Workers Trade Union (TUS-Turk-Ulasim Sen)

United Transportation Workers Trade Union (BTS)

Ulaştırma Çalışanları Memur Sendikaları (UÇMS)

Transportation Sector Public Servants Trade Union (UCMS)

Independent Transportation Services Public Workers Trade Union (BUS)

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

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Transportation Workers Trade Union (Ulasim-Bir-Sen)

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

Association of Railway Vocational School Graduates

Association of Railway Machinists and Revisors

Association of Railway Train Professionals

Association of Railway Transportation

Association of Railway 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 Center

Turkish State Railways (TCDD) Eskisehir Training Center

Turkish State Railways (TCDD) Sivas Training Center

Turkish Locomotive and Motor Industry Corporation

Turkish Railway Vehicle Industry Corporation

Turkey Railway Machinery Industry Corporation

Central Anatolian Technical Vocational High School

Anatolian Technical Vocational High School

Ataturk Anatolian Industrial Vocational High School

Haydarpasa Anatolian Technical Vocational High School

Anatolian Vocational High School

Gazi Anatolian Vocational High School

Sht. Kemal Ozalper Anatolian Vocational High School

Anatolian University Porsuk Vocational School

Erzincan University Refahiye Vocational High School Rail Systems Programme

3. Vocational Qualifications Authority 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 TÜRKEY, Member (Ministry of Energy and Natural Resources)

Damla Ebru ESEN, Member (Ministry of Industry and Trade)

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Burak ERDEM, Member (Turkish Confederation of Employer Associations) Mehmet KARABÜBER, Member (HAK Trade Unions Confederation)

Hakan BEZGİNLİ, Member (The Union of Chambers and Commodity Exchanges of Turkey)

Nizamettin ATEŞ, Member (Confederation of Turkish Tradesmen and Craftsmen)
Dilek TORUN, Member (Vocational Qualifications Authority)

Firuzan SİLAHŞÖR, Head of Department (Vocational Qualifications Authority)

Fatma GÖKMEN, Representative of Sector Committee (General Directorate of Disabled and Aged Services)

4. Vocational Qualifications Authority Executive Board

Bayram AKBAŞ Chairman, Representative of Ministry of Labour and Social Security

Assoc. Prof. Ömer AÇIKGÖZ Vice Chairman, Representative of Ministry of National Education

Prof. Dr. Mahmut ÖZER Member, Representative of Council of Higher Education

Bendevi PALANDÖKEN Member, Representative of Professional Organisations

Mustafa DEMİR Member, Representative of Confederation of Turkish Employer Associations

Dr. Osman YILDIZ Member, Representative of Confederation of Turkish Trade Unions

Duties		Tasks		Performance Criteria	
Code	Title	Code	Title	Code	Title
G	To carry out final tasks	G.1	To carry out final controls of maintained / repaired vehicle	G.1.1	Activates maintained/repaired vehicle.
				G.1.2	Controls if maintained & repaired system works well with other systems.
				G.1.3	Participates in performance tests (traction, brake, etc.) of vehicle.
				G.1.4	Renders maintained / repaired vehicle passive.
		G.2	To control realisation of daily work schedule	G.2.1	Re-examines daily work schedule.
				G.2.2	Controls whether there is any uncompleted task within daily work schedule.
				G.2.3	Identifies why tasks are not completed and informs superiors accordingly.
		G.3	To clean equipments and worksite at the end of shift	G.3.1	Leaves workplace clean and tidy.
				G.3.2	Carries out maintenance of tools and devices he/she uses by the end of his/her shift.
				G.3.3	Puts tools and devices he/she uses into their place.
				G.3.4	Pays due attention while using materials that may damage occupational safety and stores them in predetermined areas.
		G.4	To keep records of works being done	G.4.1	Records works done and materials consumed into relevant forms.
				G.4.2	Reports what he/she is doing.
		G.5	To provide information about works being done	G.5.1	Informs his superior about works he/she is doing.
				G.5.2	Informs personnel to whom he/she will deliver work about work status and submits work forms with regards to on-going works.
H	To participate in vocational development activities	H.1	To do research on personal and vocational development	H.1.1	To carry out due research on vocational and personal development.
				H.1.2	To pursue new technologies and developments regarding electronic maintenance and repair of railway vehicles.
		H.2	To provide vocational training to	H.2.1	To relay his/her knowledge and experience to his/her colleagues.

			vocational school students and other employees.	H.2.2	To receive restricted level of information and training about electronic maintenance and repair of railway vehicles.
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