



REPUBLIC OF SERBIA
CENTER FOR INVESTIGATION OF ACCIDENTS IN TRANSPORT
SECTOR FOR INVESTIGATION OF ACCIDENTS IN RAILWAY TRAFFIC
NEMANJINA 11, 11000 BELGRADE

No.: ŽS - 01/21

No.: 340-01-1/2021-02-1-48

Date: 21.01.2022.

FINAL REPORT ON SERIOUS ACCIDENT INVESTIGATION

Accident type:	Serious accident, Overtaking of a pulled shunting composition on a railway worker
Shunting composition:	Locomotive 441-510 and 6 (six) wagons of series <i>Ea</i>
Place:	Smederevo Municipality, settlement Mala Krsna, area of the railway station Mala Krsna
Date:	03.02.2021.
Time:	08:29



This Report presents the results of investigation of a serious accident, overtaking of a shunting composition (railway undertaking “Srbija Kargo” a.d.) on a railway worker, which occurred on 03.02.2021. at 08:29 at km 69+357 of the main arterial line No. 103: (Belgrade Center) - Rakovica - Jajinci - Mala Krsna - Velika Plana, at the station Mala Krsna, on the second track. In this serious accident the railway worker of “IŽS” a.d. has sustained a fatal injury.

The Working Group for investigation of this serious accident was formed by the Director of the Center for Investigation of Accidents in Transport of RS, by Decision No. 340-01-1/2021-02-1-8 of 10.02.2021.

In accordance with the Article 33 of the Law on Investigation of Accidents in Air, Railway and Waterborne Traffic (“Official Gazette of RS” No. 66/15 and 83/18) and the Article 23 of the Directive 2004/49/EC of the European Parliament and of the Council of EU (Railway Safety Directive), the Center for Investigation of Accidents in Transport (hereinafter referred to as: CINS) drafted and published this Final Report.

In this report, all values are expressed as part of the International System of Units (SI).

The meaning of abbreviations used in the text is explained in the Glossary.



CINS has been established in accordance with the Law on Investigation of Accidents in Air, Railway and Waterborne Traffic ("Official Gazette of RS" No. 66/15). The founder is the Republic of Serbia and the holder of founding rights is the Government of the Republic of Serbia.

Sector for Investigations of Accidents in Railway Traffic carries out tasks within the competence of the CINS in relation to rail traffic with the aim of possible improvement of safety on the railway by issuing safety recommendations. The investigative procedure in the field of railway traffic is conducted on the basis of the provisions of the Law on Investigation of Accidents in Air, Railway and Waterborne Traffic ("Official Gazette of RS" No. 66/15 and 83/18).

CINS conducts investigations following the serious accidents on the railway system with a view to possible improvement of railway safety and the prevention of new accidents caused by the same or similar causes. Serious accident in railway traffic means any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment, and any other similar accident with an obvious impact on railway safety regulation or the management of safety.

In addition to serious accidents, CINS may also investigate other accidents and incidents that could lead to a serious accident, including the technical failure of structural subsystems or interoperability constituents.

CINS has the discretion to decide whether to open an investigation of other accidents and incidents.

CINS is independent in its work and performs independent accident investigations. The aim of an investigation is to identify the causes and the possibility of improving safety on the railways and to prevent accidents by issuing safety recommendations.

Professional activities related to safety investigations are independent of judicial inquiry or any other parallel investigations which objective is to determine responsibility or the degree of guilt.



Glossary:

CINS	Center for Investigation of Accidents in Transport
IŽS	Serbian Railways Infrastructure
ZJŽ	Community of Yugoslav Railways
RS	Republic of Serbia
a.d.	Joint stock company
TK	Telecommand
TT	Telephone-telegraph/ by telephone-telegraph
OJT	Basic Public Prosecutor
MUP	Ministry of Interior
PU	Police Administration
TKP	Technical wagon affairs
DMK	Diesel motor wagon
ZOP	For track maintenance
OC	Organizational unit
GIŠ	The upper edge of the rail
SS	Safety signalling
SP	Traffic affairs
APB	Automatic track block
BZR	Health and safety at work/Healthy and safe work
TMD	Heavy motor track vehicle
ZGOP	For track construction and maintenance
SRS	Socialist Republic of Serbia



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1. Summary

1.1. Short description of the serious accident

On 03.02.2021. at 08:29 on the main arterial line No. 103: (Belgrade Center) - Rakovica - Jajinci - Mala Krsna - Velika Plana, at the Mala Krsna station, while performing shunting work, on the second station track, there occurred an overtaking of the pulled shunting composition of the railway undertaking "Srbija Kargo" a.d. (locomotive 441-510 and 6 (six) loaded wagons of the Ea series (five wagons of the Eas-z series and one wagon of the Eanoss series)), on an auxiliary worker at the Mala Krsna station employed by the public railway infrastructure manager "IŽS" a.d. The railway worker, an auxiliary worker at the Mala Krsna station, was moving on the second track in the direction of the switch block 2 of the Mala Krsna station, in the same direction of movement as the pulled shunting composition, when the shunting composition run into him. On that occasion, the railway worker suffered severe bodily injuries, from which he died on the spot.

The fatally injured railway worker, auxiliary worker at Mala Krsna station, employed by the railway infrastructure manager "IŽS" a.d. was moving on the track with the intention to arrive at the switch block 2 of the station Mala Krsna, in order to perform cleaning and lubrication of switches and road crossing. No material damage was caused to the railway vehicles, infrastructure and property of third parties in the serious accident in question.

1.2. The causes of the serious accident determined by investigation

The direct and immediate cause of this serious accident is that the auxiliary worker, employed by the railway infrastructure manager "IŽS" a.d. was on the second track of Mala Krsna station at the time of the shunting composition arrival, which is contrary to Article 16, paragraph 1 under 1. and 18. of the Rulebook on special measures of protection at work in railway traffic ("Official Gazette of the SRS", No. 19/85), thus creating a dangerous situation related to the occurrence of this serious accident.

Auxiliary worker employed by the railway infrastructure manager "IŽS" a.d. who headed to the switch block 2 of Mala Krsna station due to the cleaning of the counter rails at the level crossing (according to the statement of the Deputy Head of the Mala Krsna station), immediately before the shunting composition arrival, was moving along the second station track, within the track, in the direction from the station facility to the switch block 2, even though he has been familiar, from his employer "IŽS" a.d. with the dangers from the railway vehicles in motion.

The pulled shunting composition (locomotive 441-510 and 6 (six) wagons of the Ea series) was moving on the second station track towards the switch block 2 (in the same direction as the fatally injured auxiliary worker). At the head of the shunting composition there were not the train driver (he drove the locomotive from the driver cab "A" which was not at the head of the pulled shunting composition, but next to the wagon in the shunting composition) and the shunter (he was not at the head of the locomotive but was on the locomotive step by the train driver), so that the observation of the driving path of the shunting composition was difficult, which could have contributed that the shunting staff on the pulled shunting composition not see the person who was on the track in the driving path of the shunting composition.



The external train dispatcher, who performed the duty of shunting operator during the execution of shunting drive by the pulled shunting composition, was not in a position from which he would be able to observe the entire route of the shunting composition. The external train dispatcher (shunting operator) was in front of the station facility all the time.

The speed of the pulled shunting composition was higher than the maximum allowed in the area of Mala Krsna station, which could have contributed to the shunting staff not timely spotting the auxiliary worker moving within the second track in the driving path the shunting composition, i.e., to the auxiliary worker moving inside the other track not noticing on time the shunting composition moving on the same track.

When moving within the second track, the auxiliary worker did not wear the appropriate equipment for safety at work, i.e., a signal vest or a work pilot suit with fluorescent tape, which could have contributed to not being noticed by the train driver and the shunter on the pulled shunting composition.

Reduced visibility due to the presence of fog at the time of occurrence of this serious accident has affected all participants in the serious accident in question to perform their duties in difficult circumstances.

1.3. Main recommendations and information on subjects to which this Report is being submitted

Aiming to improve safety on the railway line and to prevent occurrence of the new accidents, CINS has issued the following safety recommendations:

To the Directorate for Railways SR_01/22, SR_02/22, SR_03/22, SR_04/22 and SR_05/22 are issued:

SR_01/22 “IŽS”a.d., to perform extraordinary training of station staff in terms of proper movement, in terms of danger from the railway vehicles in motion pursuant to Article 16, paragraph 1 under 1. and 18. of the Rulebook on special measures of protection at work in railway traffic (“Official Gazette of the SRS”, No. 19/85) (see points 3.3.4, 3.7. and 4.2.1.).

SR_02/22 “IŽS”a.d., to perform extraordinary training of station staff regarding the use of protective equipment pursuant to Article 35 of the Law on Safety and Health at Work (“Official Gazette of RS” No. 101/2005, 91/2015 and 113/2017 - other law), Business Order of the Mala Krsna Station Part I, case No. 15/2019-68 of 21.01.2019., Sector for SP, “IŽS”a.d. (CHAPTER E - Provisions regarding the organization of other activities in the station, 8.1. Cleaning and maintenance of switches) and the Risk Assessment Act for all workplaces in the work environment of “IŽS”a.d. No. 1/2016-4958 of 09.12.2016. (see points 3.3.2, 3.3.8, 3.3.9, 3.3.10. and 4.2.1.).



- SR_03/22** “IŽS” a.d., to perform extraordinary training of the shunting unit (shunting operator and shunter) in terms of proper performance of shunting work, with special emphasis on the position of the shunter and shunting operator upon driving a shunting composition, pursuant to Articles 23, 116 and 117 of the Shunting Instruction 42 (“Official Gazette of ZJŽ” No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94) (see points 3.3.5, 4.1. and 4.2.1.).
- SR_04/22** “IŽS” a.d., to perform extraordinary training of staff (shunting operators) regarding the issuance of orders for the formation of shunting drive routes, pursuant to Article 107 of the Shunting Instruction 42 (“Official Gazette of ZJŽ” No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94) (see points 3.3.5 and 3.5.2).
- SR_05/22** “Srbija Kargo” a.d., to perform extraordinary training of traction vehicle staff regarding the possession of the driver's cab in accordance with Article 30, item 3 of the Traffic Instruction 40 (“Official Gazette of ZJŽ”, No. 6/80, 3/82, 6/83, 2/84, 4/88, 8/88, 9/90, 2/91, 2/94 and 2/01) and Article 121 of the Shunting Instruction 42 (“Official Gazette of ZJŽ” No. 3/80, 6/83, 3/87, 4/88, 6/91 и 2/94) (see points 3.3.5, 3.3.6, 4.1 and 4.2.1).

2. Direct facts about the serious accident

2.1. Basic serious accident data

2.1.1. Date, time and location of the serious accident

The serious accident occurred on 03.02.2021. at 08:29 in the area of the city of Smederevo, the city municipality of Smederevo, in the settlement of Mala Krsna, in the area of the railway station Mala Krsna, on the second station track. The wider area where the serious accident in question occurred is populated.

The appearance of the area of the serious accident site at Mala Krsna station, taken from the satellite, is shown in Figure 2.1.1.1.



Figure 2.1.1.1: Satellite image of the serious accident site area (source: Bing maps)

2.1.2. Description of the serious accident and serious accident site and work of emergency and rescue services

The place of occurrence of the serious accident in question is located on the second station track of Mala Krsna station, on the part of the track between the external train dispatcher office and switch block 2, in the vicinity of the operating ramp next to the first station track where the warehouse of the company “Total Reciklaža” Požarevac is located, based in Mala Krsna.

As part of the shunting work for the purpose of proper formation of the gross for the planned train that was on the third station track, the pulled shunting composition of the railway undertaking “Srbija Kargo” a.d. (locomotive 441-510 and 6 (six) loaded wagons of series Ea), started driving

on the second station track from the office of the train dispatcher in the direction of switch block 2. The shunting composition consisted of a train driver, employed by the railway undertaking “Srbija Kargo” a.d. (he was located in the driver’s cab “A”, next to the gross, on the right side, seen in the direction of the shunting composition) and the shunter, employed by the manager of the public railway infrastructure “IŽS” a.d. (he was on the steps next to the driver's cab, on the train driver's side). According to the Business Order of the Mala Krsna Station, Part I, the role of shunting operator was performed by the external train dispatcher.

The railway worker, auxiliary worker at the Mala Krsna station, employed by the manager of the public railway infrastructure “IŽS” a.d. was moving on another station track in the direction from the station facility to the switch block 2 of the Mala Krsna station, in the same direction and at the same time as the pulled shunting composition, with its back turned to the oncoming shunting composition. The auxiliary worker was moving in the stated direction due to the arrival at the switch block 2 of the Mala Krsna station, in order to perform cleaning and lubrication of the switches and the level crossing.

Under these conditions, there occurred an overtaking of the pulled shunting composition on the auxiliary worker. The overtaking occurred in such a way with the head of the locomotive 441-510 (locomotive dozer blade) hitting the auxiliary worker, who fell off the track from the impact, after which the entire shunting composition crossed over him. On that occasion, the auxiliary worker suffered severe bodily injuries, from which he died on the spot.

Since the staff on the shunting composition did not notice that there was an overtaking, the pulled shunting composition continued driving until it got off the second station track and stopped at the switch block 2, where it was planned as part of the shunting work. The occurrence of the serious accident in question was first noticed by the train driver and the shunter who were on the locomotive 444-023, which was shunting along the second track from the direction of the train dispatcher's office in the direction of the switch block 2, just behind the shunting composition involved in the serious accident.

The appearance of the serious accident site, after the overtaking of the shunting composition on the railway worker, is shown in Figure 2.1.2.1.



Figure 2.1.2.1: The appearance of the serious accident site after the overtaking of a shunting composition on a railway worker (view from direction of the switch block 2 to the station facility)

The appearance of the place where the shunting composition stopped on the switch block 2 after the serious accident is shown in Figure 2.1.2.2.



Figure 2.1.2.2: The appearance of the place where the shunting composition stopped on the switch block 2 after the serious accident (view from direction of Mala Krsna station to the open track in direction to the stations Požarevac and Osipaonica)

Due to this serious accident, the team of the Emergency Medical Service of the Health Center “Smederevo” was hired.

Due to this serious accident, there was a complete interruption of traffic in the area of the Mala Krsna station. The interruption of traffic lasted until 03.02.2021. at 13:00.

2.1.3. Decision to investigate, investigative team composition and conducting the investigation

CINS has been informed immediately upon the occurrence of the serious accident. Main Investigator for Railway Traffic received the first notification of the serious accident occurred on 03.02.2021. at 09:19 via telephone by the Head of Central Operations Department of “IŽS” a.d. and at 09:37 via telephone by wagon dispatcher of “Srbija Kargo” a.d. Based on the information received and the facts that the investigative team of CINS determined by on-site investigation of the serious accident, CINS has launched the investigation of the serious accident in question in accordance with the Law on Investigation of Accidents in Air, Railway and Waterborne Traffic (“Official Gazette of RS” No. 66/15 and 83/18).

Composition of the Working group for investigation of the serious accident is determined by Decision No. 340-01-1/2021-02-1-8 of 10.02.2021. of the Director of CINS based on the Articles 6 and 32 of the Law on Investigation of Accidents in Air, Railway and Waterborne Traffic (“Official Gazette of RS” No. 66/15 and 83/18).



2.2. Serious accident background

2.2.1. Involved railway staff, contractors, other persons and witnesses

Employees of the public railway infrastructure manager “IŽS” a.d. and the railway undertaking “Srbija Kargo” a.d. participated in this serious accident.

From the employees of “IŽS” a.d. the shunter on the shunting composition, the external train dispatcher (in the capacity of the shunting operator) and the auxiliary worker, who was moving on the second track of the Mala Krsna station immediately before the serious accident in question occurred and before encountering the shunting composition, participated in the serious accident.

From the employees of “Srbija Kargo” a.d. the train driver of the 441-510 locomotive was involved in a serious accident.

The witness of the serious accident in question is a person employed as a truck driver in the company “Total reciklaža” Požarevac, based in Mala Krsna, who was at the warehouse on the unloading ramp of Mala Krsna station in the working machine - excavator at the time of the serious accident.

Staff of the contractor, who performed works on the fifth, sixth, seventh and eighth track of the Mala Krsna station in accordance with the Instruction on organization of works and traffic regulation during the execution of works on the main repair of the railway section of the Straževica tunnel - Mala Krsna (inclusive), from km 9+896 to km 70+264 railway (Belgrade) - Rakovica - Jajinci - Mala Krsna - Velika Plana No. 4/2019-1469-340 from 13.05.2019. “IŽS” a.d., did not participate in the serious accident in question, as well as other persons and witnesses.

2.2.2. Shunting composition that participated in the serious accident

Pulled shunting composition participated in the serious accident in question, consisting of 441-510 locomotive and 6 (six) loaded wagons of series Ea ((5 (five) of series Eas-z and 1 (one) of series Eanoss).

Table 2.2.2.1. gives a review of the wagons that were in the shunting composition.

Table 2.2.2.1: Review of wagon in the shunting composition (viewed from the shunting locomotive 441-510)

Serial wagon No.	Letter marking of wagon series +	Individual wagon No.	ownership	note
1.	Eas-z	31 72 5952 380-9	“Srbija Kargo” a.d.	Four axle wagon of open type
2.	Eas-z	31 72 5959 413-1		
3.	Eas-z	31 72 5958 914-9		
4.	Eanoss	80 72 5379 565-0		
5.	Eas-z	31 72 5956 203-9		
6.	Eas-z	31 72 5959 367-9		

The 441 series of electric locomotive is universal, designed for traction of all types of passenger and freight trains, on standard gauge tracks with an electrified single-phase system of 25 kV, 50 Hz. The locomotive equipment is designed for reliable operation in the temperature range from -40°C to +40°C. Regarding major as well as differences due to modification, 441 series locomotives are classified into subseries. Subseries 500 are without electrodynamic brakes and are containing a device for lubricating wheel flanges.

The appearance of locomotive 441-510 is shown in Figure 2.2.2.1.



Figure 2.2.2.1: The appearance of locomotive 441-510

Basic technical data for locomotive 441-510 are:

- length of locomotive over uncompressed bumpers: 15470 mm,
- locomotive body width: 3100 mm,
- spacing between bogie centers: 7700 mm,
- axle spacing in bogies: 2700 mm,
- height from GIS to lowered pantograph: 4650 mm,
- mass of the locomotive ready for service: 78 t.

On the locomotive 441-510 there are two driver cabs (driver cab “A” and “B”) located at the front at both ends of the locomotive. There are two doors on each side of the locomotive (one door for entering the driver cab and one door for entering the engine room). On both sides of all doors there are handrails located in the sunken space of the locomotive body frame. Under the door for entering the driver cab, there are two dents and two steps placed under the locomotive body, and under the door for entering the engine room, there is one dent in the locomotive body and two steps placed under the locomotive body. In both driver cabs, the train driver’s position is located on the opposite side from the door to enter the driver’s cab. The appearance of the door on the side of the locomotive 441-510 is shown in Figures 2.2.2.2. and 2.2.2.3.



Figure 2.2.2.2: Appearance of the locomotive 441-510 side from the position of the driver's cab "A"



Figure 2.2.2.3: Appearance of the locomotive 441-510 side from the position of the driver's cab "B"

On the front sides of the locomotive, there are two vertical handrails (one on each side) and one horizontal handrail (placed under the driver's cab windshields and connected at the ends to the upper parts of the vertical handrails), a front platform below which there are two front steps (one on each side) and two steps in the shape of a stirrup, i.e., in the shape of the Latin letter "U" (one on each side) attached to the bottom of the locomotive body. The appearance of the front side of the locomotive 441-510 from the side of the driver cab "B" is shown in Figure 2.2.2.4. (appearance of the locomotive front side from the side of the driver cab "A" is identical).



Figure 2.2.2.4: Appearance of the locomotive 441-510 front side 441-510 from the position of the driver's cab "B"

The Eas-z and Eanoss series wagons are four-axle open type freight wagons and are intended for the transport of bulk and piece cargo. They can be used in domestic and international railway traffic on a track width of 1435 mm.

Appearance of *Eas-z* wagons is shown in Fig.2.2.2.5.



Figure 2.2.2.5: Appearance of wagon *Eas-z*

2.2.3. Infrastructure and SS system

Mala Krsna station is located on the following lines: main line 103: (Belgrade Center) - Rakovica - Jajinci - Mala Krsna - Velika Plana, regional line 216: Smederevo - Junction Jezava - Radinac - Mala Krsna and regional line 218: Mala Krsna - Bor - Junction "2" - (Vražogrnac).

Mala Krsna station is an intermediate station on the distribution sections Belgrade - Požarevac and Smederevo - Lapovo. In terms of traffic execution, the station Mala Krsna is a border station (receives trains from the line equipped with TK and sends them to the line equipped with TK) on the line (Belgrade Center) - Rakovica - Jajinci - Mala Krsna - Velika Plana.

Train dispatchers regulate traffic and provide driving routes at the Mala Krsna station.

Mala Krsna station is equipped with electro-relay SS devices of the "Siemens EI" system. Traffic in the area of Mala Krsna station is regulated in accordance with the provisions of the Instruction for handling SS devices of the "Siemens EI" system in Mala Krsna station, No. 2789/75 of 21.04.1975. Registration No. 388.

Pursuant to the provisions of the Instruction on organization of works and traffic regulation during the execution of works on the main repair of the railway line section tunnel "Straževica" - Mala Krsna from km 9+896 to km 70+264 railway line (Belgrade) - Rakovica - Jajinci - Mala Krsna - Velika Plana No. 4/2019-1469-340 from 13.05.2019. "IŽS" a.d. due to the execution of works of subphase Ib, by telegram No. 171 from 26.09.2019. SS devices in the station Mala Krsna were switched off. Switching off the SS device at the Mala Krsna station means that turning switches on the drive route is done manually, by handling switches on the spot. For that reason, at the Mala Krsna station, switch blocks were occupied by switcher. The switches are equipped with a mechanical moving mechanism with a weight (julet) and switch locks and are locked on the spot. Pursuant to the provisions of Article 10, item 5 under v) of the Rulebook 2, Traffic Rulebook ("Official Gazette of ZJŽ" No. 3/94, 4/94, 5/94, 4/96 and 6/03), the switches are considered to be the fully applied switches. Also, in the conditions of disconnection of the existing SS station safety

devices in Mala Krsna station, there is no control of occupancy of station and bypass tracks and switches, central handling and control of switch positions is not possible, there is no dependence between switch positions and signals, as well as the possibility of using APB to the neighboring station Osipaonica.

According to the data submitted by the letter of the Sector for SP No. 15/2021-369 from 01.04.2021. the maximum speed of trains and shunting compositions in the area of the station Mala Krsna, from km 68+641 to km 69+709, over all tracks and switches is 10 km/h. It was introduced by telegram No. 88 from 11.12.2020. It was stated that the reason for the introduction was the reconstruction of the station and restricted speed running, referred to the 5th, 6th, 7th and 8th tracks with associated switches (from switch No. 3-26), although the reconstruction of these tracks was done and the introduction of restricted speed running over them is illogical, which can be stated as an irregularity in the telegram. After the occurrence of a serious accident, the telegram No. 88 from 11.12.2020 was changed. with a new telegram No. 95 from 17.02.2021. and only in the part referring to the restricted speed running at the station Mala Krsna and in the part that refers to the tracks for which it is valid, and instead of 5th, 6th, 7th and 8th track with associated switches (from switch No. 3-26) a change has been made so that restricted speed running refers to the 1st, 2nd, 3rd and 4th tracks with the corresponding switches, which should have been originally stated in telegram No. 88 from 11.12.2020.

During the on-site investigation of the serious accident, investigative team of CINS stated that the restricted speed running at the Mala Krsna station was signalled on block 2, observed by the Osipaonica and Požarevac stations towards the Mala Krsna station. The restricted speed running of 10 km/h is signalled by the aspect of a signal 97v: "Start of restricted speed running", so that it refers to the 1st, 2nd, 3rd and 4th track, which also should have been stated in the telegram No. 88 from 11.12.2020. The appearance of the aspect of a signal 97v: "Start of restricted speed running" is shown in Figure 2.2.2.6.



Figure 2.2.2.6: Appearance of an aspect of a signal 97v: "Start of restricted speed running" on block 2 of Mala Krsna station (observed by Osipaonica and Požarevac stations towards Mala Krsna station)

Markings for railways were taken according to the Regulation on categorization of railways ("Official Gazette of RS" No. 92/2020 and 6/2021), which was valid at the time of occurrence of the serious accident in question.

2.2.4. Means of communication

At the Mala Krsna station, in the office of the internal train dispatcher, an 80-part TK desk was installed, in which all telephone connections are concentrated, with which the lines on which the Mala Krsna station is located are equipped, as well as all local telephone connections. Conversations conducted at the TK desk are registered (recorded) on a recording device, so that this type of communication is considered evidence-based communication.

Pursuant to the provisions of the Instruction on organization of works and traffic regulation during the execution of works on the main repair of the railway line section tunnel "Straževica" - Mala Krsna from km 9+896 to km 70+264 railway line (Belgrade) - Rakovica - Jajinci - Mala Krsna - Velika Plana No. 4/2019-1469-340 from 13.05.2019. "IŽS" a.d. due to the execution of works, before switching off the SS device, telephone connections RA1 (telephone connection between internal train dispatcher and switch block 1) and RA2 (telephone connection between internal train dispatcher and switch block 2) were introduced and included in the TK desk at the internal train dispatcher (TK desk is on in the registrophone) and is currently the basic system for communication of traffic staff during traffic regulation.

At the Mala Krsna station, a local radio network is also in use - a stable unit located at the internal train dispatcher, while transmission units are at the external train dispatcher, on block 1, block 2 and shunters. The local radio network is plugged in registrophone and conversations are recorded. Communication between the personnel performing shunting in the area of the Mala Krsna station is done via the local radio network.

2.2.5. Works executed at or near the serious accident site

Works were executed in the area of the Mala Krsna station in accordance with the provisions of the Instruction on organization of works and traffic regulation during the execution of works on the main repair of the railway line section tunnel "Straževica" - Mala Krsna from km 9+896 to km 70+264 railway line (Belgrade) - Rakovica - Jajinci - Mala Krsna - Velika Plana No. 4/2019-1469-340 from 13.05.2019. "IŽS" a.d. At the time of occurrence of the serious accident in question, the works were performed on the fifth, sixth, seventh and eighth station tracks. By telegram "IŽS" a.d. No. 28 from 05.10.2020. after the technical inspection for the needs of organizing train traffic in the station Mala Krsna, the first, second, third and fourth tracks were opened to traffic, and the same telegram closed the fifth, sixth, seventh and eighth tracks for traffic due to the start of works.

These works did not affect the occurrence of the serious accident in question at the Mala Krsna station.

2.2.6. Activation of the emergency on the railway plan and sequence of events

Infrastructure manager “IŽS” a.d. immediately after the occurrence of the serious accident, has informed CINS, i.e., the main investigator for railway traffic, and then the railway undertaking “Srbija Kargo” a.d. did the same. Infrastructure Manager “IŽS” a.d. and the railway undertaking “Srbija Kargo” a.d. formed a joint investigative committee which conducted the investigation of the accident in accordance with the applicable regulations. Upon completion of the investigation, Investigation Report U-43/21 was prepared.

According to allegation from the Letter of Sector for SP “IŽS” a.d. (Letter No. 15/2021-369 of 01.04.2021.) and based on the Minutes of the hearing of the participants in this serious accident, the train driver and the shunter who were in the driver cab of the locomotive 444-023, which was moving on the second station track in the same direction as the shunting composition involved in the accident, were the first to notice the accident. The shunter on locomotive 444-023 informed the shunter on the shunting composition that participated in this accident, the external train dispatcher (by radio) and the Deputy Head of the Mala Krsna station (orally) about this accident. Upon received the notification, the Deputy Head of the station immediately called the ambulance and the police, and then all the interested parties were informed in accordance with the applicable regulations.

Upon arrival at the scene, the Emergency Medical Service team stated the death of the auxiliary worker employed by the infrastructure manager of “IŽS” a.d. After the on-site investigation by the members of MUP, the team of the public utility company “Zelenilo i groblja” Smederevo removed and drove away the remains from the scene of the accident.

Due to this accident, traffic was interrupted until 03.02.2021. at 13:00.

2.2.7. Activation of the emergency plan of public rescue services, police and medical services and the sequence of events

Due to this serious accident, members of the MUP RS, PU in Smederevo, members of OJT Smederevo and members of Emergency Medical Service of the Health Center “Smederevo” were engaged.

By Letter of the Health Center “Smederevo” No. 829/2 of 17.03.2021., data were submitted that on 03.02.2021. a call for intervention was received from a mobile telephony number at 08:32. Immediately after receiving the call, a team consisting of a doctor (emergency medicine specialist), medical technician and driver, went to the scene. According to the report, based on eyewitnesses’ statements, the injured person was hit by a train while crossing the railway line. The team found the body on the track. In the given circumstances, the doctor could only state the death. There were no other injuries.

By letter of the OJT in Smederevo, KTR No. 802/21 dated 11.03.2021, data were submitted that on 03.02.2021., after receiving a notification by phone from the police officer of the PU Smederevo, on the occasion of the on-site investigation, all necessary activities were undertaken (securing the scene by police officers, going to the scene of the police officers of the PU Smederevo, on-duty deputy public prosecutor of OJT in Smederevo and criminal technician).

2.3. Fatally injured, injured and material damage

2.3.1. Passengers, third parties and the railway staff including the contractors

In this serious accident one person was fatally injured. There were no injured.

Table 2.3.1.1: Review of fatally injured and injured persons

	Passengers	Railway staff	Third parties	Total
Fatally injured	-	1	-	1
Seriously injured	-	-	-	-
Lightly injured	-	-	-	-

2.3.2. Goods, luggage and other assets

There was no damage to the goods in the railway vehicles and other assets in this serious accident.

2.3.3. Railway vehicles, infrastructure and the environment

In the serious accident in question there is no damage done to the railway vehicles, infrastructure and third persons assets.

2.3.4. External conditions - weather conditions and geographical characteristics

The place of occurrence of the serious accident in question is located in the area of the city municipality of Smederevo, at the railway station in the settlement Mala Krsna. The area of the serious accident site is plain. Railway section where the serious accident occurred (second station track) is in the direction and horizontal.

The geographical coordinates of the accident site are: 44° 34' 57.5" *N* and 21° 0' 17.2" *E*.

By the letter of the Republic Hydrometeorological Institute No. 925-1-70/2021 from 12.03.2021. data were submitted that, based on measurements and observations at the Meteorological Station Smederevska Palanka, which is climatologically representative for the area of Mala Krsna, on 03.02.2021. at 08:00 the air temperature was -0.4°C, fog was observed, meteorological visibility was 200 m, the ground was moist, and on 03.02.2021. at 09:00 the air temperature was 3.4°C, fog was observed, meteorological visibility was 1 km, the ground was moist. Maximum daily wind speed on 03.02.2021. was measured at 14:41 and was 5.5 m/s (moderate western wind).

Meteorological visibility is the horizontal transparency of the atmosphere, which is expressed with the greatest distance at which the observer of normal vision can recognize objects known to him in the environment, when observing during the day, and light sources when observing at night.

At the time of the investigation of the serious accident in question by the CINS investigative team, it was day. The weather was partly sunny, clear, without precipitation, fog and wind. Visibility was good. The air temperature was approximately 7°C.

3. Minutes on investigation and examination

Data, facts and evidence regarding the occurrence of the serious accident in question were collected and determined on the basis of:

- On-site investigation by the investigative team of CINS;
- Materials submitted by infrastructure manager “IŽS”a.d.;
- Materials submitted by railway undertaking “Srbija Kargo”a.d. and
- Material submitted by OJT in Smederevo.

For the accident in question, the on-site investigation and investigation was conducted by the joint investigative committee of the infrastructure manager “IŽS”a.d. and the railway undertaking “Srbija Kargo”a.d.

3.1. Summary of testimonies

The CINS working group has on 12.04., 13.04., 15.04. and 20.05.2021. in the premises of CINS, interrogated the employees participating in this serious accident.

From the employees of “IŽS”a.d. the following were interrogated: Head of the Mala Krsna station, Deputy Head of the Mala Krsna station, external train dispatcher of the Mala Krsna station, as well as the shunter who was on the shunting locomotive 441-510 with which the shunting task was performed, at the time of the serious accident.

From the employees of “Srbija Kargo”a.d. the train driver was interrogated, who at the time of the serious accident was operating the shunting locomotive 441-510.

From “IŽS”a.d. (attachment of the Letter No. 1/2021-679 of 06.04.2021.) and “Srbija Kargo”a.d. (attached to the Letter No. 1/2021-1648 of 25.03.2021.) Minutes on hearing of all employees making the shunting unit (shunting operator and shunter) for execution of the task in question (the train driver who operated the locomotive 441-510, shunter on a shunting composition and external train dispatcher of the Mala Krsna station), internal train dispatcher of the Mala Krsna station, as well as the train driver and the shunter of the second locomotive 444-023 of the same track and who spotted the fatally injured auxiliary worker.

From “IŽS”a.d. the Report of the train dispatcher on irregularities during work (SP-9) of 03.02.2021. issued by the external train dispatcher and the internal train dispatcher of the Mala Krsna station, who performed service during the occurrence of the serious accident in question.

Summary of testimonies for the employees of “IŽS”a.d. and “Srbija Kargo”a.d. is given according to the hearing conducted by the Working Group of CINS.

3.1.1. The railway staff

The train driver of the locomotive 441-510 stated that on 03.02.2021. with a train which was pulled by a locomotive 441-510 arrived on the first track of the Mala Krsna station and received a shunting task from the external train dispatcher to switch from the first to the second track with the locomotive itself, where he should wait for gross (6 (six) loaded wagons of Eas series), to pull it towards block 2 and push it onto the third occupied track (there were tank wagons on the third



track). In the pulled shunting composition, he was in the driver cab on the right side to the gross, the shunter was on the locomotive, on the opposite driver cab, i.e., at the head of the pulled shunting composition on the right side, while before starting of the pulled shunting composition the external train dispatcher was between the second and third tracks on the platform in front of the station, and after that he did not see him. He communicated with the shunter non-verbally, with aspects of signal. During shunting, visibility was reduced due to fog and he could only see the distance in the length of the locomotive in front. During the shunting on the second track, he did not notice people next to the track or in the track.

Shunter on the shunting composition which consisted of the locomotive 441-510 with 6 (six) loaded wagons of Eas series stated that on 03.02.2021. after securing the train entrance on the first track at the level crossing PBL2 he came to the station facility and then the external train dispatcher told him that train composition on the third track should be changed because it is in the wrong composition. After coupling of the pushed gross of 6 (six) loaded Eas series wagons, he climbed to the locomotive 441-510. He was located at the driver's cab next to the gross on the right side in the direction of movement, that is, on the side of the train driver, the train driver was in the driver's cab up to the gross, while the external train dispatcher, who was also the shunting operator before the start of the shunting composition, was in front of the station facility. He communicated with the train driver orally and passed on the information he heard via Motorola. Together with the train driver, they observed the driving path. Due to the fog, visibility was poor, according to his estimate, about 50 m. He pointed out that during the movement of the shunting composition on the second track, he did not notice people moving inside or next to the track.

External train dispatcher of the Mala Krsna station stated that it was planned to perform a shunting task on 03.02.2021. He mentioned that the shunting unit consisted of the train driver and the shunter, as well as that the Mala Krsna station did not have a shunting operator, and that he, as the external train dispatcher performed the duty of the shunting operator, but that it is impossible to be done as he, as the external train dispatcher could not be at two places at the same time, that apart from that, he should prepare orders, receive and dispatch the trains and to watch out on the people crossing the crossing due to overhaul. During the shunting drive through the second track, he mentioned that he was in front of the station facility, next to the first track, that the train driver of the pulled shunting composition was in the driver cab of the locomotive 441-510, which was turned to the gross, and that he could not see the shunter, but he heard, via radio communication, that he was next to the handrail of the locomotive, on the right side in the direction of movement, at the driver's cab in which there was a train driver. During the shunting drive of the pulled shunting composition from the second track towards block 2, there was a thick fog with visibility up to 50 m and there was no precipitation. He did not notice people moving inside or next to the second track.

Deputy Head of the Mala Krsna station stated that the shunters are in charge of cleaning and lubricating the switches in the Mala Krsna station and that one executor works in the daily shift and occasionally two, depending on the needs of the contractors to provide the PBL 2 level crossing (this was the case on 03.02. 2021) and two executors work in the night shift. The auxiliary worker was in charge of cleaning the garbage, mowing the grass and plants and hygiene around the station. However, apart from the planned tasks, the auxiliary worker, in agreement with the Head of the Mala Krsna station, also cleaned the switches in situations when the shunters have a lot of work to do. Also, the auxiliary worker occasionally cleaned the counter rails at the level crossings on block 2. He mentioned that on 03.02.2021. in the morning, he saw an auxiliary worker and that auxiliary worker told him that day he had to take care of the counter rails at the PBL 1 and PBL 2 level crossings.

The Head of the station stated that the shunters were in charge of cleaning and lubricating the switches in the Mala Krsna station before the start of the overhaul in May 2019, and that these tasks were the responsibility of the switch staff since the start of the overhaul. The auxiliary worker was in charge of auxiliary tasks related to cleaning and maintaining the areas around the station, mowing the grass, cleaning the surfaces and toilets. The auxiliary worker told him that he would also maintain the switches, and the Head mentioned that it was not his part of the job and that he would do it at his own risk. He was not present at the station at the time of occurrence of the serious accident in question for justified reasons.

3.1.2. Other witnesses

OJT in Smederevo has, by Letter KTR No. 802/21 of 11.03.2021. submitted an Official Note on the Notification Received from Citizens made by the MUP RS, PU in Smederevo, Criminal Police Department, and regarding the testimony of a witness of the serious accident who is employed in the company “Total Reciklaža” Požarevac based in Mala Krsna (storage at the operating ramp of Mala Krsna station) at the workplace of the truck driver.

The witness stated that he came to work on 03.02.2021. at 07:00 and started his activities on handling the waste. At around 08:15, while he was in the excavator, he noticed a male person moving in the middle of the second track, from the direction of the Mala Krsna railway station towards Osipaonica, at a distance of about 10 m. He saw a locomotive with several wagons behind him and shouted “Run, train”. The male turned towards the locomotive and at that moment, the locomotive crashed into him, knocking him into the track, and then the entire shunting composition crossed over him.

3.2. Safety management system

3.2.1. Organizational frame and manner of issuing and executing orders

In accordance with the current Rulebook of Safety Management System, “IŽS” a.d. informed CINS about the serious accident.

In accordance with the applicable Safety Management System Manual, “Srbija Kargo” a.d. has informed CINS about the serious accident occurred.

The infrastructure manager “IŽS” a.d. and the railway undertaking “Srbija Kargo” a.d. have, in accordance with the Law on Railway Traffic Safety (“Official Gazette RS” No. 41/2018), formed the joint investigative committee which conducted the investigation of the accident in question. Upon completion of investigation, Report on Investigation No. U-43/21 was drafted.

3.2.2. Requirements to be fulfilled by the railway staff and the manner they are applied

“IŽS” a.d. as the infrastructure manager has through the Rulebook of the Safety Management System (SMS) secured competence management, that is, of the processes, that all the employees directly involved in the performance of the railway traffic, be trained and competent, as well as planning of the workload.

Regarding the serious accident in question, at internal and external train dispatcher of the Mala Krsna station and shunter of the Mala Krsna station employees of “IŽS” a.d. all activities related

to professional training, competence and work time planning were carried out in accordance with applicable regulations.

“Srbija Kargo” a.d. has, through the established Safety Management System Manual (SMS), secured competence management, that is, of the processes, that all the employees directly involved in the performance of the railway traffic, be trained and competent, as well as planning of the workload.

Regarding the serious accident in question, at the train driver of the locomotive 441-510 of a shunting composition, all activities related to professional training, competence and work time planning were carried out in accordance with applicable regulations.

3.2.3. Procedures for internal audits and controls and their results

“Srbija Kargo” a.d. has, as the railway undertaking, established Safety Management System Manual. The general purpose of safety management system (SMS) is, to secure that “Srbija Kargo” a.d achieves its business goals in a safe way.

Rolling stock be must maintained in the prescribed technical level of correctness and must follow the maintenance plans (EV-62) and their cycles of control and technical inspections and regular repairs, in order to be as reliable as possible in traffic, in accordance with the Rulebook on maintenance of railway vehicles and other laws and bylaws that are an integral part of the Safety Management System Manual “Srbija Kargo” a.d.

Regarding the serious accident in question, regular maintenance of the railway vehicle (locomotive 441-510) in the period from 16.01.2020. to 27.01.2021. at certain time intervals, was not performed in accordance with the applicable regulations. The irregularity is reflected in the fact that in April, June and November 2020, according to records, no periodic inspection of the locomotive was performed. The aforementioned did not have an impact on the occurrence of the serious accident in question.

3.3. Relevant international and national regulations

3.3.1. Law on Railway Traffic Safety (“Official Gazette RS” No. 41/2018)

V SUBSYSTEM INFRASTRUCTURE

Safety measures when performing works on the railway

Article 30 (excerpt)

Before the beginning of works on the railway, as well as during the maintenance of the railway lines, the infrastructure manager undertakes and announces measures for safe traffic to the interested staff of the manager and the contractor, supplemented by measures determined by the contractor for safety and health at work of his workers.

The infrastructure manager or other economic entity that maintains the railway is obliged to provide a place where the works will be performed before the beginning of the works.

...

VIII TRAFFIC REGULATION AND MANAGEMENT

Business order of the station



Article 41. (excerpt)

Technical equipment of the official position, manner of performing the service of railway workers, obligations of the manager and the railway undertaking, their mutual cooperation in performing traffic, as well as tasks that precede train formation, i.e., follow train disbanding and perform other tasks in order to preserve safety and regularity of railway traffic in the area of the official position, are determined by the Business order of the station issued by the manager.

The railway undertaking is obliged to submit to the manager data related to the tasks of railway workers employed by the railway undertaking, as well as to the facilities, premises and spaces in the station area that they use in performing their tasks.

The manager informs the railway undertakings about the Business order of the station.

...

2. Vehicle maintenance

Person in charge of maintenance

Article 53 (excerpt)

The holder of the vehicle is obliged to appoint a person in charge of its maintenance for each vehicle he uses.

...

In addition to the responsibility of the railway undertaking and the manager for the safe operation of trains, the person in charge of maintenance, through the maintenance system, is responsible for ensuring that the vehicles, for whose maintenance he is in charge of, are in a condition that allows them to move safely.

...

XI CONDITION THAT MUST BE MET BY THE RAILWAY WORKERS

1. General conditions

Article 59 (excerpt)

Railway workers must have the prescribed education, must be professionally trained for the jobs and tasks they perform in performing railway traffic, must have passed the professional exam and meet special health and other conditions in accordance with the provisions of this Law.

...

3.3.2. Law on Health and Safety at Work (“Official Gazette of RS” No. 101/2005, 91/2015 and 113/2017 - other law)

I BASIC PROVISIONS

Article 4 (excerpt)

...

6) Workplace is a space intended for performing work with the employer (in the facility or outdoors as well as on temporary and mobile construction sites, facilities, devices, vehicles, etc.) in which the employee resides or has access during work and which is under the direct or indirect control of the employer;



7) Working environment is a space in which work is performed and which includes workplaces, working conditions, work procedures and relations in the work process;

...

III OBLIGATIONS AND RESPONSIBILITIES OF THE EMPLOYER

...

3. Employee training

Article 27 (excerpt)

The employer is obliged to train the employee for safe and healthy work when establishing an employment relationship, i.e., other employment, transfer to other jobs, when introducing new technology or new means of work or changing work equipment, as well as when changing work processes that may cause a change in measures for safe and healthy work.

The employer is obliged to acquaint the employee during the training for safe and healthy work with all types of risks in the jobs for which he is assigned and about specific measures for safety and health at work in accordance with the act on risk assessment.

...

Training for safe and healthy work of the employee must be adjusted to the specifics of his workplace and is carried out according to the program, the content of which the employer must, when necessary, renew and change.

If the employer appoints the employee to perform work at two or more jobs at the same time, he is obliged to train the employee for safe and healthy work at each of the jobs.

Article 28 (excerpt)

...

Periodic checks of competence for safe and healthy work of an employee working at a workplace with increased risk are performed no later than one year from the day of the previous check, and at other jobs no later than four years from the day of the previous check.

Note: Article 78 states that until the enactment of regulations on preventive measures for BZR, if they are not in conflict with this law, occupational safety measures (rules) contained in the following regulation will be applied: 2) Rulebook on special occupational safety measures in railway traffic ("Official Gazette of RS", No. 19/85).

...

IV RIGHTS AND OBLIGATIONS OF EMPLOYEES

Article 35 (excerpt)

The employee is obliged to apply the prescribed measures for safe and healthy work, to use with purpose the means of work and hazardous substances, to use the prescribed means and equipment for personal protection at work and to handle them carefully, so as not to endanger their safety and health, as well as the safety and health of others.

Before starting work, the employee is obliged to inspect his/her workplace, including the means of work he/she uses, as well as the means and equipment for personal protection at work, and to inform the employer or other authorized person in case of observed deficiencies.

...



3.3.3. Rulebook on records in the field of safety and health at work (“Official Gazette of RS” 62/2007 and 102/2015)

Records of employees trained for safe and healthy work

Article 8 (excerpt)

Records on employees trained for safe and healthy work are kept on Form 6, in which data are entered, as follows:

...

3) work position title;

4) job description at that work position;

...

8) risks that the employee is aware of during training for safe and healthy work;

...

3.3.4. Rulebook on special occupational safety measures in railway traffic (“Official Gazette of SRS”, No. 19/85)

3. Cleaning and lubrication of switches

Article 12 (excerpt)

Cleaning and lubrication of switches, as well as cleaning of snow and ice in winter on switches is performed only with the prior approval of the responsible person at the station, when trains are not running and when shunting is not performed over a switch that is cleaned or lubricated.

...

Article 13

Cleaning and lubrication of switches can only be performed by workers who, in terms of sight, hearing and other health abilities, meet the conditions for their safest movement and retention on switches.

4. Shunting

Article 15

Shunting can be performed only with the obligatory presence of the worker who manages the shunting (shunting operator, conductor, train dispatcher or other worker when appointed by the train dispatcher).

Before starting the shunting, the worker who manages the shunting checks the shunting composition and whether the workers participating in the shunting have the prescribed and correct signalling means and appropriate personal protective equipment.

Article 16 (excerpt)

During the shunting work, it is not allowed:

1. staying or walking on the track or next to the track;

...



18. crossing the track directly in front of or between shunting drives or trains

...

3.3.5. Shunting Instruction 42 (“Official Gazette ZJŽ” No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94)

Shunting workers

...

12.

Shunting workers include workers of the shunting traction vehicle and workers of a certain occupation of the unit in whose territory the shunting activities are performed. These workers are grouped into a shunting unit, which is a common name for the shunting operator and a number of shunters, depending on the scope and type of the shunting work, local and weather conditions and other technological conditions, but not less than two workers (shunting operator and shunter).

13. (excerpt)

The staff of the shunting traction vehicle includes the train driver on the shunting and the train driver assistant. Depending on the technical characteristics of the shunting traction vehicle, the occupation can only be by a train driver or a train driver and assistant, which is prescribed by a special technical instruction.

...

14. (excerpt)

...

The shunting unit, when performing shunting tasks, is directly managed by the shunting operator.

...

Shunters are employees of the shunting unit who perform shunting tasks on the orders of the shunting operator or according to the rules of procedure for performing certain works related to shunting or work with trains during their preparation, i.e., work upon their arrival.

Shunting workers equipment

16. (excerpt)

For shunting works, every worker, except the staff of the shunting traction vehicle, must be provided with a whistle, a signal flag during the day, a white light lamp at night and a passenger car key where necessary.

...

19.

Shunting movements may be performed only under the direct guidance of the shunting operator, i.e., a worker who is well acquainted with shunting operations. If the latter is temporarily unable to perform his job, then the leadership is transferred to the deputy or for smaller tasks to another suitable worker with the necessary explanations in advance. In each shunting unit, it is determined in advance who can replace the shunting operator (work schedule), and a specific replacement is ordered by the train dispatcher with the shunting schedule.



Supervision and management of shunting operations

...

Shunting operator obligations

23. (excerpt)

The shunting operator manages the shunting according to the provisions of this Instruction and according to the valid special instructions for the respective station. He carries out the orders of the train dispatchers for certain shunting movements and is careful not to cause extraordinary events, not to injure workers, as well as to save funds and goods. Therefore, the shunting operator is obliged:

- to acquaint shunting and switching staff with shunting movements, especially when special precautions are required (passengers, dangerous goods, ramp, etc.);

...

- to respect all safety measures related to shunting and driving paths, shunting area, time restrictions, etc;
- to take such a place from which, if possible, he can monitor certain movements and agree with the shunting staff, i.e., in certain cases to check and communicate by radio;

...

- the obligations stated in the provisions of items 122 and 133 of this Instruction also apply;

...

Driving on traction vehicles

28.

Driving on traction vehicles is allowed only to workers with written permission, shunters in the performance of their duties and managerial and supervisory workers of the station and depot.

Shunters stand on the steps, or platform of the locomotive during the drive. They are allowed to enter the driver's cab when the steps or platform are insufficient or due to the danger of passing by gates, ramps, buildings, etc. that cannot be used safely. When driving on the front side step of the locomotive in the direction of travel, the speed must not exceed 20 km/h. Locomotive staff must not be interrupted during the performance of their duties.

Driving speed

29.

All shunting movements are carried out carefully, so as to avoid accidents and damage to vehicles, cargo and plants.

115.

Checking the driving route is the duty of the switcher and shunting operator, as long as the view can cover the set driving route. If the switcher cannot make inspection due to unfavourable weather, darkness or any other reason, and he cannot entrust the inspection to any other worker, he must inform the shunting operator.



116. (excerpt)

Monitoring the driving route is the responsibility of the shunting operator. He chooses the place of standing during the movement so that he has a good overview of the movement and can communicate orally or through aspects of signal with the train driver and other participants.

...

117. (excerpt)

...

Shunters who ride are distributed approximately evenly on wagons.

...

They are also responsible for observing the driving route, if the locomotive pulls the shunting composition, and in the case of a pushed shunting composition, the shunter at the head of the shunting composition has the basic responsibility.

...

121. (excerpt)

If the shunting movement is performed with the locomotive that is in front, then the observation of the driving route is primarily the duty of the train driver. Workers who ride on the locomotive are not exempted from the obligation to observe and are responsible for the driving route if they can see it from their place.

...

122. (excerpt)

Before shunting, the shunter operator and the shunters make sure:

- that the track from which the shunting composition departs, from the last wagon in the train, and the track on which it is driven are free, as well as the corresponding boundaries of that track;
- ...
- workers, passengers and other persons are not injured;
- ...
- to take on its own initiative other safety measures not listed here.

123.

The staff of the shunting vehicle and other shunters must also ensure that the provisions of item 122 are met. If the shunters notice that the movement could cause some danger, they must immediately inform the shunting operator. In case of any danger, the train driver takes all safety measures on his own initiative. The worker is explicitly responsible for this when the operator of the shunting is explicitly acquainted with the tested driving route.

...



126.

If the shunting movement is threatened by danger from any side, the shunter who first notices that danger takes appropriate measures to prevent it (stopping by applying the parking hand brake, the action of the auxiliary air brake, giving the aspect of a signal “Stop”, etc.). Other workers shall immediately take appropriate measures within the scope of their work and available technical devices and equipment in terms of accident prevention.

...

Giving orders for shunting movements

135. (excerpt)

Shunters pass orders to each other and to the train driver using the aspects of signal of the shunting staff. Aspects of signal for individual movements must be given until there is a need to change the type of movement, i.e., to stop the movement with the aspect of signal “Stop”. Aspects of signal “Easy” and “Stop” must be given in a timely manner to avoid a strong collision of the vehicle. The shunting operator shall ensure that all workers employed during the shunting give correct and timely aspects of signal, in order to safely carry out the procedures according to the given announcement.

On the right track, shunters are placed on the train driver’s side, and in curves on the inner side of the curve. The train driver assistant immediately communicates the aspects of a signal given by him to the train driver.

...

137.

During shunting movements, when only the train driver is on the locomotive, who in some cases cannot stand on the side of the shunting operator, one shunter must be near the train driver or in the driver cab, in order to be able to convey orders and distances to the train driver. For such shunting vehicles are also subject to local procedures prescribed by the station’s rules of procedure.

3.3.6. Traffic Instruction 40 (“Official Gazette of ZJŽ”, No. 6/80, 3/82, 6/83, 2/84, 4/88, 8/88, 9/90, 2/91, 2/94 and 2/01)

Use and dispatch of locomotives

Article 30

A. Use of locomotives for traction of trains

...

3.

...

In the case of electric and diesel locomotives with two driver cabs, the train driver must be located in the front driver cab in relation to the direction of travel of the train.



Exceptionally, when shunting the locomotives themselves (electric and diesel locomotives) in the station area, the train driver can be in the rear driver cab, provided that the locomotive is headed by a locomotive attendant, who will give the necessary aspects of signal. In stations where the movement of an unaccompanied locomotive is allowed, the train driver must always be in the front cab, i.e., the train driver assistant instead of him, if the locomotive is occupied by the train driver assistant.

...

3.3.7. Instruction on organization of works and traffic regulation during the execution of works on the main repair of the railway line section tunnel “Straževica” - Mala Krsna from km 9+896 to km 70+264 railway line (Belgrade) - Rakovica - Jajinci - Mala Krsna - Velika Plana (“IŽS” a.d. No. 4/2019-1469-340 from 13.05.2019.)

...

Shunting tasks

Article 19 (excerpt)

(a)-basic provisions

...

2. All shunting movements that are performed as for the needs of “IŽS” a.d. as well as for the needs of the Contractor, must be performed under the supervision of the train dispatcher in accordance with item 18, paragraph two of Instruction 42 (“Official Gazette of ZJŽ” No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94).

...

3.3.8. Business Order of the Mala Krsna station I part (Record No. 15/2019-68, valid until 31.01.2019.)

CHAPTER B - Provisions regarding traffic organization and regulation

1. Work positions related to the execution of traffic with a job description

1.1. Supervisory service posts

In the Mala Krsna station, the position of the Station Head and the Deputy Station Head have been systematized from the positions of the supervisory service.

...

Duties and tasks of the Deputy Head of Station are as follows:

- replaces the station Head during his absence (sick leave, annual leave, etc.),

...

- supervises the organization of work and work of station staff,

- coordinates the services in the station,

...

- controls the application of regulations and the execution of the timetable,



...

- warns workers about proper work both during the shift and during regular and part-time schooling,

...

- performs other tasks within the scope of work by order of the station Head.

...

1.3. Work position of the train dispatcher

...

Obligations of a train dispatcher are divided into obligations of the:

- External train dispatcher and
- Internal train dispatcher.

Obligations of an external train dispatcher are:

...

- overall planning of own and inter-station gross dispatch in agreement with the internal train dispatcher and traffic dispatcher,

...

- orders and supervises the shunting (for assembling and disassembling trains, setting up and removing the passenger sets, serving manipulative and industrial tracks), takes care of timely execution of work tasks, higher utilization of shunting, issuing shunting schedules, execution of station work plan, etc.,

- granting approval for the occupation of the main shunting tracks, as well as for shunting to the aspect of a signal "Shunting limit" and over it with the prior consent of the internal train dispatcher,

- care for precautionary measures during shunting with regard to train traffic,

...

1.5. Work positions of shunting staff

...

The duty of the shunter in the Mala Krsna station is performed by two executors in a shift. Shunters are obliged to perform their duties in the service in the spirit of the existing traffic technical regulations, as well as to adhere to safety measures at work.

Jobs and work shunting tasks in the station are performed by shunters. The composition of the shunting staff is 0/2. In exceptional cases, the composition of shunting staff may be reduced (work is done with one shunter) with the prior consent of the station head.

For shunting work, each shunter must be provided with a whistle, a signal flag during the day, and a white light lamp with 4 white lights at night.

Shunter's obligations are:

...



- controls the work of switches cleaners or shunters, i.e., whether the switches have been cleaned,

...

- receives and executes verbal orders from the external train dispatcher and executes them,
- takes care that shunting operations are performed on time and safely,

...

- performs the duties of switches cleaner in his absence of the person in charge,

...

- cleans and maintains switches,

...

3. Performing shunting tasks

3.1. Basic data regarding organization of shunting

The shunting staff at the Mala Krsna station is 0/2, i.e. two executors from the profile of shunters. The operations of the shunting operator at the Mala Krsna station are performed by an external train dispatcher.

The shunters possess, from the aspects of signal:

- Signal flag - during the day,
- Signal lamp - at night,
- A whistle,
- Portable radio station - Motorola.

The shunting area in the Mala Krsna station is Block I and II with accompanying station tracks.

There is no shunting path at Mala Krsna station. The station is illuminated with 3 portals located on Block I at km 68+833, on Block II at km 69+503 and one in the middle of the station area at km 69+164. At the Mala Krsna station, the external train dispatcher manages all shunting operations. At the Mala Krsna station, there is one shunting unit of the Railway Infrastructure Manager to perform all shunting tasks and duties.

3.2. Types of shunting movements

In the Mala Krsna station in the area of the station, shunting drives are allowed. Fly shunting is not allowed. The speed of the shunting composition is 20 km/h when the shunter follows the shunting composition on the handrail of the wagon and the locomotive, or 35 km/h when the shunter is in the cab of the locomotive.

...

3.4. Ways of communicating during shunting movements

Communication between the workers participating in the shunting is done in person, orally and by phone on block 1 and block 2 (located at the exit signals on a special pole or by phone in the local setup Ro1 and Ro2) or via radio stations. The duties of the shunting worker are performed by the external train dispatcher.

...



3.6. Shunting in station and on the railway line

At the Mala Krsna station, the station shunting is performed by locomotives, train and station staff. The shunting area is divided into the area of block 1 and the area of block 2.

...

3.7. Precautionary measures during shunting

...

The movement of the locomotive in the area of the station is allowed only with the approval of the external train dispatcher. Shunting is not allowed without the shunter.

...

CHAPTER E – Provisions regarding organization of other works in the station

...

8. Other works relating to performing traffic

8.1. Cleaning and maintaining the switches

At the Mala Krsna station, the switches are cleaned by the workers of the Mala Krsna ZOP Section.

...

Before starting the cleaning of switches, the worker who cleans the switches is obliged to contact the internal dispatcher of the train, who informs him about the traffic situation and approves the cleaning of the switches.

...

The worker who cleans the switches when going to the site must be dressed in a signal vest and have appropriate protective footwear and clothing.

...

A worker who cleans switches must take care of his personal safety.

3.3.9. Risk Assessment Act for all work positions in the work environment of “IŽS” a.d. No. 1/2016-4958 of 09.12.2016.

24. Traffic affairs (excerpt)

- Workplace risk assessment in the work environment -

...

List of jobs and conditions for establishing an employment relationship on the following jobs:

...

6. Electrician, locksmith, laundry worker, auxiliary worker



Work position - work environment	Jobs	Conditions for establishing the work employment
Station area, station premises, open railway line, workshop, auxiliary worker's room, laundry, auxiliary facilities	Electrician, locksmith, laundry worker, auxiliary worker	IV, primary school all areas

...

Conclusion

Based on the conducted procedure of recording the organization of work, applied safety and health measures at work, determining hazards and harms at the workplace and in the work environment and calculating the level of risk, according to the established Methodology and Risk Matrix, it is estimated that the workplace:

An electrician, a locksmith, a laundry worker, an auxiliary worker is not a high-risk job.

Determining ways and measures to eliminate, reduce or prevent risks

...

- means and equipment for personal protection at work:

Name of mean and equipment	standard	Validity date
Pilot suit with fl. ribbon summer	SRPS EN 13688:2015, SRPS EN ISO 20471:2015	1 year
Pilot suit with fl. ribbon winter	SRPS EN 13688:2015, SRPS EN ISO 20471:2015	2 years
Protective flat shoes	SRPS EN ISO 20347:2013	1 year

...

3.3.10. Fourth amendments to the Risk Assessment Act for all workplaces in the work environment in "IŽS" a.d. No. 4/2019-1848-431 from 04.12.2019.

31. Tabular overview of means and equipment for personal protection at work (excerpt)

...

Traffic affairs

Serial No.	Work position name	Name of mean and equipment for personal protection at work	Validity date
19.	Outdoor auxiliary worker	Pilot suit with fl. ribbon summer	1 year
		Pilot suit with fl. ribbon winter	2 years
		protective jacket with a hood	5 years
		protective raincoat	2 years
		protective deep shoes with polycarbonate cap	1 year
		universal protective leather gloves	3 months
		safety helmet	5 years
		signal vest	Without validity period

3.4. Functioning of the railway vehicles and technical installations

3.4.1. Control, command and signalling

At the time of occurrence of the serious accident, the control, command and signalling devices at Mala Krsna station were out of order, i.e. shut down due to infrastructural works at the station as part of the works on the main repair of the Straževica tunnel - Mala Krsna section of km 9+896 up to km 70+264 of the railway line (Belgrade) - Rakovica - Jajinci - Mala Krsna - Velika Plana, and in accordance with Article 13, items 54 and 73 of the Instruction on organization of works and traffic regulation during works on the main repair of the railway tunnel "Straževica" - Mala Krsna from km 9+896 to km 70+264 of the railway line (Belgrade) - Rakovica - Jajinci - Mala Krsna - Velika Plana.

3.4.2. Infrastructure

The condition of the infrastructure (in terms of the condition of the tracks and facilities) on the section from the first to the fourth track in the area of the Mala Krsna station, which were put into operation after the main repair, was orderly and in that sense, there were no irregularities that could adversely affect safety of railway traffic.

3.4.3. Communication tools

At the time of occurrence of the serious accident in question, the means of communication in the area of the Mala Krsna station were correct and functional. No disturbances or malfunctions were recorded on the means of communication.

3.4.4. Railway vehicles

At the time of occurrence of the serious accident in question, the shunting composition was moving on a second station track in the direction from the office of the external train dispatcher to the switch block 2.

The shunting composition consisted of a locomotive of series 441-510 and 6 (six) loaded wagons of series Ea.

The 441-510 series locomotive is a four-axle electric locomotive designed for traffic on standard gauge tracks with a width of 1435 mm, intended for traction all types of passenger and freight trains on all categories of lines.

At the time of occurrence of the serious accident in question, the locomotive 441-510 was used as a shunting locomotive to pull the shunting composition.

In accordance with Article 51 of the Law on Railway Traffic Safety ("Official Gazette of RS" No. 41/18), the locomotive series 441-510 is equipped with a device for giving sound signals (siren).

On locomotive 441-510 a device for measuring and registering speed of manufacturer Hasler, from Bern, registering speedometer type RT12, serial No. L07.166 and indicating speedometer device type A28i, serial No. 012.081.

“Srbija Kargo” a.d. submitted data, as attached to the Letter No. 1/2021-1648 from 25.03.2021. that within the regular inspection of rank P6, a check of speedometers installed on the locomotive 441-510 was performed, about which on 18.09.2020. a Certificate No. 210/20 with a validity period of 18.09.2021 was issued. After the inspection of speedometers, no repair of speedometers was recorded.

Processing the data taken from the memory of the speedometer records from locomotive 441-510, which was on a shunting composition, was performed in “Srbija Kargo” a.d., Section for traction of trains and TKP Belgrade.

By processing the data taken from the memory of the speedometer records from locomotive 441-510, which was on a shunting composition (document: Report from a speedometer records No. 03/21-1 of 12.04.2021.), it was determined that after the arrival of locomotive 441-510 at the station Mala Krsna at 07:31 (train locomotive train No. 73371), the same started at 08:15 (shunting at the station), at a speed of up to a maximum of 14 km/h crossed the distance of 188 m and stopped at 08:16. Locomotive 441-510 restarts at 08:17, at a speed of up to a maximum of 13 km/h crosses the road of 251 m and stops at 08:18. After that, the third start was registered at 08:31, the speed is increased to 5 km/h, with which it moves the next 63 m, and the speed is further increased to a maximum of 16 km/h, which is the next 314 m and in the end it decreases to a speed of 6 km/h at which it moves for the next 167 m and stops at 08:34.

The time is given according to the clock of the speedometer device.

Based on the data registered on the speedometer records of the locomotive 441-510, it was concluded that the speed of the locomotive 441-510 was exceeded in relation to the permitted speed or restricted speed running of 10 km/h, which was signalled at the station Mala Krsna on block 2, viewed from the stations Osipaonica and Pozarevac to Mala Krsna station. The restricted speed running of 10 km/h is signalled by aspect of a signal 97v: “Start of restricted speed running” (see point 2.2.3).

3.5. Traffic regulation and management

3.5.1. Actions taken by the staff that manages traffic regulation, control and signalling

The shunting operations during which the serious accident in question occurred were performed in the period when there was no train traffic at the Mala Krsna station. The shunting was performed for the purpose of proper assembly and preparation of trains for dispatch from the first and third station tracks.

3.5.2. Exchange of voice messages in relation to the serious accident

Communication in the Mala Krsna station immediately before the serious accident was performed via the TK desk of the train dispatcher at the Mala Krsna station, as well as via the Radio connection on channel No. 6.

Communication between the internal train dispatcher, switcher, external train dispatcher and dispatcher was performed through the TK desk and referred to the agreement regarding shunting work and further dispatch:

- gross of train No. 73371, which arrived with a locomotive 441-510 from the station Požarevac, and which was received on the first track of the station Mala Krsna. For that train from the first track, dispatch with locomotive 444-023 was planned, which was supposed to change from the third track to the first track upon arrival of the train (the plan was orally announced by the internal train dispatcher to the switcher at 07:00:12);
- gross already on the third track of the Mala Krsna station and waiting for the formation of the correct train composition and further dispatch to Požarevac station (the plan was orally announced by the internal train dispatcher to the external train dispatcher at 07:49:36);
- locomotive 441-510 for which the dispatch was originally planned to be sent to Radinac station as train No. 71170, immediately after its arrival from Požarevac station with train No. 73371, and then it was decided to use it for a shunting task to form the correct train composition on the third track and that after that to dispatch for the Radinac station (oral instruction of the train dispatcher given to the internal dispatcher of the train at 07:46:48).

Via Radio connection on channel No. 6, there was communication between the internal train dispatcher, the switcher on the blocks, the external train dispatcher, the shunters on the shunting compositions and the worker who provided the PBL 2 crossing (the shunter who was on the shunting composition who participated in serious accident) and referred to an agreement concerning:

- providing entrance for train 73371 on the first track of Mala Krsna station;
- providing passage for train No. 6753 through the second track of Mala Krsna station;
- providing passage for train No. 6731 through the second track of Mala Krsna station;
- providing a driving route for the transition of locomotive 441-510 from the first track to the second track of Mala Krsna station;
- providing a driving route for pulling out 6 (six) wagons of series Ea with locomotive 444-023 from the third track towards block 1 of Mala Krsna station;
- providing a driving router for pushing 6 (six) wagons of series Ea with locomotive 444-023 from the side of block 1 to another occupied track on which locomotive 441-510 was already located;
- providing a driving route for switching the shunting composition (locomotives 441-510 and 6 (six) cars of series Ea) from the second track via block 2 to the third track of Mala Krsna station;
- providing the entrance for train No. 70991 on the fourth track of the Mala Krsna station.

Considering the previously mentioned communication that preceded the serious accident, it can be concluded that the internal train dispatcher of the Mala Krsna station issued orders to the station staff exclusively for providing driving routes for the entry or passage of trains. The internal train dispatcher and the external train dispatcher (who also performed the work of shunting operator according to the Mala Krsna Station Business Order) did not issue any orders to the station staff regarding the provision of shunting routes, but the formation of shunting routes was done exclusively by agreement of shunters and switchers of blocks 1 and 2, which is not in accordance with the Article 107 of Shunting Instruction 42, as well as the Article 19 of the Instruction on organization of works and traffic regulation during the execution of works on the main repair of the railway line section tunnel "Straževica" - Mala Krsna from km 9+896 to km 70+264 railway line (Belgrade) - Rakovica - Jajinci - Mala Krsna - Velika Plana.

3.5.3. Measures taken to protect and secure the place of the serious accident

Due to the fact that the shunting composition stopped in the switch area of block 2 after the serious accident in question, the entrance of trains to the Mala Krsna station was closed from the Osipaonica and Požarevac stations. Traffic through Mala Krsna station was interrupted between 08:30 and 13:00. Since the shunting composition stopped on the section of the track that is horizontal and the shunting composition was not interrupted, no special measures were taken to secure the shunting composition from self-starting.

No other measures were taken until the arrival of the police and the ambulance team.

3.6. Interface between the people, machines and organization

3.6.1. Working hours of the staff involved

From the railway undertaking “Srbija Kargo” a.d. attached to the Letter No. 1/2021-1648 from 25.03.2021., data were submitted on the basis of which it was concluded that the train driver of the locomotive 441-510 who was on the shunting composition did not spend time at work longer than the maximum specified by law and that before starting work he had a legally prescribed rest.

From the manager of the public railway infrastructure “IŽS” a.d. attached to the Letter No. 1/2021-679 from 06.04.2021. data were submitted on the basis of which it was stated that the Deputy Head of the Mala Krsna station, the internal and external train dispatcher of the Mala Krsna station, the shunter who was on the shunting composition and the injured auxiliary worker did not spend time longer than the maximum determined by law and before starting work they had a statutory rest.

3.6.2. Health-related and personal circumstances that have effects on the serious accident, including the presence of physical or mental stress

For railway staff employed in “Srbija Kargo” a.d. attached to the Letter No. 1/2021-1648 from 25.03.2021., data were submitted on the basis of which it was concluded that the train driver of the locomotive 441-510 (which was in the shunting composition) was professionally trained and medically fit to perform the service. The train driver has a License to operate a traction vehicle No. RS 71 2017 1203 issued on 10.01.2017. by the Directorate of Railways with a validity period of 10.01.2027.

For railway staff employed in “IŽS” a.d. attached to the Letter No. 1/2021-679 from 06.04.2021. data were submitted on the basis of which it was stated that the Deputy Head of the Mala Krsna station, the internal and external train dispatcher of the Mala Krsna station, the shunter who was on the shunting composition and the fatally injured auxiliary worker were professionally trained and medically fit to perform the service.

Joint Investigative Committee, composed of representatives of “IŽS” a.d. and “Srbija Kargo” a.d., performed Breathalyzer testing of the internal and external train dispatcher of the Mala Krsna station on the spot in the official premises of “IŽS” a.d. at 11:55. The Breathalysing was performed with the Breathalyzer of the serial No. ARKF-0804 (the last inspection of the Breathalyzer was performed on 14.01.2021, with the validity period until 30.09.2021), about



which the Record on the Breathalysing No. 15/2021 of 03.02. 2021 was made. The presence of alcohol was not determined by Breathalyzer testing at the internal and external train dispatcher of the Mala Krsna station.

Blood samples were taken from the train driver of the locomotive 441-510 and from the shunter who was on the shunting composition, on the order of the OJT in Smederevo, for analysis for the presence of alcohol. Attached to the letter KTR No. 802/21 of 11.03.2021. OJT in Smederevo submitted data that in blood samples taken from the train driver and the shunter, the analysis did not prove the presence of alcohol.

Attached to the letter KTR No. 802/21 of 11.03.2021. the autopsy report and chemical-toxicological analysis on the presence of alcohol and psychoactive substances in the fatally injured person were submitted to the OJT in Smederevo, in which it was stated that the presence of alcohol had not been proven.

According to his own statement, the participant in the serious accident in question, i.e., the train driver of the locomotive 441-510, noticed the presence of stress as a consequence of the occurred serious accident in question.

3.6.3. Design of the equipment that has an influence on the interface between the user and the machine

The Mala Krsna station is designed in such a manner that it satisfies all the criteria for safe operation of train with the speeds prescribed by the Timetable Booklet and safe manipulation of passengers.

According to the designed state, the Mala Krsna station is equipped with an electro-relay SS device of the “Siemens - EI” system, which is operated by the internal train dispatcher from the central place (station setting).

Due to the works on the reconstruction of the Mala Krsna station, the SS station device has been switched off and the setting of driving routes is done manually on the spot.

In the area of Mala Krsna station, communication between the staff controlling the traffic and other station staff is done by phone via local TT connection and via radio connection.

According to the data obtained from “IŽS” a.d. (Annex 1 of the Letter of the Sector for SP No. 15/2021-369 from 01.04.2021), the maximum speed through the station Mala Krsna over all tracks and switches is 10 km/h (see point 2.2.3.).

The locomotive 441-510 is controlled by the train driver from the driver cab through commands designed during the production of the locomotive. With the locomotive series 441-510, no objections or irregularities were noticed on the control systems and devices.

3.7. Previous accidents of the similar character

Based on the data obtained by “IŽS” a.d. Letter No. 1/2021-679 of 06.04.2021. for the period from 01.01.2008. to 03.02.2021. in the area of the infrastructure manager “IŽS” a.d., there occurred 17 (seventeen) accidents of overtaking of a railway vehicle on a worker in total.



In most cases, the accidents occurred as a result of personal negligence of railway workers, who were moving in the railway area.

An overview of accidents is given in Table 3.7.1.

Table 3.7.1: Overview of accidents occurred between 01.01.2008. and 03.02.2021.

Serial No.	Date	Time	Short description	Fatally injured	Seriously injured	Lightly injured	Cause
1.	26.08.2008.	16:50	At the Dimitrovgrad station at km 98+440, the Bulgarian railway wagon inspector was fatally injured while getting off train number 46879/47041	1			The case is not over
2.	05.02.2009.	15:20	In the wagon workshop of the Belgrade Marshalling Yard, on the second track, during the shunting-moving of the wagon number 61 72 1070 601-7, a railway worker was seriously injured.		1		Personal omissions in the performance of the service
3.	12.03.2009.	10:00	At the Subotica station, a 661-224 locomotive crashed into a wagon inspector	1			Personal omissions in the performance of the service
4.	24.09.2009.	07:02	Between the official places Uzići and Sevojno, at km 156 +244, train No. 73106 (TMD 911-316) crashed into a worker of the railway section ZOP		1		Personal omissions in the performance of the service
5.	18.03.2010.	23:40	At the Sremska Mitrovica station, during the approach of the shunting composition to the gross, the shunter slipped and fell from the wagon under the wheel of the wagon.		1		Personal omissions in the performance of the service
6.	04.10.2010.	00:13	At the Niš station, after the dispatch of train No. 292, the lifeless body of the conductor of train No. 292 was observed on the track, out of service	1			Inattention when moving in the railway area
7.	25.11.2010.	13:45	In the Bežanijska Kosa tunnel at km 9+110, the shunting composition ran into a railway worker "ZGOP" Novi Sad			1	Personal omissions in the performance of the service
8.	30.12.2010.	14:30	At the Zaječar station, while shunting DMK 710-004 near the fuel pumping station, DMK ran into a worker of train traction			1	Inattention when moving in the railway area
9.	22.12.2011.	10:20	In the station Niš Marshalling Yard on switch No. 79, there was a crash of the shunting composition on the switch cleaner	1			Inattention and non-compliance with regulations on personal safety of employees and non-compliance with regulations when performing regular duties



Serial No.	Date	Time	Short description	Fatally injured	Seriously injured	Lightly injured	Cause
10.	27.12.2012.	10:15	Between the station Markovac and the junction Lapovo Varoš on the left track at km 102+350, train No. 3810 collided with the leader of the railway works			1	Inattention and non-compliance with regulations on personal safety of employees and non-compliance with regulations when performing regular duties
11.	09.10.2013.	07:43	At the Lajkovac station, at km 52+418, train No. 512 crashed with the Head of the railway section	1			Inattention and non-compliance with regulations on personal safety of employees and non-compliance with regulations when performing regular duties
12.	25.02.2015.	12:40	Between the stations Grošnica and Knić in the tunnel "Vučkovića" there was a crash of train No. 62998 with the railway keeper		1		Inattention and non-compliance with regulations on personal safety of employees and non-compliance with regulations when performing regular duties
13.	03.10.2016.	06:50	At the Belgrade (Peron) station on switch No. 28, a locomotive 624-106 collided with a switcher			1	Inattention and non-compliance with regulations on personal safety of employees and non-compliance with regulations when performing regular duties
14.	20.02.2018.	23:30	Between Topčider and Rakovica stations at km 7+850 there was a crash of train number 83012 (TMD 901-000) with the responsible person of the contractor Bauwesen			1	Inattention and non-compliance with regulations on personal safety of employees and non-compliance with regulations when performing regular duties



Serial No.	Date	Time	Short description	Fatally injured	Seriously injured	Lightly injured	Cause
15.	27.05.2018.	14:53	Between the stations Beograd Dunav and Belgrade at km 0+700 there was a crash of train No. 82034 (locomotive No. 641-314) with a worker of the company Millennium Team d.o.o.			1	Inattention and non-compliance with regulations on personal safety of employees and non-compliance with regulations when performing regular duties
16.	05.04.2019.	15:50	In the station Požarevac on the switch No. 16 at km 87+960 there was a crash of the locomotive No. 661-138 on the worker "IŽS" a.d.	1			Inattention and non-compliance with regulations on personal safety of employees and non-compliance with regulations when performing regular duties
17.	02.04.2020.	16:50	At the Pančevo Glavna station at km 15+900, a locomotive No. 661-116 crashed into an external train dispatcher.		1		Inattention and non-compliance with regulations on personal safety of employees and non-compliance with regulations when performing regular duties

4. Analysis and conclusions

4.1. Final review of the course of events and making conclusion on the event based on the facts determined during investigation and examination

Based on the submitted records of the internal train dispatcher of the Mala Krsna station for 03.02. 2021. by "IŽS" a.d., hearing of the external dispatcher of the train station Mala Krsna conducted by CINS as well as the Minutes of the hearing of the internal dispatcher of trains submitted by "IŽS" a.d., it can be stated that during the handover of service of both dispatchers, on 03.02.2021. at 07:00 in the station Mala Krsna on the third track (observed from block 1 to block 2) there was a locomotive 444-023 and gross from train No. 73379/65702 for the station Prahovo (6 (six) loaded wagons of series Ea and 11 (eleven) empty wagons of the Za series), while the first, second and fourth tracks were free.

In the communication between the internal train dispatcher and the traffic dispatcher, it was agreed that the gross from the third track from train 73379/65702 would be dispatched to Požarevac station by locomotive 441-510 from train No. 73371/45721, which arrived on the first track at 07:33. In accordance with that, the internal and external train dispatcher made a plan of shunting to uncouple the locomotive 441-510 from the train 73371/45721 from the gross and transfer it from the first to the second track. After that, the formation of the correct composition of train No. 73379/65702 will begin, so that with the locomotive 444-023 will pull out a part of the gross or 6 (six) loaded Ea series wagons from the third track towards block 1 and push to the locomotive 441-510 which stood on the second track. Finally, the shunting composition consisting of locomotives 441-510 and 6 (six) loaded Ea series wagons, to be pulled from the second track towards block 2 and then pushed to the third track to the rest of the gross or 11 (eleven) empty tank wagons. In this way, the loaded wagons would be placed at the head of the train, in front of the empty wagons, and the correct composition for train No. 73379/65702 would be formed, which should have been dispatched to the Požarevac station. Also, it was planned that the locomotive 444-023 would be transferred to the first track in order to prepare for the dispatch of the train from the first track.

Since these were the usual shunting tasks, no written order was issued to perform the shunting, but all orders were given orally.

Based on the planned shunting, locomotive 441-510 was transferred from the first station track to the second station track, after which 6 (six) loaded Ea series wagons were pulled from the third station track by locomotive 444-023 to block 1 and then transferred as a pushed shunting train on the second station track and coupled to locomotive 441-510 and locomotive 444-023 is uncoupled.

For the pulled shunting composition (locomotive 441-510 and 6 (six) loaded wagons of series Ea), which was formed on the second track, a shunting unit was determined, which consisted of: train driver of locomotive 441-510 (employed in “Srbija Kargo” a.d.), shunter (employed in “IZS” a.d.) and external train dispatcher (employed in “IZS” a.d.) who, in accordance with the Business Order of the station Mala Krsna Part I, performed the duties of the shunting operator.

After assembling the shunting composition that took part in the serious accident in question (coupling 6 (six) loaded Ea series wagons to locomotive 441-510), the train driver remained in the same position in locomotive 441-510 in the driver cab “A” on the right in the direction of travel), i.e., in the driver cab, which in relation to the pulled shunting composition was the last driver cab observed in relation to the direction of travel (gross side). The shunter took the position on the steps of the rear driver cab (in the direction of travel, on the gross side) on the side next to the train driver.

A sketch of a serious accident is shown in Figure 4.1.1.

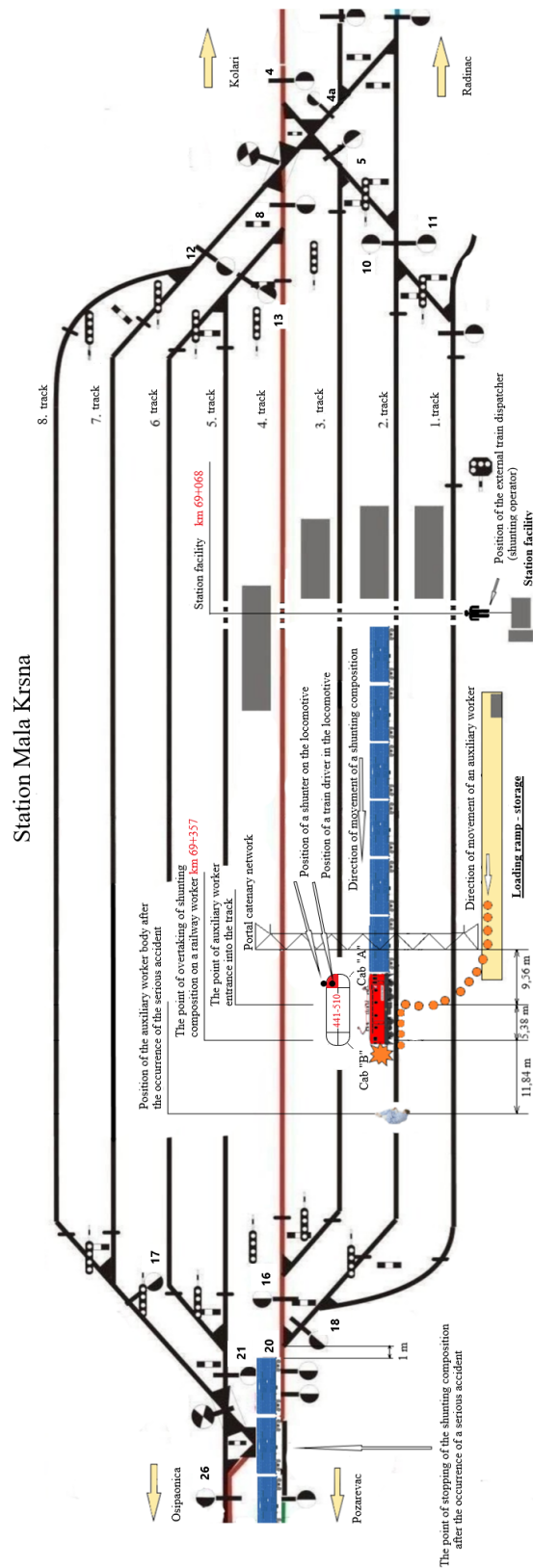


Figure 4.1.1: The sketch of a serious accident

Without determining the location of the train driver and the position of the shunter, the external train dispatcher (who performed the duties of the shunting operator) allowed the start of the pulled shunting composition from the second track in the direction of switch block 2. Since the train driver was in the driver cab that was up to the wagon in the pulled shunting composition (in driver cab of the locomotive that was not at the head of the shunting composition), and the shunter was not at the head of the locomotive, i.e., at the head of the pulled shunting composition and having in mind the fact that visibility was reduced due to fog, the drive was carried out in conditions of limited observation of the shunting path of the ride. The driving of the pulled shunting composition was performed at a speed higher than the maximum allowed in the area of the Mala Krsna station. During the driving of the pulled shunting composition, neither the train driver nor the shunter noticed the auxiliary worker moving in the middle of the second station track. Under these conditions, there occurred an overtaking by the pulled shunting composition on the auxiliary worker. The shunting composition stopped after shunting drive in the area of switch block 2.

After stopping the pulled shunting composition in the area of switch block 2, the shunting drive of the locomotive 444-023 towards switch block 2 started on the second station track. In the front driver cab of the locomotive 444-023, next to the train driver, there was also a shunter. During the shunting drive on the second track, the train driver and the shunter who were in the driver cab of the locomotive 444-023 noticed the body in the track and the train driver stopped the locomotive approximately 25 m in front of the body of the injured auxiliary worker, after which the shunter informed traffic staff about a serious accident. In the same way, via radio connection, the train driver and shunter on locomotive 441-510 at the pulled shunting composition were informed with the order to urgently stop further shunting, so that the pulled shunting composition with locomotive 441-510 remained standing on block 2.

4.2. Discussion - analysis of the facts established during the investigation and examination with the aim of drawing conclusions regarding the causes of the serious accident and the effect of the rescue services

4.2.1. Analysis of the behaviour of participants of a serious accident

At the time of the beginning of the aforementioned shunting operations, two shunters were present at Mala Krsna station, the first of which (who participated in the serious accident in question) was at the opposite end of the station behind block 2 at the PBL 2 level crossing. Pursuant to the Order of the Head of Station No. 3/2020 of 06.10. 2020., the first shunter provided the level crossing PBL 2 for the entry of train 73371/45721 on the first track. After the entry of train No. 73371/45721 on the first track, the second shunter performed the shunting task, as follows: uncoupling the locomotive 441-510 from gross, transferring the locomotive 441-510 from the first to the second track, uncoupling a group of 6 (six) loaded cars series Ea from the group of 11 (eleven) tank cars of the series Za on the third track and coupling the locomotive 444-023 on the group of 6 (six) loaded cars of the Ea series, pulling 6 (six) loaded cars of the Ea series from the third track towards block 1 and pushing them on the locomotive 441-510 which was standing on the second track. The first shunter arrived from the PBL 2 level crossing at the moment when the locomotive 444-023 had already pulled the group of wagons to block 1 and he waited at the locomotive 441-510 for the shunting composition to push on the second track next to the locomotive 441-510, after which he coupled the locomotive 441-510 for 6 (six) Ea series loaded



wagons, while the other shunter uncoupled a 444-023 locomotive from the shunting composition and it remained on the second track behind the shunting train.

After coupling the locomotive 441-510 for a group of 6 (six) loaded wagons of the Ea series and forming the driving route to get off the second track towards block 2, the pulled shunting composition was started. The shunting unit consisted of a train driver, a shunting operator (external train dispatcher), and one shunter (first shunter). During the shunting, the train driver was in the driver cab "A", in the last driver cab in relation to the direction of movement of the shunting composition (i.e., to gross), which is contrary to point 3. of Article 30 of Traffic Instruction 40 ("Official Gazette of ZJŽ" No. 6/80, 3/82, 6/83, 2/84, 4/88, 8/88, 9/90, 2/91, 2/94 and 2/01) and Article 121 of the Shunting Instruction 42 ("Official Gazette of ZJŽ" No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94). The shunter (the first shunter) was on the locomotive from the outside near the driver cab "A" in which there was the train driver, from the train driver's side, and not at the head of the shunting composition, which is contrary to Article 117 of the Shunting Instruction 42 ("Official Gazette of ZJŽ" No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94). Also, the shunter (the first shunter) did not have a signal flag or a whistle, which is contrary to Article 16 of the Shunting Instruction 42 ("Official Gazette of ZJŽ" No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94). An external train dispatcher, who was performing the duty of shunting operator, was standing in front of the station facility during the start of the shunting drive. During the shunting drive, the external train dispatcher did not follow the shunting train, i.e., he did not take a position from which he could follow the movement of the shunting composition all the time, which is contrary to Article 116 of the Shunting Instruction 42 ("Official Gazette of ZJŽ" No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94). According to the own statement of the external train dispatcher, i.e., the shunting operator, having in mind that he was standing in front of the station facility and did not monitor the shunting composition, due to the presence of fog that limited visibility, monitoring the movement of the shunting composition was difficult.

After coupling the 6 (six) loaded Ea series wagons for the 441-510 locomotive, the shunter took up position on the locomotive and was ordered to start the shunting composition. According to his own statement, before starting the shunting composition, the train driver gave with the locomotive siren an aspect of signal 67: "Watch out". According to the statement of the shunter, the train driver gave an aspect of signal 67: "Watch out" but did not repeat it during the shunting drive, while according to the statement of the external train dispatcher, the train driver gave an aspect of signal 67: "Watch out" before starting the shunting composition and during the shunting drive. The speedometer device installed on the locomotive 441-510 does not record the use of the locomotive siren, so in this way it was not possible to review the use of the locomotive siren before and during the shunting drive.

According to the statement of the Deputy Head of the Mala Krsna station, at the beginning of the shift (approximately at 07:00), an auxiliary worker employed in "IŽS"a.d. contacted him and informed him that he would clean the space between the rail and the counter rail at the level crossing in the area of the block 2. On that occasion, the deputy Head of the Mala Krsna station did not issue him with any work task for cleaning the switches or cleaning rails at level crossings.

At the time of overtaking of the shunting composition on the auxiliary worker, he was moving in the middle of the second track, although he was aware of the dangers of the railway vehicles in movement, which was confirmed in the Register of employees trained for safe work - Form 6 from 02.02.2018. which was submitted in the attachment to the Letter No. 1/2021-679 from 06.04.2021. of "IŽS"a.d. He had with him means for cleaning and lubricating the switches (a metal can with oil, a spatula and a brush). According to the statement of the witness who was on the operating ramp next to the first station track, the fatally injured auxiliary station worker turned to the

oncoming shunting composition just before the shunting composition hit him, approximately half a meter from the locomotive.

In Figure 4.2.1.1. the position of the body of the auxiliary worker and the means he carried with him after the occurrence of a serious accident are shown.

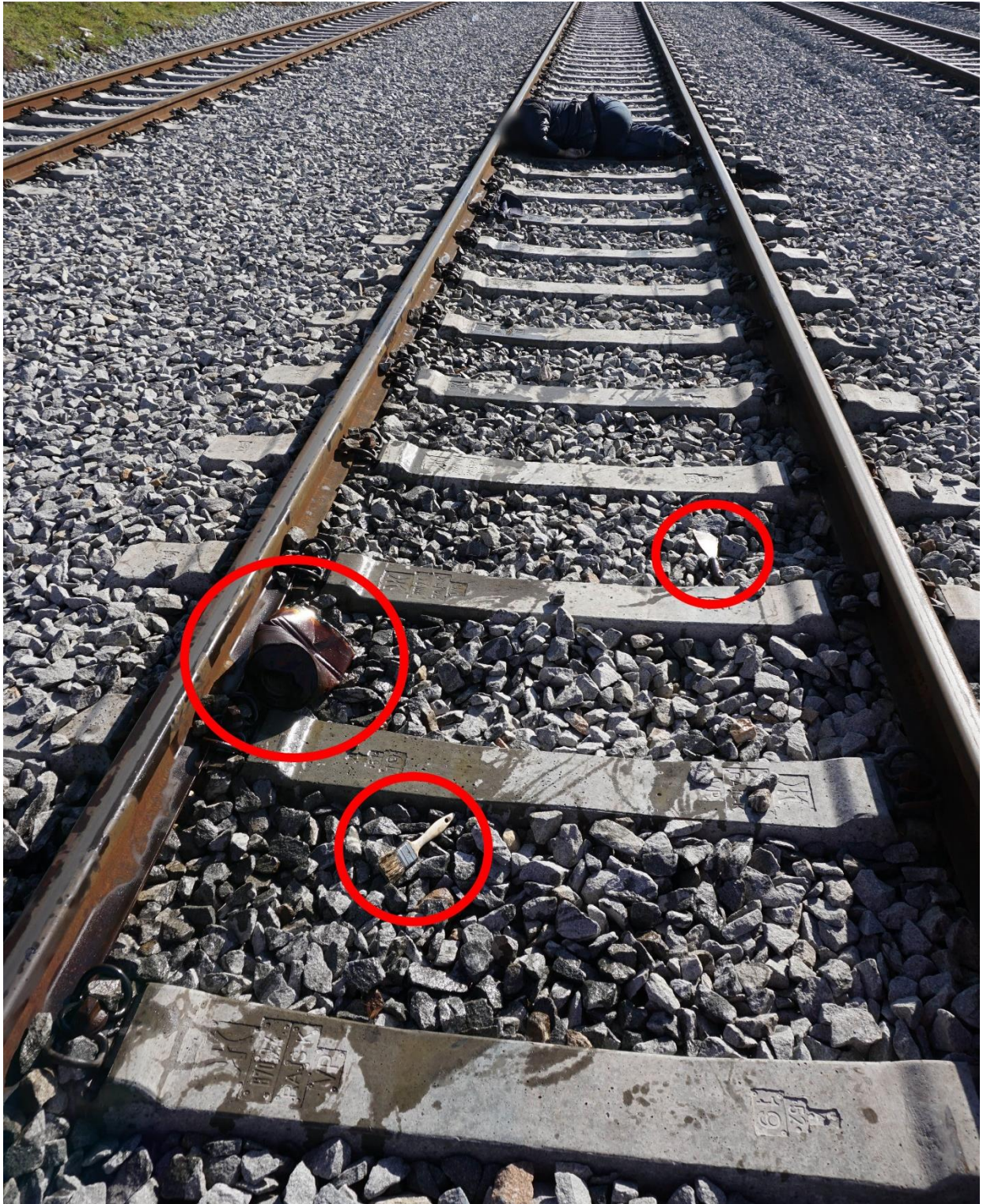


Figure 4.2.1.1: The position of the body of the auxiliary worker and the means he carried with him after the occurrence of a serious accident

The fatally injured auxiliary worker, apart from wearing the safety shoes, did not wear other protective equipment with reflective markings or a signal vest, which is contrary to Article 35 of the Law on Safety and Health at Work (“Official Gazette of RS” No. 101/2005, 91/2015 and 113/2017 - other law), the Risk Assessment Act for all work position in the work environment of “IŽS” a.d. No. 1/2016-4958 of 09.12.2016. and Fourth amendments to the Risk Assessment Act for all work position in the work environment of “IŽS” a.d. No. 4/2019-1848-431 of 04.12.2019. Attached to letter No. 1/2021-679 dated 06.04. 2021. “IŽS” a.d. Excerpt (no No. entered) was submitted on 27.01.2021. for the auxiliary worker of the station Mala Krsna with the stated protective equipment, which was signed by the applicant and the supervisory body, but it was not signed by the auxiliary worker, and based on the above it is not possible to state with certainty that the auxiliary worker indebted the mentioned protective equipment.

According to the valid Business Order of the Mala Krsna station, Part I, case No. 15/2019-68 from 21.01.2019., Sector for SP, “IŽS” a.d. (CHAPTER E - Provisions regarding the organization of other activities in the station, 8.1. Cleaning and maintenance of switches), in the station Mala Krsna switches are cleaned by employees of the ZOP Mala Krsna Section. According to the statement of the Head of the Mala Krsna station, the work of cleaning the switches before the start of the repair of the railway (until May 2019) was performed by shunters (which is contrary to the provisions of the said Business Order of the station Part I). According to the Orders of the Head of the Mala Krsna Station No. 1/2019 of 15.07.2019., No. 2/2019 from 05.09.2019. and No. 3/2020 from 06.10.2020., the work of cleaning the switches is performed by the switch staff. Considering that before being transferred to the Mala Krsna station, the fatally injured auxiliary worker worked as a switch cleaner, in addition to his regular duties at the Mala Krsna station, he also performed switches cleaning work on his own initiative.

4.2.2. Analysis of shunting composition movement

Based on the data registered on the speedometer of the locomotive 441-510, it can be stated that during the shunting drive of the pulled shunting composition when the serious accident occurred, the speed of the shunting composition was 16 km/h, which exceeds the speed of the shunting composition by 6 km/h (see section 3.4.4).

Also, the maximum allowed speed was exceeded in the area of Mala Krsna station during the drive of the locomotive 441-510 itself from the first station track in the direction of the switch block 1 and during the shunting locomotive 441-510 drive from the switch block 1 in the direction of the second station track.

4.2.3. Locomotive inspection and locomotive maintenance documentation

From the data on the maintenance of the locomotive 441-510 submitted by “Srbija Kargo” a.d. for the period from 16.01.2020. to 27.01.2021. (Attachment to the Letter “Srbija Kargo” a.d. No. 1/2021-1648 of 25.03.2021) it can be stated that six inspections P1, one inspection P6, two inspections P3 and one inspection P12 were performed, and the rest were extraordinary repairs.

Regarding the serious accident in question, regular maintenance of the railway vehicle (locomotive 441-510) in the period from 16.01.2020. until 27.01.2021. at certain intervals, was not performed in accordance with applicable regulations. The irregularity is reflected in the fact that in April, June and November 2020, according to records, no periodic inspection of the



locomotive was performed. This did not have an impact on the occurrence of the serious accident in question.

According to the data submitted by “Srbija Kargo” a.d. (Letter No. 1/2021-1648 of 25.03.2021), after the serious accident in question, no inspection of locomotive 441-510 was performed, which is contrary to Article 6, paragraph 1 under 5) of the Rulebook on maintenance of railway vehicles (“Official Gazette RS” No. 144/2020). There was no material damage to locomotive 441-510.

4.2.4. Inspection control

On-site inspection regarding the injury at work with a fatal outcome was performed by the Republic Inspector of Occupational Safety of the Ministry of Labour, Employment, Veterans and Social Affairs, Labour Inspectorate in Smederevo.

Pursuant to the Law on Investigation of Accidents in Air, Railway and Waterborne Traffic (“Official Gazette of RS” No. 66/15 and 83/18), CINS on two occasions, by Letter No. 340-01-1/2021-02-1-16 from 03.03.2021. and by Letter No. 340-01-1/2021-02-1-37 from 12.10.2021. addressed the Ministry of Labour, Employment, Veterans and Social Affairs, Labour Inspectorate in Smederevo with a request to submit:

- report on inspection supervision regarding work injury with fatal outcome,
- minutes of the hearing of the immediate participants and witnesses of this serious accident and
- data on inspection supervisions in “IŽS” a.d. and “Srbija Kargo” a.d. according to the prescribed deadlines for supervision, as well as information on the type of supervision in question.

Until the conclusion of this report, CINS did not receive a response from the Ministry of Labour, Employment, Veterans' Affairs and Social Affairs, Labour Inspection in Smederevo.

4.3. Conclusions on the serious accident causes

4.3.1. Direct and immediate causes of the serious accident

The direct and immediate cause of this serious accident is that the auxiliary worker, employed by the railway infrastructure manager “IŽS” a.d. was on the second track of Mala Krsna station at the time of the shunting composition arrival, which is contrary to Article 16, paragraph 1 under 1. and 18. of the Rulebook on special measures of protection at work in railway traffic (“Official Gazette of the SRS”, No. 19/85), thus creating a dangerous situation related to the occurrence of this serious accident.

4.3.2. Basic causes arising from skills, procedures and maintenance

Auxiliary worker employed by the railway infrastructure manager “IŽS” a.d. who headed to the switch block 2 of Mala Krsna station due to the cleaning of the counter rails at the level crossing (according to the statement of the Deputy Head of the Mala Krsna station), immediately before the shunting composition arrival, was moving along the second station track, within the



track, in the direction from the station facility to the switch block 2, even though he has been familiar, from his employer “IŽS” a.d. with the dangers from the railway vehicles in motion.

The pulled shunting composition (locomotive 441-510 and 6 (six) wagons of the Ea series) was moving on the second station track towards the switch block 2 (in the same direction as the fatally injured auxiliary worker). At the head of the shunting composition there were not the train driver (he drove the locomotive from the driver cab “A” which was not at the head of the pulled shunting composition, but next to the wagon in the shunting composition) and the shunter (he was not at the head of the locomotive but was on the locomotive step by the train driver), so that the observation of the driving path of the shunting composition was difficult, which could have contributed that the shunting staff on the pulled shunting composition not see the person who was on the track in the driving path of the shunting composition.

The external train dispatcher, who performed the duty of shunting operator during the execution of shunting drive by the pulled shunting composition, was not in a position from which he would be able to observe the entire route of the shunting composition. The external train dispatcher (shunting operator) was in front of the station facility all the time.

The speed of the pulled shunting composition was higher than the maximum allowed in the area of Mala Krsna station, which could have contributed to the shunting staff not timely spotting the auxiliary worker moving within the second track in the driving path the shunting composition, i.e., to the auxiliary worker moving inside the second track not noticing on time the shunting composition moving on the same track.

When moving within the second track, the auxiliary worker did not wear the appropriate equipment for safety at work, i.e., a signal vest or a work pilot suit with fluorescent tape, which could have contributed to not being noticed by the train driver and the shunter on the pulled shunting composition.

Reduced visibility due to the presence of fog at the time of occurrence of this serious accident has affected all participants in the serious accident in question to perform their duties in difficult circumstances.

4.3.3. The main causes of the serious accident deriving from conditions established by the legal framework and the safety management system application

N/A.

4.3.4. Additional remarks on the shortcomings and flaws identified during the investigation, but not relevant to the conclusions on the causes

N/A.

5. Measures taken

After the occurrence of the serious accident in question, “IŽS” a.d. ordered all Sections and OC for SP to include in the first regular teaching topics from the Shunting Instruction 42 (“Official Gazette ZJŽ” No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94) with special emphasis on Section IX Special precautions for shunting. The head of the Mala Krsna station issued Order No. 3/2021 of



21.02.2021. in which the obligations of the traffic staff at the Mala Krsna station when performing shunting work are prescribed in detail.

6. Safety recommendations

Aiming to improve safety on the railway line and to prevent occurrence of the new accidents, CINS has issued the following safety recommendations:

To the Directorate for Railways SR_01/22, SR_02/22, SR_03/22, SR_04/22 and SR_05/22 are issued:

- SR_01/22** “IŽS”a.d., to perform extraordinary training of station staff in terms of proper movement, in terms of danger from the railway vehicles in motion pursuant to Article 16, paragraph 1 under 1. and 18. of the Rulebook on special measures of protection at work in railway traffic (“Official Gazette of the SRS”, No. 19/85) (see points 3.3.4, 3.7. and 4.2.1.).
- SR_02/22** “IŽS”a.d., to perform extraordinary training of station staff regarding the use of protective equipment pursuant to Article 35 of the Law on Safety and Health at Work (“Official Gazette of RS” No. 101/2005, 91/2015 and 113/2017 - other law), Business Order of the Mala Krsna Station Part I, case No. 15/2019-68 of 21.01.2019., Sector for SP, “IŽS”a.d. (CHAPTER E - Provisions regarding the organization of other activities in the station, 8.1. Cleaning and maintenance of switches) and the Risk Assessment Act for all workplaces in the work environment of “IŽS”a.d. No. 1/2016-4958 of 09.12.2016. (see points 3.3.2, 3.3.8, 3.3.9, 3.3.10. and 4.2.1.).
- SR_03/22** “IŽS”a.d., to perform extraordinary training of the shunting unit (shunting operator and shunter) in terms of proper performance of shunting work, with special emphasis on the position of the shunter and shunting operator upon driving a shunting composition, pursuant to Articles 23, 116 and 117 of the Shunting Instruction 42 (“Official Gazette of ZJŽ” No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94) (see points 3.3.5, 4.1. and 4.2.1.).
- SR_04/22** “IŽS”a.d., to perform extraordinary training of staff (shunting operators) regarding the issuance of orders for the formation of shunting drive routes, pursuant to Article 107 of the Shunting Instruction 42 (“Official Gazette of ZJŽ” No. 3/80, 6/83, 3/87, 4/88, 6/91 and 2/94) (see points 3.3.5 and 3.5.2).
- SR_05/22** “Srbija Kargo”a.d., to perform extraordinary training of traction vehicle staff regarding the possession of the driver's cab in accordance with Article 30, item 3 of the Traffic Instruction 40 (“Official Gazette of ZJŽ”, No. 6/80, 3/82, 6/83, 2/84, 4/88, 8/88, 9/90, 2/91, 2/94 and 2/01) and Article 121 of the Shunting Instruction 42 (“Official Gazette of ZJŽ” No. 3/80, 6/83, 3/87, 4/88, 6/91 и 2/94) (see points 3.3.5, 3.3.6, 4.1 and 4.2.1.).