Ministry of Construction, Transport and Infrastructure

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The Serbia Railway Sector Modernization (SRSM) Project
Phase 1 of the Multi-Phase Programmatic Approach

TERMS OF REFERENCES
for

Technical Advisory for the preparation of Implementation Plan and Technical Specifications for Procurement of Rail Heavy Duty Machinery

January 2023

1. Background information

1.1 Beneficiary country: Republic of Serbia

Client: Ministry of Construction, Transport, and Infrastructure of the Republic of Serbia (MCTI).

Final Beneficiary: Infrastruktura železnice Srbije (Serbian Railway Infrastructure – IZS).

1.2 Relevant country background

The International Bank for Reconstruction and Development (IBRD) launched the Multiphase Programmatic Approach (MPA) to support the Government of Serbia in the continuation of institutional, physical and operational modernisation of the railway sector in an integrated manner by providing financial support to Serbia Railway Sector Modernization Project as part of the Multiphase Programmatic Approach to be implemented in three overlapping phases over the ten years.

For financing Serbia Railway Sector Modernization Project, Phase 1 of the MPA (the Project), IBRD and the Agence Francaise de Développement (AFD) jointly, granted to the Republic of Serbia EUR 102 million loans to support enhancing the efficiency and safety of existing railway assets and improving governance and institutional capacity of the railway sector.

The Project is managed by the Ministry of Construction, Transport and Infrastructure (MoCTI) through the Project Implementation Unit (PIU) supplemented by the Project Implementation Teams (PITs) in Railway Directorate (RD) and railway companies, respectively, Serbian Railway Infrastructure (IZS), Serbia Voz (SV) and Serbia Cargo (SC). PITs act as subordinate implementing agencies and provide technical support for specific Project subcomponents or activities of the MPA that pertain to their area of expertise. Primary responsibility for Project execution lies on PIU, which ensures that the Project development objectives are met.

The preparation of Phase 2 of the MPA is underway, within which the purchase of rail heavy duty maintenance machinery is planned. These Terms of Reference (ToR) relate to a consultancy firm for Technical Advisory on preparing an Implementation Plan and Technical Specification for the Procurement of Rail Heavy Duty Maintenance Machinery. MCTI, with the support of IZS, intends to engage a highly qualified consultant to provide services more closely described below.

1.3 General information

The position of Serbia in the European railway network is such that it forms part of the shortest traffic line between West and South-East Europe. The length of the railway lines in the Republic of Serbia is 3,438 km, of which 3,059 km are single-track and 288 km of double-track railway lines. The total length of electrified railways is 1273 km. Railway lines on the territory of the Republic of Serbia are more than one century old, and over half of all railway lines were built in the 19th century. This network consists of railway lines which are part of the Pan-European corridors, lines of international importance connecting Serbia with neighbouring countries, and regional-local lines.

Due to its position on the geographic borderline between the East and the West, Serbia is often referred to as a gateway to Europe. The important European Corridor X – the international highway

and railway corridor, part of the core TENT-T network through the Republic of Serbia (RoS), provides excellent connections with Western Europe and the Middle East.

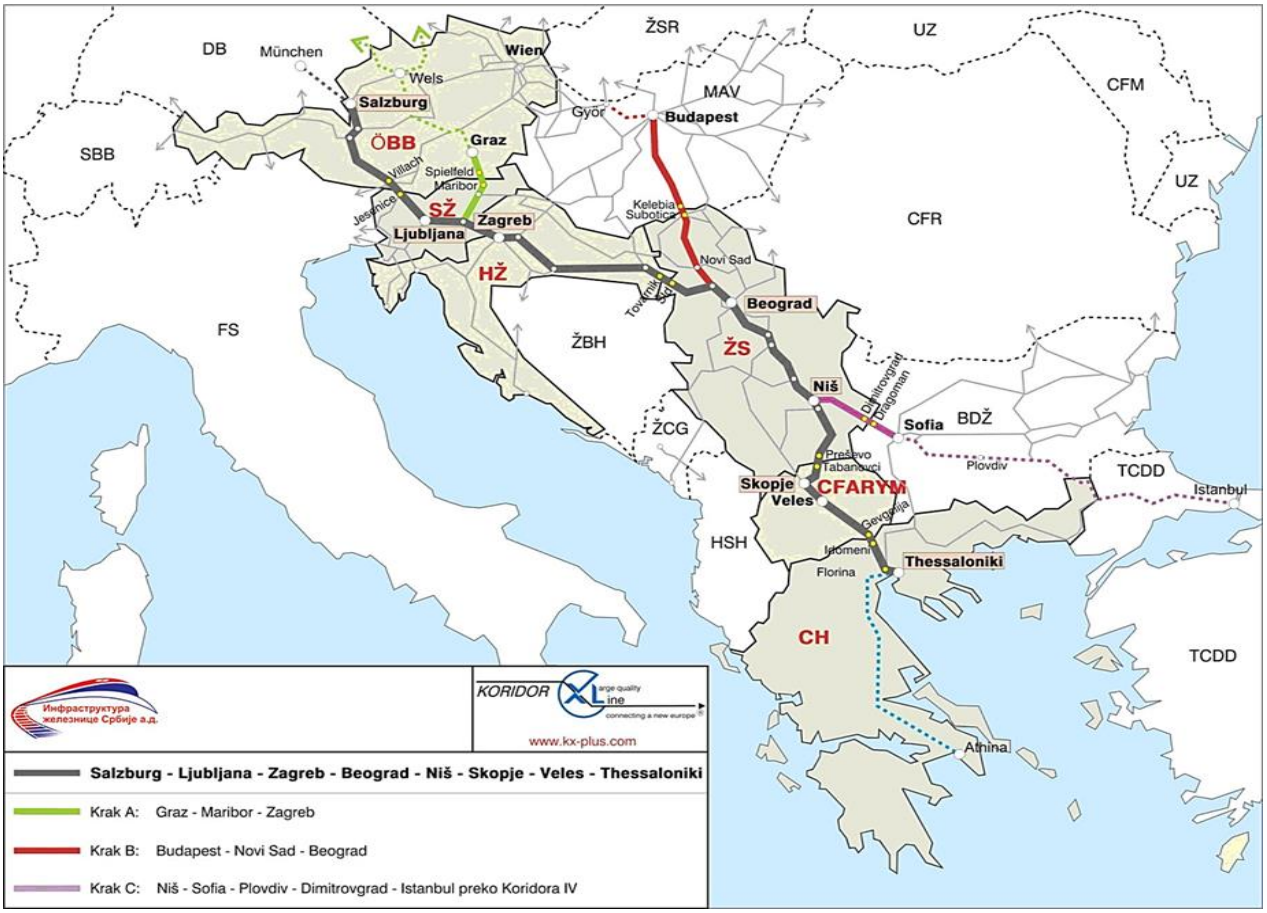

Figure 1: Position of Serbia with highlighted Rail Corridor X

The Serbian rail network includes a total of 5,247 switches of various types, 847 bridges in length of 35.9 km, 4,816 culverts, 333 tunnels in length of 153 km and 2,121 level crossings with different safety level systems. The designed condition of the railway network enables the traffic of railway rolling stock weighing from 12 t/axle to 22.5 t/axle, of which on 1.858 km or 55.5 % of the total length of the railway tracks, the permissible axle load is 22.5 t /axle, which is an obstacle to the further growth of railway traffic.

Decades of low investments, outdated management structures and practices, and neglect of maintenance have led to severe deterioration of the rail network infrastructure, obsolescence of the rolling stock, and low service quality. The significant difference between the designed speeds on the railways and the maximum permitted speeds at which trains can operate affects the reduction of commercial speed, extended train journeys and increased train delays on all main and regional railways, which is why the railway is not in a position to compete with road transport on the same routes.

Table 1: Permissible speeds on the rail tracks according to the current timetable for 2021/2022.

Permissible speed	Timetable 2021/2022.
	Share in %
Up to 60 km/h	52,73
61-80 km/h	17,30
81-100 km/h	16,65
101-120 km/h	1,43
UNMIK[1]	7,86
Without speed [2]	4,03
Total	**100**

To improve the quality of railway infrastructure and raise the efficiency of railway passenger and freight transport, the Government of RoS launched the rail modernization program. The program is targeted at the modernisation of major railway lines, the modernisation of passenger and freight rolling stock fleets and the introduction of modern train management technologies and intermodal facilities. Most notable is the modernisation of the North branch of Corridor X in Serbia, from Belgrade via Novi Sad to Subotica and onward to Hungary, where the speeds were increased to 200 km/h for the first time in RoS' history. The critical section on this line, between Belgrade and Novi Sad, the two largest cities, is completed and open for commercial service in March 2022, while on the second North-stretch, from Novi Sad to Subotica, the works have commenced. After completing this section, RoS intends to extend the modernisation works towards its South end of Corridor X as well as on other main lines, i.e. towards the border with Montenegro and Romania and other important main and regional lines within the Serbian rail network.

To maintain speed at the designed level on the newly modernized lines as well as maintain/increase the speed on existing rail lines that are planned for later reconstruction, it is necessary to carry out regular maintenance & renewal cycles, but the IZS' existing maintenance machinery and equipment cannot meet highly demanding European norms and standards related to railway infrastructure maintenance.

Currently, IZS has a fleet of railway infrastructure maintenance machinery that is, on average, 40 years old with outdated technology that does not meet current needs. The technical condition of most machinery, and therefore the reliability of their operation, is low. Also, its reliability is affected because, in recent years, low amount of funds has been allocated for machinery maintenance.

[1] The length of the lines in Kosovo and Metohija, which are under the supervision of UNMIK
[2] It includes railways out of operation and tracks on which works - rehabilitation are carried out

In Appendix 1 there is a detailed analysis of the existing condition of heavy-duty construction track machinery, the existing condition of heavy-duty motor cars of the Civil Engineering Department, the current state of the machinery of the Electric-Engineering Department and the analysis of the existing state of the machinery of the Center for Breakdown Train Operations. In Appendix 2, there is a list of all identified machines planned for procurement, grouped into indicative lots.

Taking into account the current situation, as well as the fact that after the completion of the railway infrastructure modernization program, an increase in the volume of traffic is expected, primarily on railway corridor X, in order to enable reliable, robust and safe railway operations, it is necessary to modernize the railways maintenance equipment. Funding for the procurement of the identified machinery will be provided through Phase 2 of the SRSM project.

2. Objective of the Services

The objectives of the Services are to develop an implementation plan with cost estimates and technical specifications for the rail heavy-duty maintenance machinery envisaged for procurement as part of the second phase of the SRSM Project.

3. Scope of work

The Consultant is expected to perform the following activities as a part of the Services:

3.1 Activity 1: Inception

Activity 1 includes the following tasks:

- Kick-off meeting, coordination, and agreement on the assignment with the key stakeholders, including PIU, MCTI, IZS, World Bank and FDA,
- Organization of the assignment's inception (logistics, content, etc.) so that subsequent activities can run smoothly.
- Preparation of the detailed work plan and expert mobilization according to the technical proposal;
- Obtaining and reviewing previous studies, maintenance programs and accompanying reports related to the conditions of the current conditions of the maintenance machinery and interviews with IZS employees involved in the maintenance process.

3.2 Activity 2: Preparation of Implementation Plan and Technical Specifications

Under Activity 2 the Consultant will include the preparation of an implementation plan as the basis for the development of bidding documents as well as bidding procedure, evaluation and contracting procedures and Technical Specifications and functional requirements for Heavy Duty Maintenance Machinery.

Sub-Activity 2.1: Implementation Plan

Under Sub-Activity 2.1 the Consultant will prepare the Implementation plan that should include, but not be limited to:

- Analysis of proposed indicative lots for procurement of maintenance machinery and preparation of final lots and its scope that will include machinery for which technical specification will be prepared,
- Market analysis of existing suppliers for maintenance machinery and location of its maintenance workshops with a special focus on the Eurasian continent. The Consultant should do the analysis for IZS and MCTI to gain awareness of the machines that are available for procurement,
- Recommendations for suitable procurement strategy, including adjustment of the current lot split to ensure a sufficient level of competition in the procurement process based on the conducted market analysis,
- Comprehensive qualification criteria (economic and financial capacity, professional capacity, and technical capacity) to be included into machinery Bidding Documents, which will be prepared by the CFU,
- Cost estimates of the maintenance machinery;
- Identification of risks for the procurement strategy and risk management process,
- Overall procurement schedule with bidding procedures planner.

Sub–Activity 2.2: Technical specifications

Under Sub-Activity 2.2, for all the equipment listed in Annex 2, the Consultant will prepare technical specifications that the machine should achieve with reference norms of European and international standards. Scope of technical specifications should include, but not be limited to:

- Operational Characteristics, including productivity and consumption ratios;
- Frame, Coupling and Buffers;
- Running Gear;
- Wheels and Axles;
- Suspension System;
- Propelling System with requirements for Engine, Fuel System, Air Intake, Engine Protection System, Transmission System, Exhaust System, Hydraulic System etc;
- Braking System;
- Electrical System;
- Cabins including requirements for visibility, equipment, noise & vibration level, communications system and features for cabin control panel etc;
- Signalling and Safety Systems and Equipment;
- Machine Working System and Working Units;
- Toolbox and spare parts;
- Acceptance and Commissioning Procedures
- Operators training requirements;
- Technical Maintenance and Repair requirements;
- Warranty and Liability requirements;

After Technical Specifications are finalized, the Consultant may have to update the costs estimates established in Sub-activity 2.1.

4. Timeline and deliverables

4.1 Timeline

The Services are expected to start in March 2023. The commencement date will be five days from the contract award date.

The implementation period of activities will be six months starting from the commencement date.

The Consultant will carry out the Services in line with a detailed schedule to be submitted as part of his proposal.

4.2 Deliverables

The Consultant shall prepare, at minimum, the below-listed deliverables and reports during the period of execution of the Contract. All deliverables (draft and final versions) shall be prepared in both, English and Serbian language. The Consultant will be paid for the services provided after the Client approves each deliverable as a percentage of the Lump Sum amount.

The deliverables should be delivered by the following timetable.

Deliverables	Description	Due date	Payment
Inception Report	Describe the initial findings, progress in collecting data, any difficulties encountered or expected, and the proposed approach to the project, taking into consideration the situation at the starting date of the assignment. It will also set out a detailed work plan to complete the activities. If there are any proposed modifications to the original Terms of Reference due to changed circumstances after arrival on site, these are to be discussed and agreed upon in principle with the Client and IZS before the submission of the Report (up to 20 pages)	2 weeks after commencement	10 %
Implementation Plan	The implementation plan should include, but not be limited to, tasks described within sub-activity 2.1.	2 months after inception report	20 %
Technical Specifications for procurement of Maintenance Machinery (batch 1)	Technical Specifications should be developed for Maintenance Machinery listed in Appendix 2 and its scope should include but not be limited to the requirements framework given in sub-activity 2.2.	4 months after inception report	35%
Technical Specifications for procurement of Maintenance Machinery (batch 2)	Technical Specifications should be developed for Maintenance Machinery listed in Appendix 2 and its scope should include but not be limited to the requirements framework given in sub-activity 2.2.	5.5 months after commencement	35%

5. Client organization, Services input and Contract Monitoring

5.1 Client organization

a) IZS is the final beneficiary of this technical assistance and it will nominate the competent and dedicated employees i.e. staff with necessary qualifications with respect to planning and carrying out inspection and maintenance operations as well as operation and maintenance of existing heavy-duty machinery to provide full support to the Consultant;
b) In addition, the Project Implementation Team (PIT) within IZS will be involved in day-to-day activities related to the Services. The PIU/MCTI and the IZS through its nominated shall be involved in the decision-making processes regarding the Contract implementation and shall be kept informed in all stages related to the contract(s) monitoring and implementation. The cooperation with the final beneficiary will be sustained and managed by the PIU;
c) The background documents and reports stated in this ToR will be supplied by the IZS and/or the PIU in a timely manner

5.2 Contract monitoring

All reports and other outputs, if any must be written in English and translated into Serbian language. The draft version of the reports (electronic copy) shall be submitted to PIU for distribution to the MoCTI and IZS.

The commenting period for the outputs is 2 weeks. In case of no reaction to the submitted outputs, such status will be interpreted as “no objection” and shall be deemed as approved.

All reports are subject to the approval of the MoCTI.

Consultant shall prepare the Minutes of Meetings (MoM) for the monthly progress meetings, meetings with other stakeholders and meetings with suppliers. All Meetings must be ensured to lead to clear decisions, persons in charge and deadlines. MoM will be distributed by the Consultant. MoM must be commented on within 7 calendar days by participants. MoM for the monthly progress meetings will be always on the agenda of the next monthly meeting to be approved and followed up.

All deliverables will be sent as electronic copies to PIU.Hard copies of the deliverables will be sent to the address of PIU of the SRSM project, presently 22-26, Nemanjina street, office 16, 11000 Savski Venac, Republic of Serbia.

6. Consultant Requirements

6.1 Personnel

The firm shall establish its Team in accordance with the needs and requirements of this ToR. The Team shall consist of a core team of key experts with the qualifications and skills defined in Table 3 below and non-key experts, as needed.

The firm is obliged to ensure adequate staff in terms of expertise and time allocation, as well as needed equipment in order to complete the activities required under the scope of work and to

achieve the objectives of this Contract in terms of time, costs, and quality. The Consultant is expected to be flexible in terms of travelling.

Note that staff of the public administration of the beneficiary country (Republic of Serbia) cannot be proposed as experts.

The Project language is English. All the team members assigned by the Consultant must be able to communicate effectively in English. A sufficient number of the Consultant's team should be fluent in the Serbian language.

The Consultant shall provide adequate administrative staff (secretary, translators, drivers accountant) needed to support the expert team.

6.2.1 Key experts

The team should include key experts with the qualifications and experience listed below, as well as non-key experts, if necessary, and as a minimum, the Consultant shall provide the following experts:

Title	Qualifications/Experience	Other Skills
Team Leader – Railway Maintenance Expert	Education: • Minimum an M. Sc. Degree in Civil engineering or another relevant engineering field; Relevant Professional Experience: • At least 10 years of general professional experience of which at least 5 years of experience in the domain of rail infrastructure maintenance. Experience as a rail infrastructure manager or maintenance contractor is equally acceptable. • Experience at least 1 similar project experience with the role of a Team Leader. • Experience in project and technical assistance finance by World Bank will be considered as an advantage.	Excellent command of the English language. Computer literacy. Knowledge of the Serbian language will be an advantage
Maintenance Machinery Expert	Education: • Minimum an M.Sc. degree in Mechanical engineering or another relevant engineering field; Relevant professional experience: • At least 10 years of working experience in the field of railways infrastructure maintenance and renewal with of which at least 5 years' experience in maintenance management or execution, including working with: Lining and levelling tamping machines with stabilizers, Turnouts Tamping Machines, Ballast Regulator, Maintenance Draisines, etc.	Communication skills, fluency in English. Knowledge of the Serbian language will be an advantage

Title	Qualifications/Experience	Other Skills
	• Experience at Suppliers/Producers of the mentioned machinery, at companies dealing with their maintenance, repair and refurbishment, or at their owners is equally acceptable. • Experience in project and technical assistance finance by World Bank will be considered as an advantage.	

6.2.2 Non - Key experts

Consultants may include in their proposals other positions that they consider necessary for the assignment. If so, the CVs for non-key experts should be submitted in the proposal, however, they will not be subject to evaluation. Non-key experts may include for example Procurement experts, Market analyst experts, and Administrative and support staff.

7. Location and travel

The operational base for the Contract will be Belgrade. Internal travel within the RoS might be required. The Consultant is expected to be flexible in terms of travelling.

8. Office accommodation

Office accommodation for each expert working on the Contract is to be provided by the Consultant.

The Consultant shall ensure that experts are adequately supported and equipped. In particular, it shall ensure that there is sufficient administrative, secretarial and interpreting provision to enable experts to concentrate on their primary responsibilities.

No equipment is to be purchased on behalf of neither Client (MCTI), PIU or Beneficiary (IZS) as part of this service contract or transferred to the Client or beneficiaries at the end of this Contract.

9. Terms of Payment

The Consultant should note that the proposed contract for this assignment will be Lump Sum payments with milestones against submission of deliverables.

10. Conflict of Interest

The engaged Consultant firm must not be involved in any other related activity to this Project.

Appendix 1

Detailed analysis of the existing condition of heavy-duty rail machinery

1. Analysis of rail machinery procurement for the Civil Engineering Department

The average age of existing machinery will be over 45 years in 2024. Currently, there is only one machine on the territory of IZS, owned by private company ZGOP Novi Sad JSC, with remark that ZGOP Novi Sad does not have a machine for dynamic track stabilization which is necessary to release the regular speed after mechanical regulation, which meets the European standards and valid legislation, i.e. has the appropriate technical characteristics and equipment required for mechanical regulation of tracks for speeds over 100km/h. This is insufficient, considering the strategic plans and projects whose implementation is in progress. Prices for engagement of subcontractor for regular maintenance of superstructure (for speeds of 100km/h) with mechanical regulation of tracks for lining and levelling (with measurement base of 100m to 200m — laser guidance system) with stabilization and ballast regulation, are extremely high (10.000 C/km i.e. 50.000 C per day). Most European railway administrations perform current and emergency maintenance of the superstructure of railway lines on their own, which is a practically and economically proven, maintenance model. That kind of concept enables independence and efficiency with more favorable economic parameters, which make the period of return on investments in machinery from 6 to 8 years depending on the amount of executed work. The duration of well-maintained machinery is 12 to 15 years depending on the degree of engagement. After that period, a major overhaul is needed.

The quality and efficiency of regular track maintenance depend on technical possibilities of the mechanization and the quality of preparatory works (replacement of sleepers, rails, fastenings, unloading and refilling of gravel). It is clear that with the mechanization of the average age over 40 years, which has certain technical and technological limitations, the mentioned works are extremely difficult to perform in an efficient and quality way.

1.1 The current condition of heavy-duty construction track machinery

The Civil Engineering Department has 43 construction railway machines for track maintenance, whose average age is similar to the age of handcars (about 40 years). Unlike handcars, the usage potential of this segment of mechanization is somewhat more favorable.

In the segments of railway maintenance such as tracking (screening of tracks), replacement of sleepers, replacement of turnouts, and replacement of rails, the Civil Engineering Department is equipped well enough to be able to meet the needs for servicing in our network. However, regarding machines for lining and levelling of tracks (tamper), we have faced With significant technical and operational limitations. It is clear that these types of machines are necessary and important because of the speed, and traffic safety, and because they directly affect the geometry (levelling) of the tracks.

The Civil Engineering Department has the following machines for mechanical lining and levelling:

No.	Type of machine	Machine ser. No.	Year of production
1	09-32 CSM	2288	1985
2	B40D	2006	1986

3	09-32CSM	3121	2003
4	07-16	1808	1980
5	08-16	2275	1985
6	08-32	2276	1986
7	08-32	2277	1985
8	08-32	2088	1983
9	08-32	2089	1983
10	07-16	1810	1980
11	07-275	577	1979
12	08-275	687	1983
13	08-275	780	1985
14	08-275	781	1986
15	08-32 4S	3114	2003

The key technical limitations are the obsolescence of the machine guidance system (track movement control system) and the measuring system. The machines from the 80s of the last centuries have technological potential, but they require serious investments in terms of detailed overhaul and modernization, which requires a budget of between 400,000 and 600,000 euros per machine. The age of the machinery results in unreliability and modest quantitative effects.

Of particular concern is the fact that the Civil Engineering Department owns only one machine that has the technical capacity to perform mechanical lining (regulation) of turnouts on concrete sleepers (08-32 / 4S No. 3114), i.e. that this Department owns only one more machine (09-32 CSM No. 3121) which has the ability to work with a laser guidance system that allows high-precision operation with an extended measurement base from 100 to 200 m, which is necessary for work on lines intended for speeds over 100 km/h.

The last procurement of this type of machinery was made in 2003, and to this day one investment period has been missed, which together with the missed investment period in the 1990s, makes the situation in this segment of railway maintenance particularly critical.

1.2 The existing condition of heavy-duty motorcars

The Civil Engineering Department disposes of 45 motor cars, whereof the average age is over 40 years. The average annual operating correctness of vehicles is 65%. Out of 45 vehicles, 5 motor cars were manufactured in 2003 (Robel 54.22), and other vehicles were manufactured in the period 1960-1990 (in 2003 8 motor cars manufactured by company MIN Nis were modified).

Name of asset	Manufacturer	Type	Serial number	Year of manufacture
Heavy-duty motor car without hydraulic crane	TVT Boris Kidri6 Maribor	200	9 I 1-205	1981
Heavy-duty motor car without hydraulic crane	TVT Boris Kidric Maribor	TD-2	932-301	1964

Heavy-duty motor car without hydraulic crane	ROBEL	54,12	935-301	1972
Heavy-duty motor car without hydraulic crane	ROBEL	54,12	935-304	1967
Heavy-duty motor car without hydraulic crane	TVT Boris Kidric Maribor	TD-2	11	1962
Heavy-duty motor car without hydraulic crane	TVT Boris Kidric Maribor	300	911-003	1979
Heavy-duty motor car without hydraulic crane	MIN Nis	25	915-008	1987
Heavy-duty motor car without hydraulic crane	MIN Nis	22 DC	915-101	2003
Heavy-duty motor car without hydraulic crane	MIN Nis	22 dc	915-103	2003
Heavy-duty motor car without hydraulic crane	MIN Nis	22	936-401	1956
Heavy- duty motor car without hydraulic crane	MIN Nis	22	931-402	1965
Heavy-duty motor car without hydraulic crane	MIN Nis	25-008	912-501	1983
Heavy-duty motor car without hydraulic crane	MIN Nis	25-014	121376	1981
Heavy- duty motor car without hydraulic crane	MIN Nis	22 DC	915-104	2004
Heavy-duty motor car without hydraulic crane	MIN Nis	22	915-107	2003
Heavy-duty motor car without hydraulic crane	MIN Nis	22	931-404	1966
Heavy- duty motor car without hydraulic crane	MIN Nis	22 DC	915-106	2003
Heavy-duty motor car without hydraulic crane	MIN Nis	22 DC	915-108	2003
Heavy-duty motor car without hydraulic crane	TVT Boris Kidric Maribor	000	911-004	1979
Heavy-duty motor car without hydraulic crane	TVT Boris Kidric Maribor	200	911-002	1979

Heavy- duty motor car without hydraulic crane	MIN Nis	25	912-503	1980
Heavy-duty motor car without hydraulic crane	MIN Nis	22	931-412	1980
Heavy-duty motor car without hydraulic crane	MIN Nis	22 DC	915-105	2004
Heavy-duty motor car without hydraulic crane	MIN Nis	22	931-410	1971
Heavy-duty motor car without hydraulic crane	MIN Nis	22	931-403	1968
Heavy-duty motor car without hydraulic crane	MIN Nis	22 DC	915-102	2003
Heavy-duty motor car with hydraulic crane	TVT Boris Kidric Maribor	200	911-232	1985
Heavy-duty motor car with hydraulic crane	TVT Boris Kidric Maribor	200	911-230	1984
Heavy-duty motor car with hydraulic crane	MIN Nis	25-004	912-504	1980
Heavy-duty motor car with hydraulic crane	MIN Nis	25-002	912-505	1980
Heavy-duty motor car with hydraulic crane	TVT Boris Kidric Maribor	200	911-240	1987
Heavy-duty motor car with hydraulic crane	TVT Boris Kidric Maribor	200	911-229	1984
Heavy-duty motor car with hydraulic crane	ROBEL	54-22	935-305	2003
Heavy-duty motor car with hydraulic crane	ROBEL	54-22	935-306	2003
Heavy-duty motor car with hydraulic crane	ROBEL	54-22	935-307	2003
Heavy-duty motor car with hydraulic crane	MIN Nis	25	915-007	1982
Heavy-duty motor car with hydraulic crane	TVT Boris Kidric Maribor	200	911-234	1985
Heavy-duty motor car with hydraulic crane	MIN Nis	22	931-416	1978
Heavy-duty motor car with hydraulic crane	TVT Boris Kidric Maribor	200	911-235	1985
Heavy-duty motor car with hydraulic crane	TVT Boris Kidric Maribor	200	911-215	1982
Heavy-duty motor car with hydraulic crane	TVT Boris Kidric Maribor	200	911-231	1979
Heavy-duty motor car with hydraulic crane	ROBEL	54-17	935-302	1982

Heavy-duty motor car with hydraulic crane	TVT Boris Kidric" Maribor	000	911-006	1979
Heavy-duty motor car for cutting vegetation	ROBEL	54-22	935-309	2003
Heavy-duty motor car for inspection of bridges	ROBEL	54-22	935-308	2003

Motorcars are the necessary assets for the regular functioning of the Civil Engineering Department because they are required in all segments of current, intervention and investment maintenance of the track. Only five motor cars ROBEL 54.22, manufactured in 2003 have the technical characteristics required for efficient operation in the 21st century and the rest of the fleet has a visual and technical potential for a museum with a modest use value given the traction characteristics and equipment of the vehicle.

2. The existing condition of heavy-duty motor cars of the Electrical Engineering Department

The priority task of heavy-duty motor cars, in Electrical Engineering Department, is fast and efficient intervention on catenary in case of accidents. Also, railcars are used for works on regular and investment maintenance of catenary, without which the work on OCL is impossible, as well as monitoring works on track which is performed by railway machine of the Civil Engineering Department.

No.	Serial Number and Name of the machine	Pcs
1	916 Series Heavy-duty motor cars	1
2	912-100 Series Heavy-duty motor car (remotorized)	3
3	912 Series Heavy-duty motor cars	8
4	901 Series Heavy-duty motor cars	1
5	911-100 Series Heavy duty motor car	2
6	911-300 Series Heavy-duty motor car	7
7	931 Series Heavy-duty motor cars	7
8	Track recording vehicle for OCL	1
9	Coaches (sleeping car, dining rooms, offices, workshops, cisterns, flat wagons, warehouses)	69

The technical condition of total rail machinery, and thus the availability and reliability of their work, is ln good condition, considering that heavy-duty motor cars are on average 50 years old and their amortization life cycle is exceeded several times. There are currently 13 operational and 16 non-operational heavy-duty motor cars. On average, 5 railcars are missing for regular work.

In accordance with the above, the capacities for maintenance of OCL facilities on electrified railway lines have been greatly reduced, and therefore it is not possible to properly meet all the needs.

A special problem is that producers of railcars, Gosa Smederevska Palanka, TAM Maribor and MIN Nis, accept production programs of heavy-duty motor cars with big problems or almost not at all. Besides that, over 40 years old engines and drive units (Bussing, FAP 2fu) are not produced

as well as their spare parts. All heavy-duty motor cars, as well as their drive units, are over 40 years old. The demands are increasing daily, both in terms of complexity and dynamics for the execution of works on catenary maintenance, because the conditions of train traffic in Serbian Railways dictate free intervals for works on catenary. With outdated railcars, responding to such requests is becoming increasingly difficult.

Electrical Engineering Department has approx. 70 wagons of various types and purposes. Their age is between 40-50 years, but even more. Therefore, there is interest in procuring various wagons for the maintenance of electrical engineering facilities and devices but also wagons for dismounting old and mounting new catenary etc.

No	Asset description	Wagon marking	Manufacturing year	Working order
1.	Tank wagon	80 72 9250999-7	1980	scrapping
2.	Wagon for gravel	80 72 9303602-4	1980	scrapping
3.	Wagon for gravel	80 72 9303601-6	1977	scrapping
4.	Mixer wagon	40 72 9050003-1	1980	scrapping
5.	Warehouse 1	40 72 9053570-4	1958	scrapping
6.	Warehouse 2	40 72 9053571-2	1958	scrapping
7.	Generator wagon	40 72 9090000-7	1980	operational
8.	Wagon for concrete	40 72 9090038-7		operational
9.	Wagon for accommodation of workers	80 72 9300025-1	1922	operational
10.	Warehouse wagon	20 72 9100203-9	1944	scrapping
11.	Warehouse wagon	20 72 9053702-7	1943	scrapping
12.	Warehouse	42 72 9100416-1		scrapping
13.	Workshop	80 72 9250320-6	2000	scrapping
14.	Catenary recording vehicle	61 72 9990600-9	1970	operational
15.	Crane wagon	40 72 9053456-6	1995	operational
16.	Warehouse wagon	40 72 9053563-9	1995	scrapping
17.	Generator wagon	40 72 9052036-7	1918	operational
18.	Wagon with stairs	10 72 9090008-6	1967	scrapping
19.	Wagon for OCL installation	80 72 9090005-7	1932	scrapping
20.	Wagon for the accommodation of workers	80 72 9250784-3	1995	scrapping
21.	Wagon for OCL installation	40 72 9052384-1	1995	operational
22.	Wagon for OCL installation	40 72 9090023-9	1991	operational
23.	Trailer RP-4		-	operational
24.	Wagon for OCL installation	40 72 90540 00-1	-	non-operational
25.	Wagon for OCL installation	40 72 9052397-3	1991	non-operational
26.	Generator wagon	40 72 9052336-1	1991	operational
27.	Generator wagon	46 72 9090007-6	-	operational
27.	Crane wagon	40 72 9054002-7	-	operational
29.	Warehouse	40 72 9054009-2	-	scrapping
30.	Workshop with kitchen	80 72 9300208-3	1963	scrapping

31.	Wagon for the accommodation of workers	80 72 9300062-4	1963	scrapping
32.	Warehouse working wagon	40 72 9053568-8	1958	scrapping
33.	Sleeping carriage	80 72 9300067-3	1931	scrapping
34.	Warehouse	40 72 9054007-6	1962	operational
35.	Warehouse	40 72 9053569-6	1964	scrapping
36.	Warehouse	40 72 9054008-4	1960	non-operational
37.	Workshop Kitchen	80 72 9202006-0	1915	operational
38.	Wagon for the accommodation of workers	80 72 9300017-8	1923	scrapping
39.	Wagon for the accommodation of workers	80 72 9300064-0	1986	operational
40.	Warehouse	10 72 9053680-7	1942	scrapping
41.	Wagon for the accommodation of workers	80 72 9250032-7	1993	scrapping
42.	Generator wagon with platform	40 72 9052038-3	1966	non-operational
43.	Wagon for accommodation of workers	10 72 9250408-4	1930	scrapping
44.	Workshop with generator	40 72 9052339-5	1911	operational
45.	Workshop	40 72 9052340-3	1921	operational
46.	Flat wagon	40 72 9090026-2	1901	operational
47.	Wagon for OCL installation	40 72 9053281-8	1923	operational
48.	Manual jack	80 72 9200351-2	1980	scrapping
49.	Tank wagon	40 72 9052816-2	-	non-operational
50.	Crane wagon 2t	40 72 9054001-9	2004	operational
51.	Wagon for railway purposes	40 72 9050152-4	1923	scrapping
52.	Wagon for railway purposes	10 72 9052305-2	1920	scrapping
53.	Wagon for railway purposes	10 72 905 3559-3	1939	scrapping
54.	Wagon for railway purposes	80 72 9300068-1	1963	scrapping
55.	Warehouse wagon	20 72 905 2282-1	-	non-operational
56.	Workshop	20 72 905 I 170-9	1992	non-operational
57.	Flat wagon	80 72 9250356-0	1995	operational
58.	Generator wagon with tilting platform	40 72 905 2037-S	1995	operational
59.	OCL installation wagon	40 72 9054003-5	1995	non-operational
60.	Workshop wagon	80 72 930 0210-9	1995	non-operational
61.	Working trailer	981-304 KIPER	-	non-operational
62.	OCL installation wagon	40 72 9053452-5	-	scrapping
63.	Sleeping coach — 10 beds	10 72 930 0028 0	1923	scrapping

64.	Wagon for railway purposes	10 72 9053550-2	1944	non-operational
65.	Wagon for railway purposes	10 72 9053681-5	1940	non-operational
66.	Wagon for railway purposes	10 72 9054507-1	1943	non-operational
67.	Wagon for railway purposes	10 72 9053530-4	1925	non-operational

3. The existing condition of the equipment of the breakdown train (auxiliary train)

The Center for Breakdown Train Operations, with its employees and the equipment it uses, performs activities that primarily relate to the remediation of the consequences of accidents and incidents, technical inspection and measurements of the rolling stock managed by IZS, as well as determining conditions for dispatching vehicles that cannot be transported under regular conditions, such as derailed wagons.

In the Center for Breakdown Train Operations, work is organized in the Center Administration, Unit for Technical Supervision and Monitoring of Rolling Stock of Railway Undertakings and three organizational units for breakdown train operations — Belgrade, Kraljevo and Nis", which perform their work duties based on the Instruction on the procedures in the event of accidents and incidents in the territory of IZS and the Procedures for activation of breakdown train.

Unit in Belgrade uses the following machinery:

No	Use of vehicle	UIC Number	Status
1.	Rail motor crane EDK 1000/1	99 72 9 471 001-4	Non-operational (motor-generator coupling)
2.	Rail and road truck "Geismar"	99 72 9 981 200-5	Operational
3.	Staff wagon	80 72 9250 785-0	Deadline for regular overhaul passed (wagon is in poor technical condition)
4.	Warehouse / wardrobe wagon	80 72 9250 471-7	Operational
5.	Staff / tools crane wagon	80 72 9250 309-9	Operational
6.	Tools wagon	50 72 9255 700-0	Operational

Unit in Kraljevo uses the following machinery:

No	Use of vehicle	UIC Number	Status
1.	Rail motor crane EDK 300	99 72 9 471 101-2	Operational
2.	Tools wagon	80 72 9250 217-4	Operational
3.	Staff wagon	80 72 9250 119-2	Operational
4.	Tools wagon / Lukas	80 72 9202 009-4	Operational
5.	Staff wagon	5172 7080 101-5	Deadline for regular overhaul passed
6.	Staff wagon	8072 930 0074-9	Deadline for regular overhaul passed

Unit in Nis uses the following machinery:

No	Vehicle purpose	UIC number	Status
1.	Rail motor crane DHPD 65	99 72 9571 001-3	The regular overhaul (RO) deadline has expired (implementation has not been planned due to the small volume of operation-carrying capacity)
2.	Wagon for accommodation of workers	80 72 9300 072-3	Operational
3.	Tool wagon	50 72 9527 500-6	Deadline for RO has expired (wagon is in poor technical condition)
4.	Tool wagon	80 72 9300 603-5	Operational

Rail motor crane EDK-1000/1 has a maximum carrying capacity of 125 I at the 7 m reach i.e. 29t at the 25m reach provided that the support base is at 7m i.e. at 3.5 m from the track axis to which the width of the support has to be added which depends on the terrain conditions. Due to its features, the mode of operation and preconditions for operating the crane are surpassed by the current operating conditions since it takes a lot of time to install the supports and perform the levelling and mounting of counterweights which also requires a lot of workers who will perform such operations. Due to its age (it was purchased in 1969), the non-quality and non-timely maintenance, and the reliability of the crane is very low, especially in the segment which relates to electrical installations and power. The wagon part of the crane was rendered operational in the overhaul performed on 20 February 2020 by overhauling company “Zelvoz 026”, a complete revision of brakes was performed (RK 3), the running gear as well as the buffing and draw gear, replacement of hydraulic fluid and washing out of hydraulic installations were performed.

For the functional and safe operation of the crane, it is primarily necessary to perform failure testing and then to repair the electrical installations and replace the necessary parts of electric installations and power components on the lifting segment of the crane and on the power central unit, the generator set.

By procuring the new asset i.e. crane with the carrying capacity of l20t, with modem structure and advanced operational options, with telescopic boom and adaptive counterweight, and other advantages in line with the Multi-Tasker 1600 crane we will be able to perform even the most challenging tasks such as heavy loads at greater distances from the track, lifting and operation in the tunnels, cuttings and slopes owing to the function of hinged counterweight, carrying of load by self-propelling and self-levelling of the crane while moving along the track, whereas the probability for damaging of buildings and rolling stock such as Siemens Vectron locomotives or EMUs series 413/416 Stadler FLIRT will be reduced. Repair and achieving of functional condition of the EDK 1000 crane is certainly necessary for the potential operation of two cranes as well as the replacement of the crane on the breakdown train Nis which is not functional for the needs of the breakdown train.

Road and rail vehicle Geismar V2R-730-S (BG 982 FW), is a modification of the truck type Renault Midlum 270.164X4 whereon the device for self-propelled running along the standard gauge track has been installed along with all the necessary systems for safe self-propelled running. The truck is equipped with a generator set for electricity generation with an actual output of 4.5 KW, a loading-unloading ramp with a 750 kg carrying capacity and a console crane with a flaschenzug with a 50 kg carrying capacity. The truck cab is envisaged for the driver and 6 passengers. Its own weight with all the upgrades is 11400 kg so the carrying capacity is 4600 kg. The said carrying capacity is insufficient when we take into account the needs of the breakdown train and the unpredictability of required equipment and tools that depend on and change on a case-by-case basis. Also, the cabin space for the accommodation of the driver and 6 passengers is very uncomfortable. Between the back bench envisaged for 4 passengers and the motor area, there is only a 10 cm spacing so longer journeys are very tiresome. The truck chassis i.e. the body supports are not adequately dimensioned for the conditions of running outside the paved roads so their cracking is often. The main advantage of using this type of transport of staff and breakdown train equipment is reflected in extreme mobility and speed of arrival to the intervention locations while the financial savings are obvious as opposed to using the traction vehicle for the transport of wagons with equipment. After the rail and road truck has been introduced into service the breakdown train unit Belgrade has used this truck in more than 90% of cases in 2016 thus generating multiple savings for IZS.

Appendix 2. List of Machinery to be procured

Lot 1 (Heavy Duty Track Maintenance)

No.	Machine	Quantity
1	Lining and levelling tamping machine with stabilizers	2
2	Universal tamper (e.g. Unimat)*	2
3	Ballast regulator (e.g. USP)	2

* Note that brands are provided in this table and the tables below for reference only, to explicit the functions to be undertaken by specified equipment. Open competitive bidding will be carried out.

Lot 2 (Wagons)

No.	Machine	Quantity
1	Wagon for continuous loading/unloading of materials (e.g., MFS 100)	6
2	Flat wagon	11
3	Wagon for automatic assembly and disassembly of overhead line, self-propelled	2

Lot 3 (Construction Machines)

No.	Machine	Quantity
1	Backhoe loader (e.g., CAT, model 428)	4
2	Rail and road vehicle (truck) with a basket	1
3	Rail and road vehicle	2
4	Rail and road vehicle (e.g., Unimog)	4

Lot 4 (Motor Cars with Upgrade)

No.	Machine	Quantity
1	Inspection car for SS/TT, ETCS 11, self-propelled (Motor Car with Upgrade)	1
2	Recording Vehicle for OCL, self-propelled	1
3	Motor car (platform, basket, crane)	6
4	Heavy Duty Motor Cars with flat waggons	13

Lot 5 (Intervention Machinery)

No.	Machine	Quantity
1	Track and switches installation heavy motorcar, with crane for interventions (e.g., Multitasker 1200)	1