NATIONAL OCCUPATIONAL STANDARD

RAIL SYSTEMS SIGNALLING MAINTAINER AND REPAIRER
LEVEL 6

REFERENCE CODE / 12UMS0235-6

OFFICIAL GAZETTE DATE-ISSUE / SEPTEMBER 5, 2012 - 28402
(Duplicated)

Occupation:	**Rail Systems Signalling Maintainer and Repairer**
Level:	**6**[1]
Reference Code:	**12UMS0235-6**
Prepared by:	**Turkish State Railways (TCDD) Development & TCDD Personnel Solidarity and Assistance Foundation**
Verified by:	**VQA Transportation, Logistics and Communication Sector Committee**
VQA Executive Board Date/Issue:	**Decision Dated July 18, 2012 and No. 51**
Official Gazette Date / Issue:	**September 5, 2012 - 28402 (Duplicated)**
Revision Number:	**00**

[1] Vocational Qualification Level is determined as Level 6 in the octal (8) level matrix.

TERMS, SYMBOLS AND ABBREVIATIONS

ACTIVE DEVICE: XDSL, Multiplexer, SDH, and DWDM devices in communication systems,

INTERLOCKING: Signalling systems control unit,

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

INTERFACE: Electronic and electromechanical system for inter-communication of systems at the intersection of different signal systems,

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

ATO (Automatic Train Operation): Automatic train operation,

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

ATS (Automatic Train Stop) : Automatic train stopping system,

ATS (Automatic Train Supervising): Automatic train supervising system,

BALISE/ BEACON: Wayside equipment transmitting the fixed and variable data recordable in ATP, ATC systems to on vehicle system,

BARRIER: Automatic or manually-operated wooden, PVC or metal mechanism for opening and closing level crossings to on-road vehicles,

BTM (Balise Transmission Module) : Balise transmission module,

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

DWARF SIGNAL: Short signals placed at the exit of passing tracks,

DETECTOR: Device monitoring location of switch in the circuit-controlled switches,

RAILWAY: A pair of rails and whole facilities composing the rails on which series of tractive and hauled vehicles move,

CIRCUIT-CONTROLLED SWITCH: Block single switch of which positions are monitorable from traffic control center and station control desk,

BLADE LOCK: Mechnical gear lock-up preventing shooting by locking blades in switches,

AXLE COUNTER: The unit transmitting train's existence by counting axles to signalling system,

AXLE: Part of wheel set connecting two wheels, carrying loads like a beam and transmitting torque to wheel,

DMI (Driver Machine Interface): Driver Machine Interface,

ELECTRIFICATION: System made of power lines, substations and their control units for electrical management in the railway transportation systems,

ELECTRICALLY LOCKED SWITCH: Block switch equipped with electrical lock, manually-operated, of which positions are monitorable from traffic control center and station control desk,

IMPEDANCE BOND: Equipment providing continuity of traction return current in insulated track circuit,

INDUCTIVE LOOP: System providing communication with train and detection in the light rail systems,

ETCS (European Train Control System) : European Train Control System,

EVC (European Vital Computer): European Vital Computer,

F/O SIGNAL: Alpha-numeric signals reporting deviation rate and direction,

F/O: Fiber optic cable,

GAUGE: Safety distance between permanent facilities and railway cars,

GSM-R (Global System for Mobile Communications - Railway): Mobile communication system providing data transmission of audio and signalling system between the railway operational personnel,

LEVEL (GRADE) CROSSING: Section where the railway and highway intersect at same level,

LEVEL CROSSING PROTECTION SYSTEM: System reporting train's existence to on-road vehicles and pedestrians at the intersections of highway and railway,

ISCO: International Standard Classification of Occupations,

OHS: Occupational Health & Safety

STATION: Location of railway and its facilities used for providing traffic services and passenger and goods transportation,

INSULATED FISHPLATE: Insulated fishplate,

INSULATED SEAL: Insulation of seal for preventing intermingling of two adjacent track circuits in track circuits,

CATENARY: Electrification (high-tension) line,

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,

CONTACT: Part for cutting and supplying voltage in the electrical circuits,

CONTROL PANEL: Installation in which the personnel in charge regulates the switches by the approval of traffic controller to be obtained,

SWITCH BLADE: Moving part guiding the vehicles passing from one road to another by reclining on one of the facility rails according to the direction in the switches,

SWITCH CONTROL SYSTEMS: System providing control of switches in signalling systems,

SWITCH MOTOR: Mechanism changing the position of the switch by remote control, locking it to the final destination and transmitting the switch's position information to the signalling system,

SWITCH: Railway facility providing railway cars to pass from one rail to another,

SWITCHES ZONE: Track-circuit section of railway between entry and exit signals on one side of the stations,

ODOMETER SENSOR: Device measuring the train's instant speed,

POLARITY CONTROL: Control of voltage polarity in both tracks in the insulated track circuits, insulated seals,

PROTOCOL PRINTER: System continuously monitoring the operations of operator and system and printing out the related texts,

TRACK CIRCUIT: Unit transmitting the train's existence electrically to the signalling system,

TRACK: Special-profile railway superstructure member providing uninterrupted and smooth bearing surface for the railway car's wheels and transferring the loads from wheels to the support elements,

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

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

SIGNAL PHONE: Phone providing the personnel of rail systems to communicate with the control/monitoring center,

SIGNAL: Railway traffic facility placed on steel pipe, console or bridges with two, three or four coloured built-in lights, regulating the railway traffic by giving various colour signals, giving automatic or controlled signals,

SIGNALLING: Signalling systems used for ensuring safety in the railway traffic and shuntings,

ACTUATOR: Arm transferring the driving and hauling power in the switch motor to the switch blade in the switch control systems,

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,

WHEEL SENSOR: Unit reporting the wheel's rotation speed to the on-vehicle equipment in the railway cars,

TRAFFIC CONTROL CENTER: Center where the system required for carrying out the traffic is located, operations related to traffic are carried out and controlled and the instructions are given,

TRAIN DETECTION SYSTEMS: System detecting the existence of moving cars and transmitting such data to the control/monitoring center by the signalling system in the rail systems,

TRAIN: Integrated rail system vehicle made of one or more traction vehicles and railway cars or one or more traction vehicles,

TRAINGRAPH: System continuously monitoring, recording in graphics and printing out the train operations in the traffic monitoring centers,

TSM: Trains management by signals,

REMOTE CONTROL SWITCH: Switch controlled from the traffic control center, statoin control desk or control panel, manually-operated if required, featuring one electric engine, of which positions are monitorable from the control center and station control desk,

VIDEOWALL: Control/monitoring screen made of LCD, LED or DLP displays,

RECLINING RAIL: Facility rail onto which the switch blades recline,

HIGH SIGNAL: Signals on the main route built in 3-3.8 m high pipe posts with three or four lights or consoles or bridges where the field or gauge is not convenient.

TABLE OF CONTENTS

1. INTRODUCTION

National occupational standard titled Rail Systems Signalling Maintainer and Repairer (Level 6) was issued by the Turkish State Railways (TCDD) Development & TCDD Personnel Solidarity and Assistance Foundation assigned 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 Rail system Signalling Maintainer and Repairer (Level 6) was assessed upon receiving the opinions of the related institutions and organizations 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

Rail Systems Signalling Maintainer and Repairer (Level 6) is the qualified person in terms of knowledge and experience who ensures that the signalling facilities in his areas of responsibility are under constant supervision; manages periodic maintenance, troubleshooting, defect repair, assembly and disassembly, revision and project processes, testing and controlling of all equipment related to the system for commissioning in accordance with the technique. Rail Systems Signalling Maintainer and Repairer (Level 6) plans and organizes the processes he manages and ensures coordination between the units.

Rail Systems Signalling Maintainer and Repairer (Level 6) 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. He assesses the risks related to his occupation. Taking measures related to his own occupational safety and making contributions to the occupational safety of the other persons working with him are included in the responsibilities of the Rail Systems Signalling Maintainer and Repairer (Level 6).

2.2. Place of the Occupation in International Classification System

ISCO 08: 2149 (Engineering professionals not elsewhere classified)

2.3. Regulations on Health, Safety and Environment

Labor Law No. 4857

Social Security and General Health Insurance Law No.5510

Regulation on Heavy and Dangerous Work

Communication on Vocational Training 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 Equipments in the Workplace

Machinery Safety Directive (2006/42/EC)

Regulation on Preventing the Personnel from the Hazards of the Explosive Environments

Regulation on Control of Hazardous Wastes

Regulation on Vibration

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

Public Servants Law No. 657

Trade Unions Law No. 2821

Collective Bargaining Agreements, Strike and Lock-Out Law No. 2822

Highway Traffic Law No. 2918

Vocational Training Law No. 3308

Government Employee Unions and Collective Bargaining Law No. 4688

Decree Law Concerning Regulation of State Economic Enterprices Personnel System Law No. 399 and Repealing Some Articles of Decree Law No. 233

Regulation on Vocational and Technical Training

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

2.5. Working Environment and Conditions

Provided that they’re not above the international standards; risk of exposure to smell, noise, humidity, vibration, excessive air flow, electric current and radiation may be included in the negative working conditions of the Rail Systems Signalling Maintainer and Repairer (Level 6). Working in shifts is in the question.

There are also damage and injury risks which require taking occupational health and safety measures while performing the work. Rail Systems Signalling Maintainer and Repairer (Level 6) cooperates with the employees carrying out different works and uses the appropriate personal protective equipment during his operations.

2.6. Other Requirements Regarding The Occupation

Rail Systems Signalling Maintainer and Repairer (Level 6) shall not have claustrophobia, fear of heights and be allergic to chemicals and shall have “Form of Initial Entrance and Periodical 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**	Participates in trainings related to Occupational Health and Safety.
				A.1.2	Uses the work clothes and personal protective equipment suitable for the work performed.
				A.1.3	Supervises activities of determining deficiency, suitability for use and adequacy of expiry dates of personal protective equipment and replacing the inadequate with the new ones.
				A.1.4	Ensures availability of first aid, emergency medical intervention or personal protective equipment related to OHS as ready for use and operative.
				A.1.5	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.2	To decrease risk factors	**A.2.1**	Contributes to the activities related to determination of risks.
				A.2.2	Contributes to the activities related to determination of risks by assessing the hazards and risks related to his work within the scope of the national regulations and standards.
				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 elimate 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.
				A.3.4	Applies the exit or escape procedures in cases of emergency.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
B	To fulfill 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 ensure environmental protection measures are applied	**B.2.1**	Ensures the measures are taken 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 enivronmental impacts to occur.

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	**D.1**	To make personal preparations	**D.1.1**	Carries out his personal care and cleaning in accordance with the rules determined by the workplace.
				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 (such as clock in, signing and etc.).
				D.1.4	Wears identification symbols and signs on his work clothes.
		D.2	To accept work	**D.2.1**	Takes the 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.2.4	Obtains permission in works affecting other departments.
		D.3	To investigate the work area	**D.3.1**	Inspects the conformity of work area to the duty.
				D.3.2	Ensures that the negative aspects of the works are improved.
				D.3.3	Provides the coordination in case of works affecting other departments.
		D.4	To prepare the equipment and material for work	**D.4.1**	Controls that the employees choose the equipment and material suitable for the work specifications.
				D.4.2	Controls that the employees make the equipment and material available for work.
				D.4.3	Repairs the faults and defects of the defective equipment and material under his authority..
				D.4.4	Carries out the necessary procedures for replacement/repair of defective equipment and material.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out management activities (to be continued)	**E.1**	To carry out work organization	**E.1.1**	Takes measures related to the Occupational Health and Safety.
				E.1.2	Makes the daily work schedule of the team and equipment.
				E.1.3	Control the team and equipment.
				E.1.4	Gives corrective instructions in case of problems related to the team.
				E.1.5	Delegates the duties in the work area and supervises the performance of works.
				E.1.6	Reports the works performed to his chief.
				E.1.7	Prepares/ensures the preparation of the personnel's annual leave schedule according to the work status.
				E.1.8	Ensures that the annual leaves are taken in accordance with the schedule.
		E.2	To make personnel planning	**E.2.1**	Makes recommendations on the number and qualification of the personnel to be employed.
				E.2.2	Makes work distribution between the personnel according to the knowledge, capabilities, experiences and competences the duty requires.
				E.2.3	Makes balanced distributions of the signalling teams to the shifts.
				E.2.4	Controls the prepared shift chart.
				E.2.5	Submit the shift chart to the relevant departments and employees.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
E	To carry out management activities	**E.3**	To assess personnel performance	**E.3.1**	Assesses the performance of signalling personnel according to the legislation.
				E.3.2	Makes recommendations related to promotion, penalty and awarding according to the results of performance assessment.
				E.3.3	Provides written or oral feedback related to the work he has performed as a result of the supervision.
		E.4	To carry out activities increasing motivation of employees	**E.4.1**	Supports the personnel in theactivities related to their special days.
				E.4.2	Promotes and appreciates the successful personnel.
				E.4.3	Awards the successful personnel within the scope of his authority.
				E.4.4	Organizes the periodic sharing meetings.
				E.4.5	Takes the personnel's opinion and suggestions.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To carry out office activities (to be continued)	**F.1**	To keep the scores and prepare the renumerations of the employees	**F.1.1**	Controls the work attendance of the employees.
				F.1.2	Prepares/ensures the preparation of the scores of the employees.
				F.1.3	Prepares/ensures the preparation of renumerations of the employees
		F.2	To keep records of work performed	**F.2.1**	Prepares the documents for the personnel's arrival to and departure from the work sites in his team.
				F.2.2	Ensures that the work records are kept.
				F.2.3	Manages the office's correspondences.
		F.3	To carry out correspondences and archieve of office	**F.3.1**	Draws the sketches of accidents and incidents.
				F.3.2	Prepares the maintenance and repair work schedules.
				F.3.3	Controls the office operations.
				F.3.4	Files all the correspondences in accordance with the procedure.
		F.4	To give information about the works performed	**F.4.1**	Prepares the reports related to the maintenance and repair operations and submits these reports to the authorities periodically.
				F.4.2	Informs the company's policy and priorities, mission and vision to the personnel in written and orally.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
F	To carry out office activities	**F.5**	To carry out material procedures	**F.5.1**	Makes materials requirement planning.
				F.5.2	Requests material purchase.
				F.5.3	Follows up current material stocks.
				F.5.4	Supplies consumable, spare and fixed materials.
				F.5.5	Issues debit ticket for the fixed materials received.
				F.5.6	Makes the delivery record for the consumable materials.
				F.5.7	Submits the delivery and debit records to the relevant department.
				F.5.8	Follows up the materials used.
				F.5.9	Makes stock material available for the cases of emergency.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
G	To ensure that periodic maintenance is carried out (To be continued)	**G.1**	To make preparations before periodic maintenance	**G.1.1**	Reviews the records related to the system equipment to be maintained and obtains information from those concerned.
				G.1.2	Makes maintenance planning and work distribution in accordance with the periodic maintenance schedule and prepares the maintenance instructions for active and effective maintenance.
				G.1.3	Determines and ensures timely delivery of the spare parts and consumable materials required for maintenance.
				G.1.4	Ensures the preparation and adjustment of tools and appliances required for maintenance.
				G.1.5	Ensures the transportation of the team to the location of the system component to be maintained.
				G.1.6	Ensures that the measures of occupational health and safety are taken and applied before starting the maintenance work.
				G.1.7	Determines the completion period of work by considering the mean processing time required for maintenance.
				G.1.8	Obtains permission in case of works affecting the other departments.
		G.2	To ensure that the periodic maintenance of the system components are carried out (To be continued)	**G.2.1**	Ensures that the switch control systems are maintained in accordance with the maintenance periods and standards.
				G.2.2	Ensures that the signals are maintained in accordance with the maintenance periods and standards.
				G.2.3	Ensures that the train detection systems are maintained in accordance with the maintenance periods and standards.
				G.2.4[2]	Ensures that the level crossing protection systems are maintained in accordance with the maintenance periods and standards.[II]

[2] Applicable in national railway lines.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
G	To ensure that periodic maintenance is carried out	**G.2**	To ensure that the periodic maintenance of the system components are carried out	**G.2.5**	Ensures that ATP and ATC on-vehicle equipment are maintained in accordance with the maintenance periods and standards.[3]
				G.2.6	Ensures that ATS (automatic train stop), ATP and ATC wayside equipment are maintained in accordance with the maintenance periods and standards.
				G.2.7	Ensures that the central and local control/monitoring panels and their subsystems are maintained in accordance with the maintenance periods and standards.
				G.2.8	Ensures that the interlocking systems are maintained in accordance with the maintenance periods and standards.
				G.2.9	Ensures that the communication systems and their subsystems are maintained in accordance with the maintenance periods and standards.[4]
				G.2.10	Ensures that the cables and cable distribution boxes are maintained in accordance with the maintenance periods and standards.
				G.2.11	Controls that the maintenance works are carried out wholly and completely.

[3] Applicable in national railway lines.
[4] Applicable in national railway lines.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
H	To ensure that the defects are repaired (To be continued)	**H.1**	To make preparations before defect repair	**H.1.1**	Reviews the records related to the system equipment to be repaired and obtains information from those concerned.
				H.1.2	Makes maintenance planning and work distribution and prepares the repair instructions for active and effective repair.
				H.1.3	Determines and ensures timely delivery of the spare parts and consumable materials required for repair.
				H.1.4	Ensures the preparation and adjustment of tools and appliances required for repair.
				H.1.5	Ensures the transportation of the team to the location of the system component to be repaired.
				H.1.6	Ensures that the measures of occupational health and safety are taken and applied before starting the repair work.
				H.1.7	Determines the completion period of work by considering the mean processing time required for repair.
		H.2	To ensure that the defects of the system components are repaired (To be continued)	**H.2.1**	Ensures that the switch control systems are repaired in accordance with the standards.
				H.2.2	Ensures that the signals are repaired in accordance with the standards.
				H.2.3	Ensures that the train detection systems are repaired in accordance with the standards.
				H.2.4	Ensures that the level crossing protection systems are repaired in accordance with the standards.[5]
				H.2.5	Ensures that ATP and ATC on-vehicle equipment are repaired in accordance with the standards.[6]

[5] Applicable in national railway lines.
[6] Applicable in national railway lines.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
H	To ensure that the defects are repaired	**H.2**	To ensure that the defects of the system components are repaired	**H.2.6**	Ensures that ATS (automatic train stop), ATP and ATC wayside equipment are repaired in accordance with the standards.
				H.2.7	Ensures that the central and local control/monitoring panels and their subsystems are repaired in accordance with the standards.
				H.2.8	Ensures that the interlocking systems are repaired in accordance with the standards.
				H.2.9	Ensures that the communication systems and their subsystems are repaired in accordance with the standards.[7]
				H.2.10	Ensures that the cables and cable distribution boxes are repaired in accordance with the standards.
				H.2.11	Controls that the repair works are carried out wholly and completely.

[7] Applicable in national railway lines.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
I	To carry out assembly and disassembly (To be continued)	**I.1**	To make preparations before assembly/disassembly	**I.1.1**	Reviews the records related to the status of the system equipment to be assembled/disassembled and obtains information from those concerned.
				I.1.2	Makes the work planning and distribution for active and effective assembly/disassembly.
				I.1.3	Determines the assembly/disassembly processes and prepares the instructions for assembly/disassembly.
				I.1.4	Controls and ensures the up-to-dateness of the documents used in assembly/disassembly.
				I.1.5	Determines and supplies the spare parts and consumable materials required for assembly/disassembly.
				I.1.6	Ensures the preparation and adjustment of tools and appliances required for assembly/disassembly.
				I.1.7	Ensures the transportation of the team to the location of the system equipment to be assembled/disassembled.
				I.1.8	Ensures that the measures of occupational health and safety are taken and applied before starting the assembly/diassembly work.
				I.1.9	Determines the completion period of work by considering the mean processing time required for assembly/disassembly.
		I.2	To carry out assembly and disassembly of the system equipment (To be continued)	**I.2.1**	Ensures that the switch motor is assembled and disassembled in accordance with its design.
				I.2.2	Ensures that the electrical interlocking switch systems are assembled and disassembled in accordance with their designs.
				I.2.3	Ensures that the detector switch systems are assembled and disassembled in accordance with their designs.
				I.2.4	Ensures that the high signals are assembled and disassembled in accordance with their designs.
				I.2.5	Ensures that the dwarf signals are assembled and disassembled in accordance with their designs.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
I	To carry out assembly and disassembly (To be continued)	**I.2**	To carry out assembly and disassembly of the system equipment (To be continued)	**I.2.6**	Ensures that F/O signals are assembled and disassembled in accordance with their designs.
				I.2.7	Ensures that the receivers are assembled and disassembled in accordance with their designs.
				I.2.8	Ensures that the buzzers are assembled and disassembled in accordance with their designs.
				I.2.9	Ensures that the axle counters are assembled and disassembled in accordance with their designs.
				I.2.10	Ensures that the illuminated track signals are assembled and disassembled in accordance with their designs.[8]
				I.2.11	Ensures that the barrier drivers are assembled and disassembled in accordance with their designs.[9]
				I.2.12	Ensures that the level crossing is assembled and disassembled in accordance with its design.[10]
				I.2.13	Ensures that the rail joint bars are assembled and disassembled in accordance with their designs.
				I.2.14	Ensures that on-vehicle ETCS DMI is assembled and disassembled in accordance with its design.[11]
				I.2.15	Ensures that on-vehicle odometer sensors are assembled and disassembled in accordance with their designs.[12]
				I.2.16	Ensures that on-vehicle balise/beacon antennas are assembled and disassembled in accordance with their designs.[13]

[8] Applicable in national railway lines.
[9] Applicable in national railway lines.
[10] Applicable in national railway lines.
[11] Applicable in national railway lines.
[12] Applicable in national railway lines.
[13] Applicable in national railway lines.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
I	To make mounting and dismantling (To be continued)	**I.2**	To have system equipment mounted and dismantled (to be continued)	**I.2.17**	Ensures on-vehicle EVC mounted and dismantled according to drawings.[14]
				I.2.18	Ensures on-vehicle BTM's mounted and dismantled according to drawings.[15]
				I.2.19	Ensures ATS (automatic train stop) ground magnets mounted and dismantled according to drawings.
				I.2.20	Ensures balis/beacons mounted and dismantled according to drawings
				I.2.21	Ensures ATS (automatic train stop) control boxes mounted and dismantled according to drawings.
				I.2.22	Ensures central and local command / monitoring system mounted and dismantled according to drawings.
				I.2.23	Ensures system computers mounted and dismantled according to drawings.
				I.2.24	Ensures information transmission system devices mounted and dismantled according to drawings
				I.2.25	Ensures traingraph and protocol printers mounted and dismantled according to drawings
				I.2.26	Ensures interlocking system devices mounted and dismantled according to drawings
				I.2.27	Ensures interlocking system roofs and cabinets mounted and dismantled according to drawings
				I.2.28	Ensures central telephone system mounted and dismantled according to drawings.[16]
				I.2.29	Ensures signal telephones mounted and dismantled according to drawings.

[14] Ulusal demiryolu hatlarında geçerlidir.
[15] Ulusal demiryolu hatlarında geçerlidir.
[16] Ulusal demiryolu hatlarında geçerlidir.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
I	To make mounting and dismantling	**I.2**	To have system equipment mounted and dismantled	**I.2.30**	Ensures signal telephone sockets mounted and dismantled according to drawings.[17]
				I.2.31	Ensures all distribution boxes mounted and dismantled according to drawings.
				I.2.32	Ensures completion of mounting / dismantling operation within planned time schedule.
				I.2.33	Checks that all mounting and dismantling operations are complete.
				I.2.34	Keeps tracks and prepares reports of controls.
		I.3	To execute corrective and preventive actions related to mounting / dismounting	**I.3.1**	Collects data related to nonconformities detected in mounting / dismantling operations.
				I.3.2	Defines nonconformity and reports to relevant department for corrective measures.
				I.3.3	Participates in and monitors the operations performed for correcting nonconformities.

[17] Applicable in national railway lines.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
J	To perform testing and controlling operations	**J.1**	To prepare documents related to tests and controls	**J.1.1**	Prepares test and control instructions.
				J.1.2	Prepares test and control plans.
				J.1.3	Keeps update the documents used in controls and tests.
		J.2	To conduct preliminary acceptance and final acceptance tests and controls.	**J.2.1**	Controls conformity of devices and equipment used in tests and controls and corrects detected nonconformities.
				J.2.2	Tests and controls conformity of signaling materials and systems with criteria set forth in technical specifications in accordance with instructions and control documents.
				J.2.3	Gives approval for materials and systems, which meet requirements.
				J.2.4	Rejects materials and systems, which do not meet criteria, and reports them to relevant units.
				J.2.5	Keeps records and reports related to tests and controls.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
K	To execute project activities related to improvement of system (to be continued)	**K.1**	To perform system improvement general analysis	**K.1.1**	Checks feasibility of project outputs from technical point of view.
				K.1.2	Prepares draft solutions, which meet requirements.
				K.1.3	Performs cost calculations according to draft solution.
				K.1.4	Determines deadline for delivery of project.
				K.1.5	Ensures coordination and communication between units related to the project.
		K.2	To perform system improvement risk analysis	**K.2.1**	Identifies possible technical and security-related problems which may arise with meeting end-user requirements.
				K.2.2	Develops alternative solutions to possible problems.
				K.2.3	Calculates effect of possible problems on cost and delivery period.
				K.2.4	Determines the most appropriate one from among alternative solutions in terms of cost, time, and functionality.
				K.2.5	Obtains approval of possible changes from relevant end users and units.
		K.3	Project and resource planning for system improvement (To be continued)	**K.3.1**	Splits the project into subgroups, which can be made independently, and calculates final costs.
				K.3.2	Prepares work flow chart of the project.
				K.3.3	Prepares time schedule of the project.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
K	To execute project activities related to improvement of system	**K.3**	Project and resource planning for system improvement	**K.3.4**	Determines and plans qualities of personnel to employ within scope of the project.
				K.3.5	Determines and plans domestic and foreign resources to be used within scope of the project.
				K.3.6	Determines list of materials and service providers of designed and approved project and ensures procurement of required materials and services.
		K.4	To perform project audits	**K.4.1**	Controls project cost periodically.
				K.4.2	Checks that the project progresses in accordance with planned timeline and technical conditions.
				K.4.3	Controls suitability of materials used in the project.
				K.4.4	Takes measures regarding auditing processes and ensures their implementation.
		K.5	To make delivery of the project	**K.5.1**	Prepares user documentation (user's manual, maintenance manual, spare parts list, schemes, final drawings, etc.) related to the project.
				K.5.2	Delivers the project, whose tests and controls are complete, to relevant official for approval.
				K.5.3	Keeps delivery records and reports.
				K.5.4	Plans end user trainings.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
L	To perform end-of-work delivery operations	**L.1**	To perform end-of-work controls	**L.1.1**	Controls if there is any incomplete work according to work order.
				L.1.2	Ensures completion of, if any, incomplete works.
		L.2	To clean / have cleaned the hardware and work area at the end of work.	**L.2.1**	Keeps work area clean and tidy.
				L.2.2	Keeps maintained the tools and equipment used in the work.
				L.2.3	Ensures materials, tools, and equipment are put back at the end of work.
				L.2.4	Exercises due diligence during use of materials, which may be harmful to work safety, and ensures they are stored appropriately in prescribed places.
		L.3	To keep records of works done.	**L.3.1**	Ensures performed works are recorded in relevant forms and digital environment.
				L.3.2	Ensures consumed materials are recorded in relevant forms and digital environment.
		L.4	To report about the works done.	**L.4.1**	Prepares report of works s/he has done.
				L.4.2	Reports the works done to immediate supervisor.

Duties		Tasks		Performance Criteria	
Code	**Title**	**Code**	**Title**	**Code**	**Description**
M	To execute occupational development activities	**M.1**	To perform training planning and organization studies.	**M.1.1**	Determines personal development and training needs of personnel in parallel with technological development, changes in activities, and career objectives.
				M.1.2	Evaluates periodical and ad hoc trainings in respect with time planning.
				M.1.3	Reports determined training needs to relevant units.
		M.2	To perform studies on personal occupational development.	**M.2.1**	Implements research activities required for occupational and personal development.
				M.2.2	Follows up new technologies.
		M.3	To provide occupational training for subordinates and other personnel	**M.3.1**	Shares her/his knowledge and experience with her/his associates.
				M.3.2	Provides information and training on rail systems signaling operations.
				M.3.3	Provides / making provided applied on-the-job training for novice or newly appointed signaling personnel in line with determined needs.
				M.3.4	Provides /making provided occupational training for students, who attend in vocational courses.

3.2. Tools, Appliances and Equipment Used

1. Battery tester
2. Multimeter
3. Balisemeter
4. Computer
5. Battery hydrometer
6. Steel measuring tape
7. Echometer
8. Flash lamp
9. Emergency line
10. Phasemeter
11. Camera
12. Frequency meter
13. General purpose programming device
14. Communication devices (radio, field telephone, cell phone, GSM-R phone)
15. Insulating tape
16. Personal protective equipment
17. Caliper
18. Switch lever
19. Switch pin driver
20. Leverage
21. Megger
22. Ladder
23. Micrometer
24. Oscilloscope
25. OTDR Test Device
26. Clamp meter
27. Mallet
28. High visibility jacket
29. RLC meter
30. Feeler gage
31. Signal binocle
32. Bubble level
33. Shunting device
34. Swab
35. Grounding measurement megger
36. Torque meter
37. Warning and work lamps

3.3. Knowledge & Skills

1. Knowledge on emergency situation
2. Analytical thinking skills
3. Fault analysis and evaluation knowledge
4. Diagnostic skills
5. Basic first-aid knowledge
6. Computer skills
7. Inspection skills
8. Circuit diagram reading skill
9. Hardware knowledge
10. Safe work shill and knowledge with hand tools
11. Manual skill
12. Electricity knowledge
13. Electrical train operating knowledge
14. Electronics knowledge
15. Safety and security knowledge
16. General accounting knowledge
17. Visual inspection knowledge and skill
18. Occupational health and safety knowledge
19. Knowledge of determining escape and standby points during works performed during operation
20. Knowledge on workplace procedures
21. Knowledge on quality control principles
22. Decision making skills
23. Crisis management skills
24. Knowledge on materials
25. Mathematics knowledge
26. Distance measuring skills
27. Foreign language skills at occupational level
28. Knowledge of vocational terms
29. Knowledge of vocational and technical drawing
30. Skill of learning and being able to share what s/he learned
31. Knowledge on measuring and control
32. Planning, coordination, and orientation skills
33. Problem solving skills
34. Knowledge of rail systems signs
35. Knowledge of rail systems traffic
36. Knowledge of sector-specific international instructions and standards
37. Knowledge of signaling
38. Sözlü ve yazılı iletiìim becerisi
39. Skill of reading and understanding technical documents and being able to share what s/he learned
40. Knowledge of telecommunication
41. Knowledge of basic electrification
42. Knowledge of basic physics
43. Knowledge of basic mechanics
44. Knowledge on spare parts and consumables
45. Knowledge of railway superstructure
46. Management skills
47. Skill of using the time well.

3.4. Attitudes and Behaviors

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 able to take initiative in the matters related to her/his duties, when required.
8. Attending regularly and actively in group meetings
9. Being sensitive on possible changes which may arise during operation
10. Being sensitive on use and recovery of resources
11. Behaving in accordance with hierarchical structure of workplace
12. Ensuring his/her own safety and safety of other people
13. Determining negative environmental effects
14. Being planned and organized
15. Being sensitive on risk factors
16. Knowing his/her responsibilities and fulfilling the same
17. Taking care of process quality
18. Informing relevant people of dangerous situations
19. Sensing and assessing dangerous situations carefully
20. Taking care of cleanness, tidiness, and order of workplace
21. Being innovative and open to occupational developments
22. Informing concerned people about the malfunctions which are not under his/her authority
23. Being able to direct personnel and associates under her/his management

4. TESTING, ASSESSMENT AND CERTIFICATION

Testing and assessment for certification with respect to national qualifications based on Rail Systems Signaling Maintainer and Repairer (Level 6) 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.

ANNEX: 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)

2. Technical Work Group Members

Meşhut KARGI	Occupation Group Coordinator (Deputy Manager of Premises Dept., TCDD)
Mehmet KÖZ	Manager, TCDD
Yüksel YAŞAR	Deputy Branch Manager, TCDD
Hacı KARAKOÇ	Controller, TCDD
Şahin ERSOY	Controller, TCDD
Kadir ÖKESLİ	Technical Chief, TCDD
Z. Gürsel ÇEKMEGÜL	Technical Chief, TCDD

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

Alarko Group of Companies

Anatolian Technical and Industrial Vocational High School

Anatolian University Porsuk Vocational School

Ankara Chamber of Industry (ASO)

Ankara Chamber of Trade (ATO)

Ankaray

Antalya Metropolitan Municipality

Ataturk Anatolian Industrial Vocational High School

Independent Transportation Services Public Workers Trade Union (BUS)

Ministry of Science Industry and Technology

United Transportation Workers Trade Union (BTS)

Bursa Rail Operation Center (BURULAS)

Ministry of Labor and Social Security

Association of Railway Machinists and Revisors

Association of Railway Train Professionals

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

Association of Railway Public Servants

Association of Railway Vocational School Graduates

Association of Railway Transportation

State Personnel Administration

Confederation of Revolutionary Trade Unions of Turkey (DISK)

Aegean Region Chamber of Industry (EBSO)

Eregli Steel & Iron Plant Enterprise (ERDEMIR)

Erzincan University Refahiye Vocational High School Rail Systems Programme

Eskisehir Light Rail System Enterprise (ESTRAM)

Eti Mining Enterprise

Fatih Anatolian Vocational High School

Gazi Anatolian Vocational High School

HAK-IS Trade Union Confederation

Haydarpasa Anatolian Technical Vocational High School

Iskenderun Steel & Iron Plant Enterprise (ISDEMIR)

Istanbul Chamber of Trade (ITO)

Istanbul Transportation Incorporated

Izmir Metro A. Ş

Kayseray

Konya Metropolitan Municipality

Small and Medium Industry Development Organization (KOSGEB)

MoE Life-Time Learning Directorate General

MoE Occupational and Technical Education Directorate General

MoE Innovation and Education Technologies Directorate General

Central Technical and Industrial Vocational High School

Mechanical and Chemical Industry Corporation (MKE)

Olmuksa

Petkim

Association of Rail Transportation Systems

Rhomberg Kalebozan Demiryolu İnş. San. ve Tic. A. Ş.

Sumer Holding (Iron&Steel)

Sht. Kemal Ozalper Anatolian Vocational High School

Turkish State Railways (TCDD) Ankara Training Center

Turkish State Railways (TCDD) Traction Division

Turkish State Railways (TCDD) Eskisehir Training Center

Turkish State Railways (TCDD) Personnel and Administrative Affairs Department

Turkish State Railways (TCDD) Sivas Training Center

Turkish State Railways (TCDD) Premises Department

Turkish State Railways (TCDD) Traffic Department

Turkish State Railways (TCDD) Railway Department

Tüpraş

Turkey Railway Machinery Industry Corporation

Confederation of Turkish Tradesmen and Craftsmen (TESK)

Turkish Exporters Assembly (TIM)

The Turkish Employers Association of Construction Industries (INTES)

Turkish Statistical Institute (TUIK)

Turkish Labor Institution (ISKUR)

Confederation of Turkish Trade Unions (TURK-IS)

Turkish Confederation of Employer Associations (TISK)

Turkish Locomotive and Motor Industry Corporation

Turkish Union of Chambers and Exchange Commodities (TOBB)

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

Turkish Railway Car Industry Corporation

Transportation Workers Trade Union (Ulasim-Bir-Sen)

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

Transportation Sector Public Servants Trade Union (UCMS)

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

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

Ministry of Transportation maritime and Communication

Yapıray

Yıldız Entegre (Tügsaş)

Board of Higher Education (YOK)

Yuksel Project Corporation

4. Sector Committee Members and Experts

Prof. Dr. Mustafa KARAŞAHİN,	President (Board of Higher Education)
Şeyhamit Ünal SARIBAŞ,	Vice President (Ministry of Education)
Nasip Gül İNCEKARA,	Member (Ministry of Labor and Social Security)

Edip TÜRKAY,	Member (Ministry of Energy and Natural Resources)
Ahmet VURAL,	Member (Ministry of Industry and Trade)
Erkin GÜNER,	Member (Ministry of Transportation)
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 (Occupational Qualification Authority)
Firuzan SİLAHŞÖR,	Department Head (Occupational Qualification Authority)
Sinan GERGİN,	Sector Committee (Prime Ministry Department of the Administration of the Disabled)

5. Executive Board

Bayram AKBAS, Rep.of Ministry of Labor and Social Security)	President
Prof. Dr. Oguz BORAT, Rep.of Ministry of Education	Deputy President
Doç.Dr. Omer ACIKGOZ, Rep. of Board of Higher Education)	Member
Prof Dr. Yucel ALTUNBASAK, Rep. of Professional Associations	Member
Celal KOLOGLU, Rep. of Employer Assoc. Conf.	Member
Dr. Osman YILDIZ, Rep. of Trade Union Confederations	Member