



REPUBLIC OF SLOVENIA

MINISTRY OF TRANSPORT

RAILWAY ACCIDENT AND INCIDENT INVESTIGATION DIVISION

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FINAL INVESTIGATION REPORT INTO A RAILWAY ACCIDENT – THE COLLISION OF MAINTENANCE TRAIN NO. 90433 WITH TMD-44 MOTORISED RAIL VEHICLE (DRAISINE) ON THE CLOSED GROSUPLJE – KOČEVJE RAILWAY LINE



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1 SUMMARY

On 11 March 2009 at 14:04, there was a head-on collision involving maintenance train no. 90433 and motorised rail vehicle (draisine) TMD-44 on the closed, single-track Grosuplje – Kočevje railway line.

Maintenance train no. 90433 was travelling from the direction of Grosuplje towards a working site located on a closed railway line, while motorised rail vehicle (draisine) TMD-44 was travelling from the direction of the working site in front of the Dobropolje station towards the Grosuplje station. The maintenance train and the motorised rail vehicle (draisine) collided on the closed, single-track Grosuplje-Kočevje railway line, at km 3+480. The train and the rail vehicle collided at approximately the middle of the second left-hand curve of three bends, viewed from the direction of Grosuplje; given the shape of the land through which the railway passes, the first and the third left-hand curves are not at all clearly visible. The railway line was constructed at the foot of a hill rising, at the site of the collision, above the railway line at an angle of approximately 30°. The first right-hand curve preceding the site of the collision – viewed from the beginning towards the end of the railway line – from the direction of Grosuplje towards Kočevje, which is also the travelling direction of the maintenance train, has a radius of R-252 m, while the next left-hand curve the approximate middle of which is the site of the collision of the maintenance train and the rail vehicle, has a radius of R-209 m, and the next, third right-hand curve from which the motorised rail vehicle (draisine) was travelling, has a radius of R-221m. Because of the curves with such a small radius and on account of vegetation – the railway line passes through a wooded area in this section – the respective crews in the maintenance train and in the motorised rail vehicle (draisine) noticed the vehicle travelling from the opposite direction only moments before colliding.

On account of reconstruction in the second stage, the closure of the Grosuplje – Kočevje railway line was scheduled from 08:00 on 9 March 2009, and until 15:00 on 9 July 2009.

Maintenance train no. 90433 consisted of 4 Eamos wagons loaded with gravel.



Figure no. 1: Blue arrow indicating the travelling direction of the maintenance train, red arrow indicating the travelling direction of the motorised rail vehicle (draisine)

The direct cause of the accident is the movement of the motorised rail vehicle (draisine) from the working site located on the closed railway line in front of the Dobropolje station, without being authorised to do so by the traffic controller of the Grosuplje station, as laid down in Article 189 of the Traffic Rules.

The indirect causes of the collision are the following:

- The unscheduled movement of the maintenance train towards a specific location onto the open railway line, not defined in the Station Rules and in the instruction for the railway line as laid down by paragraph 3 of Article 183 of the Traffic Rules;
- maximum permitted speed of the motorised rail vehicle (draisine) exceeded by 12 km/h;
- the driver of the TMD-44 motorised rail vehicle (draisine) not having been informed of the maintenance train's movement along the closed line.

Recommendations:

In order to avoid similar accidents on closed railway lines and tracks in the future, we recommend:

- amendment to the second paragraph of Article 96 of the Traffic Rules published in Uradni list RS, No. 123, of 28 December 2007, adding a new fundamental task for the traffic management staff organising train traffic in the times of scheduled and unscheduled closures of railway lines and tracks;
- amendment to Article 169 of the Traffic Rules published in Uradni list RS, No. 123, of 28 December 2007, with the wording to lay down in detail the content of the written request for the railway line or track to be closed, to be submitted by the works contractor to the traffic management staff, as well as the contents of the closure order for a railway line or a track, to be issued by the traffic management staff in compliance with paragraph 5 of the same article.
- harmonisation of the provision under paragraph 1 of Article 189 of the Traffic Rules published in Uradni list RS, No. 123, of 28 December 2007, stipulating, inter alia, the obligation of the driver of the motorised rail vehicle (draisine) to obtain, prior to each movement, the permission that applies only to a specific track, a specific railway line and a specific direction, with a prepared wording of section III of the P-15 Pass for motorised rail vehicle (draisine) movements” P-15, which, under item 3, enables entry of permission: “Up to km:towards the station:and **return**,” which can be interpreted as permission covering also the return to the station of departure, which is not in compliance with the provisions under paragraph 1 of Article 189 of the Traffic Rules;
- amendment to the provisions of Article 183 of the Traffic Rules published in Uradni list RS, No. 123, of 28 December 2007, by adding precisely defined conditions for the dispatch of rail vehicles to a specific location on an open railway line or track, and conditions for withdrawing these vehicles from the railway line or track in cases when other vehicles (a rail vehicle or a maintenance train) are located ahead of them);
- amendment to the provisions under Article 186 of the Traffic Rules published in Uradni list RS, No. 123, of 28 December 2007, where it is necessary to add a more detailed description of conditions for the movement of the maintenance train to a closed railway line or track in cases when other vehicles (rail vehicle or another maintenance train) are positioned on such a railway line or track.
- amendment to Article 189 of the Traffic Rules published in Uradni list RS, No. 123, dated 28 December 2007, by adding provisions specifying in detail the manner of communication between traffic controllers, drivers of rail vehicles and train managers of maintenance trains in cases of movements on a closed railway line or track and relating to the provision of information to the crews of these vehicles about other vehicles (rail vehicles or maintenance trains) about to be dispatched to the closed railway line or track - a fact of which they have not been informed by means of the “P-15 Pass for the rail vehicle movement” or the “P-13 train movement order”, before their departure to the closed railway line or track.

1.1. Copies of the Accident Report with Recommendations to:

Slovenske železnice, d.o.o.
Kolodvorska 11
1506 Ljubljana

SŽ – Železniško gradbeno podjetje Ljubljana d.d.
Ob zeleni jami 2
1000 Ljubljana

Republic of Slovenia
Ministry of Transport
Minister, Dr Patrick Vlačič
Langusova, 4
1000 Ljubljana

Agencija za železniški promet RS (The Public Agency for Rail Transport of the Republic of Slovenia)
Kopitarjeva 5
2000 Maribor

Ministry of the Interior
Police
Police Directorate Ljubljana
Criminal Investigation Police Division
Prešernova cesta 18, p.p. 647
1001 Ljubljana

ERA – European Railway Agency
120 rue Marc Lefrancq
BP 20392
F-59307 VALENCIENNES Cedex

2 IMMEDIATE FACTS OF THE OCCURRENCE

On 11 March 2009, two maintenance trains were travelling from the Grosuplje station onto the closed track towards the Dobropolje station. The first one pulled off from the Grosuplje station at 12:25, and returned from the closed line at 13:40. The second maintenance train set off at 14:01 and collided, at 14:01 and at km 3+483, with the TMD – 44 motorised rail vehicle (draisine) travelling from the opposite direction.

The Grosuplje station traffic controller recorded in the P-14 traffic logbook the movements of both maintenance trains as one, departing the Grosuplje station at 12:25; no record was made of the arrival on return of the first part, and of the departure of the second part. The traffic controller did not record in the P-14 traffic logbook the second part of the maintenance train departing at 14:01. Both trains were dispatched with the same number, 90433. The accompanying documents were submitted to the train staff by the Grosuplje station traffic controller only for the first part of train 90433 that pulled off onto the closed track at 12:25 and returned to the Grosuplje station at 13:40.

It is stated under the heading entitled “Other Vehicles” in the “P-15 Pass for the rail vehicle movements” submitted to the staff of the TMD-44 motorised rail vehicle (draisine) by the Grosuplje station traffic controller that behind this rail vehicle, the TMD-43 motorised rail vehicle (draisine) was located at km 14+100. The traffic controller did not inform the driver of the TMD-44 motorised rail vehicle (draisine) of the movement of the maintenance train.

The movement of the TMD-44 motorised rail vehicle (draisine) from the working site at km 14+500 towards the Grosuplje station was not agreed between the Grosuplje station traffic controller and the driver of the motorised rail vehicle (draisine).

The driver of the TMD-44 motorised rail vehicle (draisine) did not inform the Grosuplje station traffic controller of the intended movement from the working site at km 14+500 towards the Grosuplje station that had started at 13:42. The Grosuplje station traffic controller did not allow the driver of the TMD-44 motorised rail vehicle (draisine) to drive from the working site at km 14+500 towards the Grosuplje station.

On 11 March 2009, there was no daily plan elaborated of movements of rail vehicles and maintenance trains which the Grosuplje station traffic controller should receive from the works managers on 10 March 2009, as stipulated in Order No. 3 of 2 March 2009 issued by the station staff by the manager of the Grosuplje supervisory station. The movements of the maintenance trains were discussed orally by the Grosuplje station traffic controller and the works manager, immediately preceding the train’s arrival at the station on 11 March 2009.

2.1 Date, exact time and location of the occurrence

The incident – collision of maintenance train no. 90433 with the TMD-44 motorised rail vehicle (draisine) on the closed track of the single-track Grosuplje-Kočevje railway line at km 3+480 in during the major reconstruction works – occurred on 11 March 2009 at 14:05.

2.2 Description of the events and the accident site

On 11 March 2009 at 14:01, maintenance train no. 90433, consisting of a diesel locomotive of the 644-008 Series and four Eammo-s wagons loaded with gravel, pulled off from the Grosuplje station onto the closed track towards the Dobropolje station. The Grosuplje station traffic controller allowed the movement up to km 9+000, after previous agreement with the works manager, train managers and locomotive drivers.

The TMD-44 motorised rail vehicle (draisine) with attached – and included in the primary air pipe for the train air brake – two wagons of the Kgs Series loaded with manufactured tracks, started to move from the working site at km 14+500 towards the Grosuplje station at 13:41. The driver of the motorised rail vehicle (draisine) did not obtain permission to travel from the Grosuplje station traffic controller.

At km 3+480, maintenance train no. 90433 collided, at 14:05, with the oncoming TMD-44 motorised rail vehicle (draisine) that was returning to the Grosuplje station after loading tracks at the working site.

The speed of the maintenance train was 30 km/h at the time of the collision, and the speed of the TMD-44 motorised rail vehicle (draisine) 34 km/h. On account of the ratio of forces that emerged in connection with the weight and speed of the maintenance train and the motorised rail vehicle (draisine) respectively, the maintenance train was pushing the motorised rail vehicle (draisine) forward for a length of approximately 16 m. The weight of the maintenance train with all wagons and locomotive amounted to 410 tonnes, the weight of the MTD-44 motorised rail vehicle (draisine) with two loaded Kgs with wagons amounted to 88 tonnes.

Damage occurred in the collision on the maintenance train locomotive, TMD-44 motorised rail vehicle (draisine) and both Kgs-z wagons. The maintenance train locomotive of the 644-008 series sustained heavy damage to its front, as did individual elements of the diesel engine. During the collision, the TMD-44 motorised rail vehicle (draisine) derailed with the second axle in the travelling direction; the vehicle was completely destroyed, the cab lost shape, longitudinal carriers bent, the loading surface lost shape and there were several motor oil and hydraulic oil leaks. The first wagon Kgs-z placed immediately behind the motorised rail vehicle (draisine) derailed with its first axle in the travelling direction. The wagon was greatly damaged; its front got raised onto the TMD-44 loading space. The second Kgs-z wagon's loading area is damaged as well as its front and sides.

2.3 The body that established the investigation

The investigation procedure was launched by the Railway Accident and Incident Investigation Division of the Ministry of Transport of the Republic of Slovenia, the Criminal Police Division of the Police Directorate Ljubljana and by Slovenske železnice, d.o.o.

The investigation procedures were conducted separately.

2.4 The decision to establish an investigation, the composition of the team of investigators and the conduct of the investigation

The Railway Accident and Incident Investigation Division of the Ministry of Transport of the Republic of Slovenia launched an investigation into this accident in order to establish all its direct and indirect causes with a view to arriving at relevant information to improve safety during the movements of motorised rail vehicles and maintenance trains to a specific location on the railway line during the closure of a railway line or track.

The Chief Investigator of the Ministry of Transport of the Republic of Slovenia conducted the investigation, and brought it to a close himself.

Slovenske železnice, d.o.o. conducted its investigation through an investigation commission.

The Criminal Police Division Ljubljana conducted the investigation in compliance with the Criminal Procedure Act.

2.5 The background to the occurrence

The scheduled closure of the railway line between the Grosuplje and the Kočevje stations, the second stage of the railway line reconstruction on the Grosuplje – Dobropolje section was – at the time of the accident on 11 March 2009 – being carried out in accordance with the Order for the closure of railway line no. 066 dated 26 February 2009, issued by Prometna operativa Ljubljana, Sekcija za vodenje prometa Ljubljana, Slovenske železnice.

The contractor indicated in the Order for the closure of track 66 is SŽ – Železniško gradbeno podjetje d.d.. Also indicated is the works manager, a construction technician by profession, of SŽ – Železniško gradbeno podjetje d.d.

Indicated as the works manager in charge of the works is the head of supervision of the Grosuplje railway lines, Sekcija za vzdrževanje prog Ljubljana, Slovenske železnice d.o.o..

On 11 March 2009 at 07.15, the Grosuplje station traffic controller dispatched the motorised rail vehicle (draisine) TMD-44 to the closed railway line with permission to 14+500; at 7:30, he dispatched the motorised rail vehicle (draisine) TMD – 43 after it, with permission to 14+100. The motorised rail vehicle (draisine) TMD – 43, which had been dispatched to the closed railway line at 07.30, withdrew from the railway line into the Grosuplje station at 13.55. The Grosuplje station traffic controller did not record the voice message of the arrangement to withdraw the motorised rail vehicle (draisine) TMD – 43 in the P-14 traffic logbook.

To meet the needs and at the request of the contractor, the movement of maintenance train no. 90433/90430 was announced on 6 March 2009 for 11 March 2009, with telegram no. 614 f – correction of telegram no. 607 f.

The maintenance train had to be split into two parts at the Grosuplje station because of the technical characteristics of unloading the wagons that had arrived loaded with stone chipping; each part was then dispatched separately to the unloading site.

The first part of the maintenance train with no. 90433 was dispatched at 12.25 – 5 loaded wagons permitted to move to up to km 9+000, as indicated in the “P-13 Order for train movement”.

At the request of the train manager and after consent given by the Grosuplje station traffic controller, the first part of the maintenance train returned to the Grosuplje station after it had unloaded the gravel; empty wagons were removed, the remaining 4 loaded wagons were attached and the maintenance train then waited for TMD – 43 to arrive. At the request of the train manager and after consent given by the traffic controller, TMD – 43 arrived at the Grosuplje station at 13.55.

On arrival of the TMD – 43 at the Grosuplje station, the second part of the maintenance train with the same no. 90433 was dispatched to the closed track up to km 9+000 at 13.57, with the “P-13 Order for train movement” submitted by the traffic controller to the train manager for the movement of the first part despite the fact that the situation on the railway line changed because the TMD – 43 had already withdrawn into the Grosuplje station.

The Grosuplje station traffic controller did not record the movement of the maintenance train’s second part in the “P-14 Traffic logbook”.

The driver of the TMD – 44 motorised rail vehicle (draisine) was not informed of the maintenance train movements on the closed track.

During the movement of the maintenance train, the train manager sitting in the locomotive driver’s cab, spotted the TMD – motorised rail vehicle (draisine) travelling from the opposite direction and immediately warned the locomotive driver who applied the high-speed brakes.

Despite active braking, maintenance train no. 90433 collided with the TMD – 44 motorised rail vehicle (draisine) travelling from the opposite direction at 14.05, at km 3+480.

The maintenance train speed was 30 km/h at the moment of the impact, which is evident from the analysis of the travelling speed record.

It is evident from the technical analysis of the record sheet that the travelling speed of the TMD – 44 between 13:45 and 14:04 was a constant 42 km/h; at the moment of the impact it dropped to 34 km/h on account of the activated brake.

The crews of the maintenance train and of the TMD – 44 motorised rail vehicle (draisine) was informed in writing of the maximum permitted speed, which 30 km/h as prescribed in the Traffic Rules.

The works manager in charge, head of nadzorništva proge Grosuplje, Sekcija za vzdrževanje prog Ljubljana, Slovenske železnice d.o.o., was not present at the site during the investigation at the scene of the accident.

2.5.1 Staff involved

The following persons were involved in the event:

- driver of the motorised rail vehicle (draisine) TMD – 44, SŽ – Železniško gradbeno podjetje Ljubljana d.d., Ob zeleni jami 2, Ljubljana;
- attendant in the motorised rail vehicle (draisine) TMD – 44, SŽ – Železniško gradbeno podjetje Ljubljana d.d., Ob zeleni jami 2, Ljubljana;

- locomotive driver of maintenance train no. 90433, Sekcija za vleko Ljubljana, Slovenske železnice d.o.o.;
- locomotive driver assistant in maintenance train no. 90433, Sekcija za vleko Ljubljana, Slovenske železnice d.o.o.;
- train manager of maintenance train no. 90433, Sekcija za tovorni promet Ljubljana, Slovenske železnice d.o.o.;
- shunter of train no. 90433, Sekcija za tovorni promet Ljubljana, Slovenske železnice d.o.o.;
- Grosuplje station traffic controller, Sekcija za vodenje prometa Ljubljana, Slovenske železnice d.o.o.;
- works manager in charge – head of nadzorništva proge Grosuplje, Sekcija za vzdrževanje prog Ljubljana, Slovenske železnice d.o.o.;
- works manager, SŽ – Železniško gradbeno podjetje Ljubljana d.d.;

All the above employees have passed the required professional qualifying examinations. They were physically and mentally fit for carrying out their work. They had had the statutory rest breaks between the working shifts involved.

2.5.2 The trains and their composition, including the registration numbers of the items of rolling stock involved

Maintenance train no. 90433 consisted of locomotive no. 9479 2 644-008-4 and 4 wagons of the series Eamos-z, placed from the front towards the back as follows: nos 31795940000-1, 31795940002-7, 31795940006-8 in 31795940003-5. The wagons were loaded with gravel. The freight on individual wagon amounted to approximately 48.500 t. The total weight of the train was 410 t, of which the locomotive 90 t and wagons together with freight 320 t. The total length of the train wagons was 52 m, the total number of axles was 16. The length of the diesel locomotive of the 644-008 series is 16.8 m and has 6 axles.

There were two wagons of the Kgs-z series attached to the motorised rail vehicle (draisine) TMD – 44, first no. 21793329066-0, and behind it no. 21793329154-4. Both wagons were loaded with old assembled tracks marked UIC-49. The cargo of tracks on each wagon weighed approximately 22 t. The total weight of the TMD – 44 and two loaded Kgs-z wagons was 88 t. The total length of the motorised rail vehicle (draisine) and the two Kgs-z wagons was 37.72 m. There were 4 axles in total in the two wagons, and two axles in the motorised rail vehicle (draisine) TMD – 44.

2.5.3 The description of the infrastructure and signalling system – track types, switches, interlocking, signals, train protection

At the time of the accident, no signalling and safety devices were in operation on the Grosuplje – Kočevje line since the line was closed due to reconstruction and the devices had been installed anew during reconstruction. The maintenance trains and the motorised rail vehicles (draisines) were travelling along the line with permission having been given by the Grosuplje station traffic controller at the request of the contractor's works manager.

The maintenance trains and the motorised rail vehicles (draisines) entered the Grosuplje station by permission given by the Grosuplje station traffic controller, communicated to the train managers of the maintenance trains or of the motorised rail vehicles (draisines) by phone at the telephone set situated ahead of the "C" entry signal of the Grosuplje station at km 0+800.

Tracks of the UIC-49 type are fitted into the line from the Grosuplje station to the working site at km 14.500. The width of the line is 1435 mm.

The movements of maintenance trains and motorised rail vehicles (draisines) on a closed track are managed solely by the Grosuplje station traffic controller in cooperation with the drivers of the motorised rail vehicles (draisines) and train managers of the maintenance trains.

2.5.4 Means of communication

The diesel locomotive of the 644-008 series and the motorised rail vehicle (draisine) TMD – 44 are not equipped with telecommunication devices.

Reconstruction was under way between the Grosuplje station and the Dobropolje station at the time of the accident. At the time of reconstruction, the communication means were already in place at communication points.

2.5.5 Works carried out at or in the vicinity of the site

At the time of the accident, there were no building works in progress at the site of the accident or in its vicinity. Building works were in progress at several sites of the closed railway line since the entire area from the Grosuplje station to the Dobropolje station was regarded as a building site.

2.5.6 Trigger of the railway emergency plan and its chain of events

The Grosuplje station traffic controller immediately notified the regional notification centre of the accident after he had been informed by the maintenance train manager of the consequences of the collision between the maintenance train and the motorised rail vehicle (draisine). A police patrol was dispatched from the Grosuplje police station to the site of the accident, as well as two officers of the Criminal Police Division of the Police Directorate Ljubljana who inspected the site and documented the situation after the accident.

2.5.7 Trigger of the emergency plan of the public rescue services, the police and the medical services and its chain of events

After the message communicated by the maintenance train manager, the plan of emergency response measures was triggered. An ambulance arrived at the site of the accident to take the injured locomotive driver and attendant of the motorised rail vehicle (draisine) TMD – 44 for treatment to the University Medical Centre Ljubljana.

A professional fire brigade of PGD Ljubljana, the Professional Fire Brigade's Association, was dispatched to the site of the accident. The firemen and the locomotive driver of the maintenance vehicle inspected the vehicles and protected them against fire, if any. Collecting containers were placed under spots leaking dangerous liquids, fuels and lubricants.

2.6 Fatalities, injuries and material damage

The driver of the motorised rail vehicle (draisine) TMD – 44 suffered severe injuries in the accident since he jumped from the vehicle immediately before the collision; the attendant of the TMD - 44 motorised rail vehicle (draisine), however, suffered minor injuries.

Damage was caused to the locomotive of the maintenance train, the TMD – 44 motorised rail vehicle (draisine) and both Kgs-z wagons. The front of the maintenance train locomotive of the 644-008 was badly damaged as well as individual elements of the diesel engine. The motorised rail vehicle (draisine) TMD – 44 derailed during the collision with its second axle facing the travelling direction; the vehicle is totally wrecked, the driver's cab lost its shape, longitudinal carriers are bent, the loading surface lost its form, motor oil and hydraulic oil are leaking from the vehicle at several spots. The first Kgs-z wagon placed immediately behind the motorised rail vehicle (draisine) derailed with the first axle facing the travelling direction and shows extensive damage; during the collision its front was raised onto the loading space of the TMD-44 motorised rail vehicle (draisine). The second Kgs-z wagon's loading space as well as its front and sides are damaged.

2.7 External circumstances

Weather conditions at the time the accident occurred: Cloudy, +5 °C, good visibility. Tracks were dry and clean, enabling a good grip.

3 RECORD OF INVESTIGATIONS AND INQUIRIES

On 11 March 2009 immediately after the accident at 15:05 the Chief Investigator of Railway Accidents and Incidents of the Ministry of Transport inspected the scene of the accident.

Incident notification no. 06/2009 from Slovenske železnice d.o.o., Sekcija za vodenje prometa Ljubljana, Nadzorna postaja Grosuplje, dated 12 March 2009, was received.

On 16 March 2009, the chief investigator of the Criminal Police Division, Police Directorate Ljubljana, received the speedometer tape of train no. 90433 and TMD-44 motorised rail vehicle (draisine) to be analysed.

On 28 May 2009, the Chief Investigator of Railway Accidents and Incidents of the Ministry of Transport again inspected the scene of the accident and the means of communications.

The following materials were acquired: investigation material of SŽ – Železniško gradbeno podjetje Ljubljana d.d., no. 1.3.-813/09 – MČ dated 30 March 2009 (P -7 Emergency Report written by the driver of the TMD-44 motorised rail vehicle (draisine), no. 31/87 dated 11 March 2009, Certificate of passed qualifying exam for the driver of motorised rail vehicle (draisine) TMD-44 no. 31/87 dated 13 April 2009; Ž-9 Overview of passed periodic exams for the driver and the attendant of motorised rail vehicle (draisine) TMD-44; Minutes on the regular periodic exam for the driver and the attendant of motorised rail vehicle (draisine) TMD-44 no. 1.2.3.-4589/07 dated 6 December 2007; Certificate of competence no. 8002/80 for the driver attendant of motorised rail vehicle (draisine) TMD-44; Ž-9 Overview of passed periodic exams for the driver attendant of motorised rail vehicle (draisine) TMD-44; Engine report of the driver of motorised rail vehicle (draisine) TMD-44 dated 10 March 2009; Test results of periodic – extraordinary medical exam for the driver of motorised rail vehicle (draisine) TMD-44 no. 1779 dated 18 March 2008; Test results of periodic – extraordinary medical exam for the driver attendant of motorised rail vehicle (draisine) TMD-44 no. 6307 dated 25 November 2008; Record of the questioning of the driver of motorised rail vehicle (draisine) TMD-44 dated 30 March 2009).

The following investigation materials were obtained from Slovenske železnice d.o.o., Služba za notranji nadzor no. 1.0.4./11-888/09 PZ dated 15 April 2009 (P-7 Emergency report written by the Grosuplje station traffic controller, dated 11 March 2009; Information on the collision of the maintenance train and the motorised rail vehicle (draisine), letter no. 1.0.4/01-594/09 JK dated 16 March 2009; Report written by the locomotive driver of maintenance train no. 90433, EV-49 no. 0402, Sekcija za vleko Ljubljana, Delovne enote Novo mesto; Minutes on breathalyzer testing of the traffic controller dated 11 March 2009; P-15 Passes for motorised rail vehicle (draisine) (draisine) movements, no. 17 for motorised rail vehicle (draisine) TMD-43 and no. 18 for motorised rail vehicle (draisine) TMD-44 dated 11 March 2009; Order for the movement of train no. 90433/90432 (P-13) dated 11 March 2009; P-14 Traffic logbook of the Grosuplje station for 11 March 2009; Order no. 3/09 of the head of the Grosuplje supervisory station dated 2 March 2009; Order for the closure of track no. 066-PO Ljubljana dated 26 February 2009; Reports on the composition and application of brakes for train no. 90431 (P-63) nos 39 and 40 dated 11 March 2009; Records of the hearing of employees as parties/witnesses in the proceedings in respect of the following employees: Head of track supervision Grosuplje, Sekcija za vzdrževanje proge Ljubljana, traffic controller and pointsman of the Grosuplje station, Sekcija za vodenje prometa Ljubljana; train manager of train no. 90433, Sekcija za tovorni promet Ljubljana; locomotive driver and locomotive driver assistant of train no. 90433, Sekcija za vleko Ljubljana; driver and driver attendant of motorised rail vehicle (draisine) TMD-44. SŽ-Železniško gradbeno podjetje Ljubljana d.d.; building site manager, SŽ-Železniško gradbeno podjetje Ljubljana d.d.; construction overseer, SŽ-Železniško gradbeno podjetje Ljubljana d.d.; Building III manager, SŽ-Železniško gradbeno podjetje Ljubljana d.d.).

During a repeated inspection of the scene of the accident on 28 May 2009, additional investigation materials were obtained from Slovenske železnice d.o.o., Grosuplje station (Request for closure of the railway line – amendment to Order no. 066, no. 2.2.5-1031-2009/MG dated 30 March 2009; Second amendment to Order No. 066, telegram no. 2.1.4. – 3017f/2009-3- PB, dated 30 March 2009; Second amendment to Order no. 066, no. 197/2009 dated 1 April 2006; Explanatory note to letter no. 197 of the head of NP Grosuplje no. 2.1.4. – 251-3.IR dated 2 April 2009).

A Commission report on incident investigation no. 6/2009 from Slovenske železnice d.o.o., Sekcija za vodenje prometa Ljubljana (Ljubljana Traffic Management System), dated 5 May 2009, was received.

An analysis of the speedometer tape – taken from the locomotive of the 644-008 series on 11 March 2009 – was made for train no. 90433 on 16 March 2009.

A technical analysis of the record sheet taken from the MTD-44 motorised rail vehicle (draisine) on 11 March 2009 was received on 20 March 2009.

3.1 Summary of testimonies

The works manager in charge – head of supervision of SVP Ljubljana said he did not wish to plead his case and sign the minutes.

The driver of the TMD-44 motorised rail vehicle (draisine) (draisine), SŽ ŽGP Ljubljana said that, after integrity check, the motorised rail vehicle (draisine) (draisine) had been dispatched from the Grosuplje station by means of the pass. He was informed by the Grosuplje station traffic controller that the motorised rail vehicle (draisine) operated by him would be followed by motorised rail vehicle (draisine) TMD-43. He also said that there was no train in the schedule presented to him by the traffic controller. On arriving, at around 07:50, at the work site specified in the transit pass, motorised rail vehicle (draisine) TMD-44 stood idle until 13:42. The wagon is being loaded until the above time. He was informed by the manager that motorised rail vehicle (draisine) TMD-43 positioned at km 14.100 would be withdrawn into the Grosuplje station and would, after the removal of the trailer, continue its journey towards Ljubljana. At 13.30, motorised rail vehicle (draisine) TMD-43 set off in the direction of Grosuplje. He arranged with the driver of the TMD-43 motorised rail vehicle (draisine) to be informed if there were to be any stopping along the railway line; since no such information was given, he continued the journey towards the Grosuplje station at his own discretion. During the journey, he safeguarded the level crossing and continued his journey. At the turning at km 3.483, he crashed into the oncoming maintenance train. He had not been informed of the movement of the maintenance train.

It is stated in the Records of the hearing of employee – building site manager, SŽ-ŽGP Ljubljana d.d., that the building site management planned, together with the traffic staff of Nadzorna postaja Grosuplje, the movement of the maintenance train to take place in two parts on account of the features of the traction locomotive. In agreement with the building site management and the traffic staff of the Grosuplje station, the second part of the maintenance train was dispatched to km 9+000. The building site manager emphasises that the driver of the TMD-44 had no permission given by the building site management to start moving from km 14+400. He also explains that a coordinator of the movements of the motorised rail vehicles (draisines) and the maintenance train was neither envisaged nor designated by the traffic staff.

The construction overseer in charge of picking and loading assembled tracks onto two wagons attached to the TMD-44, at 15+400 km, mentioned by the driver of motorised rail vehicle (draisine) TMD-44 in his statement, indicates in his statement that the driver of motorised rail vehicle (draisine) TMD-44 had been informed that motorised rail vehicle (draisine) TMD-43, which had left the building site at 13:00, would withdraw into the Grosuplje station. He then

went on to explain that the driver of the TMD-44, at 13:45 – immediately on being informed that the work intended for the TMD-44 had been completed at the building site – most certainly must have started the motorised rail vehicle (draisine) and drove off the building site. At 14.05 he was informed of the collision of the motorised rail vehicle (draisine) with the maintenance train by the assistant driver of the TMD-44 motorised rail vehicle (draisine). He had not been informed of the maintenance train movement.

The train manager of the maintenance train of Sekcija za tovorni promet Ljubljana indicated in his statement that he had been informed before the dispatch of the maintenance train of the movement of maintenance train no. 90433 in two parts to km 9+000. Before the dispatch of the first part of the maintenance train, he tested the brakes, wrote a report on the train composition and braking, and hand it over to the locomotive driver against signature. The train was dispatched to km 9+000. After the stone chipping was unloaded and the traffic controller's consent received, the train withdrew to the Grosuplje station. While waiting after the completed movement of the first part of the train, he was informed by the traffic controller that the second part of the train movement would be permitted to the same km and would carry the same number. On completed composition of the train, a total braking check was made, issued was a train composition and braking report which was handed over to the locomotive driver against signature. The train was then dispatched. He monitored the train movement in the locomotive cabin and while scanning the railway line, he noticed the oncoming motorised rail vehicle (draisine) at km 3,480 and immediately jumped from the locomotive whereupon the train collided with the motorised rail vehicle (draisine).

The driver of maintenance train no. 90433 says that the Grosuplje station traffic controller informed him of the departure of the train's second part after the crossing of TMD-43 motorised rail vehicle (draisine) at the Grosuplje station. After the entry of the motorised rail vehicle (draisine) the route was set, I received the go-ahead and the train pulled off. The maximum permitted train speed was 30 km/h and it was not exceeded. At km 3+400, the locomotive driver assistant activated the high-speed brake at his side and at that moment I caught sight of the oncoming motorised rail vehicle (draisine) and applied the high-speed brake myself, too. The maintenance train and the TMD motorised rail vehicle (draisine) collided immediately afterwards.

The assistant locomotive driver said that after leaving the Grosuplje station, the train was travelling in a normal fashion, at 30 km/h as it had been stipulated in the train movement order. On reaching km 3+400 I caught sight of the oncoming motorised rail vehicle (draisine) and immediately applied the high-speed brake. The train crashed into the motorised rail vehicle (draisine) and stopped.

The Grosuplje station traffic controller said that arrangements had been made as early as in the morning that the maintenance train would, on account of excessive weight, be divided into two parts. The maintenance train locomotive driver and the train manager both agreed with the above.

I recorded the departure of the first part of the maintenance train into the Traffic logbook, but not the arrival since the maintenance train was returning to the closed track under the same number. I gave oral permission for the second part of the maintenance train to travel. The pointsman was informed of all the movements by phone; since he was very busy, he did not, however, succeed in recording all voice messages. I did not make a separate entry in the Traffic logbook for the second part of the maintenance train since it was part of the same train. The TMD-43 requested permission by phone to withdraw to the station. I did not give permission for the withdrawal of TMD-44 from km 14+500 because nobody had asked me to grant permission. I did not inform the driver of the TMD-44 motorised rail vehicle (draisine) of the movement of the maintenance train; the works manager was informed, however, since

he asked me to authorise the movement of the maintenance train. I discussed the movements to the closed track with the works manager.

The pointsman of the Grosuplje station stated that he had received the order to set up the entrance route for maintenance train no. 90433 from the traffic controller at 12:21. I received an order to set up the entrance route for TMD-43 from the traffic controller at 13:50; and I protected the entrance route at 13:51. The TMD-43 motorised rail vehicle (draisine) arrived at the Grosuplje station at 13:52, of which I was informed also by a voice message from the traffic controller. I was informed of the movement of the second part of the maintenance train by the traffic controller orally and therefore I was able to set up the entrance route in good time. I was informed of the collision between the maintenance train and the motorised rail vehicle (draisine) by the pointsman II.

3.2 The safety management system

Provisions for the movements of trains to a specific location on the open track pertain to trains that travel up to a specific location on the open track and return to the station from which they have departed, and to motorised rail vehicles (draisines) that travel up to a specific location on the open track whether or not they have departed from a station or have been railed on the open track and whether or not they are returning to the station or the location where vehicles are removed from the rail.

The movement of a maintenance train or a motorised rail vehicle (draisine) for the purpose of work to be carried out on an open rail either on an open or closed track is also regarded as the movement of a train or motorised rail vehicle (draisine) to a specific location on the open track.

Traffic of motorised rail vehicles (draisines) on closed tracks during maintenance works is managed by means of permission that the drivers of motorised rail vehicles (draisines) have to obtain from the traffic controller. This permission is valid only for a specific track, a specific rail and a specific direction. The movement to a neighbouring station or to a specific location on the open rail or from the open rail to the station or to a specific location on an open rail may be allowed by a traffic controller only with permission given by the traffic controller of the neighbouring manned station.

A maintenance train travels on a rail section between two stations either along a closed track or an open track in the gap between two other trains.

Two or more maintenance trains are allowed to travel to a closed rail or track, while only one maintenance train is allowed to travel to an open track in the gap between two trains per one inter-station section.



Figure no. 2: View of the place of collision of maintenance train and motorised rail vehicle (draisine), marked with red arrow

3.3 Rules and regulations

Safety of railway transport during maintenance works on public railway infrastructure is regulated by Article 9 of the Safety of Railway Transport Act (ZZelP – UPB4), Uradni list RS No 44/2007 of 21 May 2007, and Articles 23, 37 and 39 of the Safety of Railway Transport Act, Uradni list RS No. 61 of 10 July 2007.

Movements of trains to a specific location on the open track are regulated by Article 183 of the Traffic Rules published in Uradni list RS No. 123 of 28 December 2007.

Movements of motorised vehicles for special purposes are regulated by Article 188 of the Traffic Rules published in Uradni list RS No 123 of 28 December 2007.

The marking of trains is regulated by Article 84 of the Traffic Rules published in Uradni list RS No 123 of 28 December 2007.

Provisions on train accompanying documents are to be found in Article 100 of the Traffic Rules published in Uradni list RS No 123 of 28 December 2007.

Supervision of the contractor carrying out maintenance works on public railway infrastructure is stipulated in paragraph 3 of Article 14 of the Rules on conditions and procedures for the commencement, implementation and completion of ordinary and extraordinary maintenance as well as the maintenance works in the public interest in the field of railway infrastructure.

3.4 Functioning or rolling stock and technical installations

The TMD-44 motorised rail vehicle (draisine) intended for special purposes, no 9979 9 915 006-0 is provided with a built-in speed recorder, Kienzle, of the type 1318-27, recording speeds up to 120 km/h. The speed recorded immediately ahead of the collision by the speed recorder was 42 km/h and 34 km/h at the moment of collision.

All the diesel locomotives owned by Slovenske železnice d.o.o., Series 644, are fitted with Hasler speed recorders recording speeds up to 100 km/h. The speed recorders of this type also records individual events related to drivers' activities operating the braking and security devices built into these locomotives. Immediately before, and during the collision, the speed

recorder recorded a train speed of 30 km/h, which means that the locomotive driver activated the high-speed brake immediately before the train collided with the motorised rail vehicle (draisine). Despite the high-speed brake having been activated, the speed of train no. 90433 failed to decrease on account of the locomotive driver's reaction time required by the braking system for active operation.

3.5 Documentation on the operating system

The Grosuplje – Kočevje railway line has no incorporated operating system. The rail traffic is organised on a one-train-only system basis, which means that only one train may be on the railway line at one and the same time. A train is dispatched onto the railway line and its safety looked after by the Grosuplje station traffic controller.

During the railway closure, too, the entire rail traffic on this railway line is managed exclusively by the Grosuplje station traffic controller who issues permission to train managers and motorised rail vehicle (draisine) drivers for individual movements on the section fit to carry traffic.

3.6 Man-machine-organisation interface

Locomotive drivers and drivers of motorised rail vehicle (draisine)s have no special built-in devices at their disposal to decrease the speed and to stop on the Grosuplje Kočevje railway line. Drivers operate their vehicles by pressing or releasing the accelerator and applying the braking systems.

The pneumatic braking system of the diesel locomotive, Series 644-008, and of the TMD-44 motorised rail vehicle (draisine) requires – to start operating, – a reaction time from 3.5 to 4 seconds.

The locomotive driver of train no. 90433 who was involved in the railway accident on the closed railway line between the Grosuplje and Kočevje stations, at km 3+480 on 11 March 2009 at 14:05, had passed all the required qualifying examinations to operate the diesel locomotive, Series 644; he was physically and mentally fit for driving, had had the statutory rest break between the two working shifts involved and had not exceeded the working hours in the shift.

The driver of the TMD-44 motorised rail vehicle (draisine) who was involved in the railway accident on the closed railway line between the Grosuplje and the Kočevje stations at km 3+480 on 11 March 2009 at 14:05, had passed all the required qualifying examinations to operate traction vehicle no. -44-138; he was physically and mentally fit for driving, had had the statutory rest break between the two working shifts involved and had not exceeded the working hours in the shift.

3.7 Previous occurrences of a similar character

On 3 March 1999, a light auxiliary rail vehicle (ballast tamper, S-9), with a pushed wagon, at km 10+100 collided with rail vehicles waiting to enter the Hrpelje Kozina station, at the end of the closure of the railway line between the Divača and the Hrpelje Kozina stations. The rail vehicles (PL-16 plough, NR-8, TMD 911-148 motorised rail vehicle (draisine), and the end wagon of the maintenance train were damaged during the collision. The driver of the rail vehicle marked PL-16 suffered minor injuries.

On 18 October 2007 at 08:00, a rail vehicle – a speno rail grinder, and a TMD 915-2003 collided on the closed left-hand track at km 602+990 between the railway stations Verd and Logatec. The scheduled closure of the left-hand track according to Order no. 288 started at 07:15 in order to carry out rail grinding. At 07:28, a TMD 915-203 motorised rail vehicle (draisine) was dispatched from the Verd station to the closed left-hand track to km 601+100. At 07:50, a Speno rail grinder was dispatched from the neighbouring Logatec station to the closed left-hand track to km 601+500. At 08:00, the Speno rail grinder collided with the

stationary TMD 915-203 motorised rail vehicle (draisine) on the left-hand track. As a consequence of the collision the TMD 915-203 motorised rail vehicle (draisine) derailed with its first axle in the travelling direction while the front side of the Speno rail grinder was also damaged. No persons were injured in the accident.

4 ANALYSIS AND CONCLUSIONS

The accident, i.e. the collision of maintenance train no. 90433 with the TMD-44 motorised rail vehicle (draisine) on the closed railway line between the stations Grosuplje and Kočevje on 11 March 2009 at 14:05 happened as a result of the omission of several security measures stipulated in the Traffic Rules:

- the driver of the TMD-44 vehicle failed to obtain permission from the Grosuplje station traffic controller to travel from km 14+500 towards the Grosuplje station, which started on 11 March 2009 at 13:41;
- the Grosuplje station traffic controller failed to inform the driver of the TMD-44 motorised rail vehicle (draisine) of the movements of maintenance train no. 90433, and nevertheless dispatched the maintenance train onto the track;
- Section III of the “P-14 Pass for motorised rail vehicle (draisine) movements” delivered by the Grosuplje station traffic controller to the driver of the motorised vehicle specifies that the TMD-44 motorised rail vehicle (draisine) is permitted to travel, from 07:00 until 17:00, from the Grosuplje station to km 14+500 towards the Kočevje station and back; it can therefore be inferred that the driver of the motorised rail vehicle (draisine) believed that permission for the movement of the motorised rail vehicle (draisine) also extended to its return from the railway line to the station;
- during the movement of the TMD-44 motorised rail vehicle (draisine), its driver exceeded by 10 to 12 km/h the maximum permitted speed of 30 km/h in the final 6 km before the collision, prescribed in “the Pass for motorised rail vehicle (draisine) movements” by the Grosuplje station traffic controller; the speed of the motorised rail vehicle (draisine) immediately before the collision was 42 km/h.

It is also a fact that owing to insufficient, or insufficiently clearly defined, terms, individual provisions may be interpreted in several ways. For example, the title of Article 39 of the Safety of Railway Transport Act, Uradni list RS No 61/2007 of 10 July 2007 is “Execution of works under traffic”; there is, however, no legislative instrument or implementing regulation containing an accurate definition or explanation of the term “traffic” or “railway traffic”. It is therefore impossible to accurately explain if “railway traffic” or “traffic” in the broadest sense as used in the above article also covers movements of rail vehicles and maintenance trains on closed railway lines or tracks, which can be misleading.

Provisions under paragraph 1 of Article 189 of the Traffic Rules published in Uradni list RS No 123 of 28 December 2007 stipulate, inter alia, that drivers of rail vehicles must, for each movement, obtain permission which applies only to a specific track, a specific railway line and a specific direction, which is not consistent with the wording of section III of the “Pass for motorised rail vehicle (draisine) movements”, which in item 3 enables the entry of permission: “Up to km:towards the station:and **return**”, which can be interpreted as permission covering also the return to the station of departure, which, in turn, is indeed misleading.

Supervision of the works carried out by the contractor which should have been performed by the works manager of SVP Ljubljana – on the basis of Order by PO Ljubljana, Sekcija za vodenje prometa Ljubljana no. 066 – was not executed in compliance with provisions of paragraph 3 of Article 14 of the Rules on conditions and procedures for the commencement, implementation and completion of ordinary and extraordinary maintenance as well as the maintenance works in the public interest in the field of railway infrastructure.

In the second line of the definition “works manager”, under item 112, paragraph 1 of Article 2 of the Traffic Rules published in Uradni list RS, No 123 of 28 December 2007, missing after the comma before the word “rail”, the following text: “during maintenance works in “.

Accompanying documents for the movement of the second part of maintenance train no. 90433 were not issued in compliance with the provisions of paragraph 1 of Article 100 of the Traffic Rules published in Uradni list RS No 123 of 28 December 2007.

The second part of the maintenance train was dispatched with the same number as the first part, which is not in compliance with the provisions of paragraph 5 of Article 84 of the Traffic Rules published in Uradni list RS No. 123 of 28 December 2007.

The speed of the TMD-44 motorised rail vehicle (draisine) was limited by the Grosuplje station traffic controller on the basis of item 1b of paragraph 2 of Article 190 of the Traffic Rules published in Uradni list RS No. 123 of 28 December 2007, stipulating that when several separate rail vehicles travel between two stations at the same time, the maximum permitted speed of a rail vehicle is 30 km/h.



Figure no. 3: Consequences of the collision of maintenance train no. 90433 and TMD-44 motorised rail vehicle (draisine)

4.1 Final account of the event chain

The executive staff of the railway stations uses either railway telephones or radio communications to communicate either among themselves or with other staff working on the railway line and with locomotive drivers of stationary trains.

During reconstruction works on the railway line or on individual tracks on the open line, particular attention when managing railway traffic should be paid to communications. During maintenance works on such a large scale, individual railway communication devices and means are often being renovated at the same time. It is therefore necessary to lay down, along with the closure order, communication posts to be used for traffic management, as well the communication establishing procedures and a flow process chart for managing the traffic of maintenance trains and rail vehicles.

It can be established on the basis of the investigation into this accident that the rules prescribed for the management of the traffic involving rail vehicles and maintenance trains on a closed section of the railway line are lax, very poorly defined and fragmented at that, since they are to be found in various chapters of the Traffic Rules; they can therefore lead to misunderstanding.

4.2 Discussion

The traffic controller is the person responsible for direct management and provision of safe railway traffic; it may therefore never be allowed for this role to be taken over by any other member of the staff not qualified to perform these tasks.

The works manager is responsible to ensure safety of the work on the railway line during maintenance works carried out in railway line or station devices; on completion of the works, the works manager assesses the current state of the railway line, railway line or station devices, and on this basis determines the conditions for further safe railway traffic.

The tasks related to the safety of work on the railway line during maintenance works on railway line or station devices, discharged by the works manager, are not to be confounded with the task of direct management of safe railway traffic and the provision of safe railway traffic, which is the responsibility of the traffic controller.

It is the task of the traffic controller to dispatch rail vehicles and maintenance trains onto a closed track; the traffic controller must ensure safe railway traffic which also includes the movements of maintenance trains and rail vehicles on a closed railway line or track.

4.3 Conclusions

It was established during the investigation that the direct cause of the accident had been the collision between maintenance train no. 90433 and the TMD-44 motorised rail vehicle (draisine) at km 3+483, between the railway stations Grosuplje and Kočevje, the movement of the motorised rail vehicle (draisine), TMD-44, from km 14+500 to the Grosuplje station, violation of paragraph 1 of Article 189 of the Traffic Rules stipulating that a motorised rail vehicle (draisine) driver must obtain permission of the railway line traffic controller or the traffic controller for every movement made by the rail vehicle or for its positioning onto a track or in a station or on an open railway line. Permission is granted only for a specific track, a specific railway line or a specific direction.

The indirect causes of the accident are:

- misinterpretation of the provisions under paragraph 1 of Article 189 of the Traffic Rules on the part of the Grosuplje station traffic controller and the drivers of motorised rail vehicles (draisines) TMD-43 and TMD-44, which, inter alia, specify that permission for the movement of a rail vehicle only applies to a specific track, a specific railway line and a specific direction; misinterpretation can be inferred from the traffic controller's conduct since he took no action when, without permission, the first motorised rail vehicle (draisine) (TMD-43) drove up to entry signal "C" of the Grosuplje station;
- inconsistently drafted wording in section III of the "P-15 Pass for motorised rail vehicle (draisine) movements" into which permission for movement is entered; item 3 makes it possible for permission to be entered for the return travel back to the station although paragraph 1 of Article 189 of the Traffic Rules clearly stipulates that permission for the movement of a rail vehicle applies only to a specific track, a specific railway line or a specific direction;
- the maximum permitted speed of the TMD-44 motorised rail vehicle (draisine) exceeded by 12 km/h (set at 30 km/h by the Grosuplje station traffic controller in the "Pass for motorised rail vehicle (draisine) movements";
- the driver of the TMD-44 motorised rail vehicle (draisine) not having been informed that two parts of maintenance train no. 90433 had been dispatched after him to km 9+000 on the railway line;
- the manner of communication between the Grosuplje station traffic controller and the drivers of rail vehicles, as well as the train manager, which was not stipulated, given the fact that the means and locations of communication are limited on the railway line under reconstruction; since some are of a provisional nature and out of operation;

4.4 Additional observations

Had the driver of the TMD-44 motorised rail vehicle (draisine) taken into consideration the prescribed maximum permitted speed of 30 km/h, the motorised rail vehicle (draisine) would have covered a substantially shorter distance from the moment of pulling off from the working site to the site of collision, and the site of collision would have been shifted to the railway line area which provides a clearer view. It is probable that in such an event both the motorised rail vehicle (draisine) and the maintenance train would have stopped in good time before colliding since the crews of either vehicle would have been able to notice the other oncoming vehicle. If the collision between the maintenance train and the motorised rail vehicle (draisine) still took place, the consequences would be far less serious.

Had the Grosuplje station traffic controller informed the driver of the TMD-44 motorised rail vehicle (draisine) about the entrance of maintenance train no. 90433 as provided for by section IV of the "Pass for the motorised rail vehicle (draisine) movements", it is possible to envisage that no collision would have taken place on account of a high probability that the driver of the motorised rail vehicle (draisine) would have paid more attention and would, at the worst, only have come closer to km 9+000 of the railway line with his motorised rail vehicle (draisine).

Had section III of the "Pass for the motorised rail vehicle (draisine) movements" been harmonised with paragraph 1 of Article 189 of the Traffic Rules which stipulates that permission for the movement of a motorised rail vehicle (draisine) applies only to a specific track, a specific railway line and a specific direction, it would have been perfectly clear to the driver of the motorised rail vehicle (draisine) that for the return to the Grosuplje station, permission must be granted by the traffic controller.

4.5 Measures that have been taken

There are no records of previously adopted special measures or adopted measures on the basis of the accident.

The following measures have been adopted on the basis of the investigation findings:

- on 19 March 2009, the head of PO Ljubljana, Sekcija za vodenje prometa Ljubljana, Slovenske železnice d.o.o., with telegram no.1915f sent an amendment to Order by PO Ljubljana no. 066 in which he included the wording of the new item, item 4, of the Order which tasked the head of the Grosuplje supervisory station with the elaboration of a provisional flow process chart, and the works manager with the obligation to enter the beginning and the end of the closure in the Grosuplje station.

4.6 Recommendations

In order to avoid similar accidents on closed railway lines and tracks in the future, we recommend:

- the change of the title "Execution of works under traffic" in Article 39 of the Safety of Railway Transport Act, Uradni list RS No 61 of 10 July 2007, since there is, however, no legislative instrument or implementing regulation containing an accurate definition or explanation of the term "traffic" or "railway traffic"; and it is therefore impossible to have a clear explanation as to what is categorised as "railway traffic" or "traffic" given the wide meaning of this word as it is used in the above-mentioned article; it is indeed not clear whether the movements of rail vehicles and maintenance trains along closed railway lines or tracks are included in this term or not;
- amendment to the second paragraph of Article 96 of the Traffic Rules published In Uradni list RS No 123 of 28 December 2007, adding a new fundamental task for the traffic management staff organising train traffic in times of scheduled and unscheduled closures of railway lines and tracks;

- amendments to Article 169 of the Traffic Rules published in Uradni list RS No 123 of 28 December 2007 with the wording to lay down in detail the content of the written request for the railway line or track to be closed, to be submitted by the works contractor to the traffic management staff, as well as the contents of the closure order to be issued by the traffic management staff in compliance with paragraph 5 of the same article.
- harmonisation of the provision under paragraph 1 of Article 189 of the Traffic Rules published in Uradni list 123 of 28 December 2007, stipulating, inter alia, the obligation of the driver of the motorised rail vehicle (draisine) (draisine) to obtain, prior to each movement of the rail vehicle, permission that applies only to a specific track, a specific railway and a specific direction, with a prepared wording of section III of the “P-15 Pass for the motorised rail vehicle (draisine) movements”, which, under item 3, enables entry of permission: “Up to km:towards the station:and **return**”, which can be interpreted as permission covering also the return to the station of departure, which, is not in compliance with the provisions under paragraph 1 of Article 189 of the Traffic Rules;
- amendment to provisions under Article 183 of the Traffic Rules published in Uradni list RS No 123 of 28 December 2007, by adding precisely defined conditions for the dispatch of rail vehicles to a specific location on an open railway line or track, and conditions for withdrawing these vehicles from the railway line or track in cases when other vehicles (a rail vehicle or a maintenance train) are located ahead of them;
- amendment to provisions under Article 186 of the Traffic Rules published in Uradni list RS No. 123 of 28 December 2007 where it is necessary to add a more detailed description of the conditions of the movement of a maintenance train to a closed railway line or track in cases when other vehicles (rail vehicle or another maintenance train) are positioned on such a railway line or track.
- amendment to Article 189 of the Traffic Rules published in Uradni list RS No. 123 of 28 December 2008 by adding provisions specifying in detail the manner of communication between traffic controllers, drivers of rail vehicles and train managers of maintenance trains in cases of movements on a closed railway line or track, and relating to the provision of information to the crews of these vehicles about other vehicles (rail vehicles or maintenance trains) about to be dispatched to a closed railway line or track, – a fact of which they have not been informed by means of the “P-15 Pass for the rail vehicle movements” or with the “Train movement order”, before their departure to the closed railway line or track.

5 REFERENCES

Safety of Railway Transport Act, Uradni list RS No 61 of 10 July 2007:

Traffic Rules, Uradni list RS No 123 of 28 December 2007;

Signalling Rules, Uradni list RS No 123 of 28 December 2007;

Rules on brakes, safety defices, special devices and equipment of railway vehicles, Uradni list No 122 of 28 December 2007.

Daniel Lenart, Undersecretary
Chief Investigator of Railway Accidents
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