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**FINAL REPORT ON THE INVESTIGATION OF A RAILWAY ACCIDENT – COLLISION OF
REGIONAL PASSENGER TRAIN NO. 2615 WITH A LIGHT GOODS ROAD VEHICLE AT
HALF-BARRIER PROTECTED LEVEL CROSSING
"LEVEL CROSSING – VNANJE GORICE", AT KM 575+460, BETWEEN VNANJE GORICE
AND PRESERJE STATIONS**



Ljubljana, 26 April 2012

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1 SUMMARY

On 10 June 2010, at 18.45, regional passenger train no. 2615 hit the right-hand side of a light goods vehicle, a Citroen Jumper 2.2 HDi, at a half-barrier-protected level crossing where the railway line is intersected by a municipal road. The accident occurred on Podpeška cesta in Vnanje Gorice at the level crossing of the municipal road with the main Ljubljana–Sežana double-track railway line.

The driver of the light goods vehicle, a Citroen Jumper 2.2, was driving along the municipal road from the direction of Brezovica pri Ljubljani towards Vnanje Gorice.

Regional passenger train no. 2615 was travelling from Sežana to Ljubljana along the correct right-hand track of the double-track railway line.

The level crossing at km 575+460 between Brezovica and Preserje stations is protected for road users with Iskra RC (remote control) signalling and safety equipment.

In front of the level crossing, the driver of the light goods vehicle drove onto the opposite lane of the road, circumventing the lowered half barrier, and then drove across the level crossing at the moment when regional passenger train no. 2615 entered the level crossing to the right of the vehicle.

Train no. 2615, which was travelling at a speed of 100 kph, frontally hit the right wheel of the light goods vehicle, which then rotated around its axis by 180°, during the rotation it scraped the left-hand side of the electric multiple unit and ended up on its right-hand side, perpendicular to the railway line, 12 m from the edge of the roadway of the level crossing, with its rear on the railway ballast, 0.5 m from the outer rail track. The train stopped with its front at km 575+460, which is 359 m from the level crossing.

The driver of the road vehicle suffered multiple injuries and died on the spot.

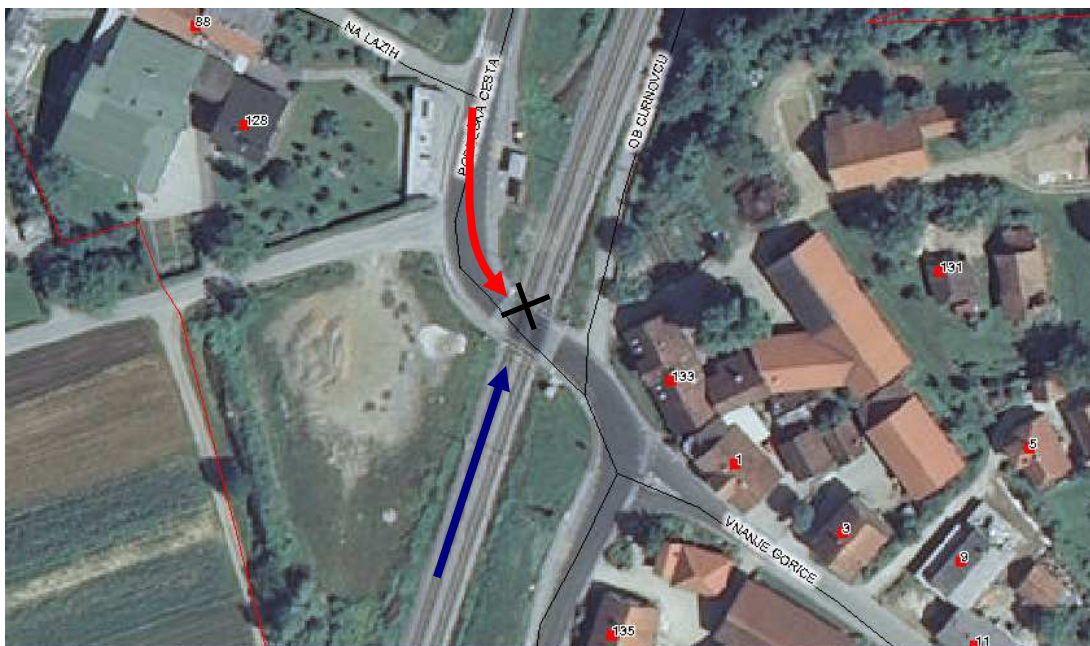


Figure 1: The travelling direction of the train is indicated by a blue arrow, the travelling direction of the road goods vehicle by a red arrow and the site of the collision by a black cross

Cause:

The direct cause of the accident was the driver of the light goods vehicle tempting fate by circumventing the lowered half barrier and driving onto the right-hand track at the moment when regional passenger train no. 2615 entered the level crossing along this track.

The indirect cause of the accident can be attributed to the type of level crossing protection in use, which enables road users to simply circumvent the lowered half barriers and drive onto the part of the road intersecting the railway line. Special consideration should be given to level crossings in urban settlements.

Recommendation:

Since road vehicles frequently circumvent lowered half barriers at level crossings where the lowered half barriers protect only one half of the road, i.e. the lane in the travelling direction and not the opposite lane, a gradual modification of protection at this type of level crossing, with half barriers for both lanes from both directions or barriers extending over the entire width of the road, is recommended.

1.1. Copies of the accident report with recommendations to:

SŽ – Infrastruktura d.o.o.

Kolodvorska ulica 11

1000 Ljubljana

Brezovica Municipality

Tržaška cesta 390

1351 Brezovica

Republic of Slovenia

Ministry of Infrastructure and Spatial Planning

Minister Zvonko Černač

Langusova 4

1000 Ljubljana

Public Agency of the Republic of Slovenia for Railway Transport

Kopitarjeva 5

2000 Maribor

Ministry of the Interior

Ljubljana Police Directorate

Ljubljana Traffic Police Station

Grič 56

1000 Ljubljana

ERA – European Railway Agency

160 boulevard Harpignies

BP 20392

F-59307 VALENCIENNES Cedex

2 IMMEDIATE FACTS OF THE INCIDENT

The level crossing of the road with the railway line between Brezovica and Preserje stations at km 575+460 has been constructed in compliance with the applicable standards. Trains have priority over road vehicles and the level-crossing protection for road users at this level crossing is provided by safety equipment which was in perfect working order at the time of the accident. The light signalling devices on the road were activated and the half barriers were lowered across the road.

2.1 Date, exact time and location of the incident

The accident – a collision of regional passenger train no. 2615 and a light goods road vehicle at the half-barrier-protected level crossing of the Brezovica–Vnanje Gorice municipal road, at km 575+460, with the Ljubljana–Sežana state border double-track railway line no. 50 with designation E-70 – occurred on 10 June 2010, at 18.45, which is evident from the traffic documentation of 10 June 2010 on the journey of train no. 2615.

2.2 Description of the events and the accident site

On 10 June 2010, at 18.45, regional passenger train no. 2615 collided with a light goods vehicle at half-barrier-protected level crossing 'NPr Vnanje Gorice', at km 575+460, between Preserje and Brezovica stations.

At the level crossing, the municipal road Podpeška cesta between Brezovica and Vnanje Gorice intersects the main Ljubljana–Sežana two-track railway line no. 50, with international designation E-70, which is part of pan-European Corridor V. 'Ob Curnovcu' street runs parallel to line 1 and is directly connected to Podpeška cesta in front of the level crossing as seen from the direction Vnanje Gorice–Brezovica.

The passenger train was travelling along line 2 from Preserje station towards Brezovica station. The light goods vehicle, a Citroen Jumper, was driving along the municipal road from Brezovica towards Vnanje Gorice. The road vehicle circumvented and passed the lowered half barriers and drove onto the right-hand track of the railway line at the very moment when regional train no. 2615 entered the level crossing.

The train, travelling at a speed of 100 kph, hit the right front wheel of the light goods vehicle. The road vehicle then rotated around its axis and during the rotation scraped the left-hand side of the electric multiple unit. The vehicle ended up on its right-hand side, perpendicular to the railway line, 20 m from the level crossing, with its rear on the railway ballast 0.5 m from the outer rail track. The train stopped with its front at km 575+460, which is 359 m from the level crossing.

The driver of the light goods vehicle suffered multiple injuries and died at the scene.



Figure 2: Consequences of collision of regional passenger train no. 2615 with road motor vehicle at Vnanje Gorice level crossing

2.3 The body that launched the investigation

The safety investigation procedure was launched by the Chief Investigator of the Accident Investigation Service of the Ministry of Infrastructure and Spatial Planning of the Republic of Slovenia. The Slovenian Railway Company, Slovenske železnice d.o.o. launched an inspection procedure to determine the causes of and responsibility for the accident. The procedure was conducted by an investigation commission.

In accordance with the provisions of the Minor Offences Act, an investigation was also launched by the employees of the Ljubljana Traffic Police Station.

Their 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 to determine all direct and indirect causes of the accident, with a view to providing information important for improving safety at this level crossing.

The investigation was conducted by the Chief Investigator of the Railway Accident and Incident Investigation Division of the Ministry of Transport of the Republic of Slovenia, who brought it to a close himself.

At Slovenske železnice d.o.o., the investigation was conducted by an investigation commission.

2.5 Background to the incident

The incident involved the 32-year-old driver of the light goods vehicle and the locomotive driver of train no. 2615.

There is a speed limit of 50 kph in force for road users on this section of the local road passing through the settlement.

The maximum permitted speed of regional passenger train no. 2615 on this railway line section is 100 kph, as laid down in the timetable.

For road users approaching the level crossing from the direction of Ljubljana to Vnanje Gorice, the visibility of the railway line in both directions is not particularly impaired; this is also not a decisive factor, as the level crossing is protected by half barriers which were lowered, i.e. in their horizontal position, at the time of the accident.

The light goods vehicle was registered.

The surface of the local road up to the level crossing is made of coarse asphalt/concrete. The level-crossing roadway is covered with special composed rubber elements. At the time of the

accident, the roadway was dry, which means that the tyre adhesion of road vehicles was very good.

In particular during peak hours, road traffic is heavy at this level crossing. There is an average of 60 trains in both directions per day on workdays.



Figure 3: Display of level-crossing protection during the passage of trains

2.5.1 Staff involved

The incident involved the 32-year-old driver of the light goods vehicle from the vicinity of Trebnje and the 24-year-old locomotive driver of regional passenger train no. 2615, an employee of Slovenske železnice d.o.o., *Poslovna enota vleka* (Traction Business Unit), *Sekcija za vleko Divača* (Divača Traction Section).

At the time of the accident, the locomotive driver of train no. 2615 had been working at this work-station for 1 year and 2 months.

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

Regional train no. 2615 consisted of two traction units of an electric multiple unit (EMU), unit 94 79 6 312 113-4 and unit 94 79 6 312 114-2, and of one passenger unit, unit 94 79 6 317 107-1.

2.5.3 Description of the infrastructure and signalling system (track types, switches, interlocking, signals, train protection)

Up to 0.50 m from the outer edge of the track of the level crossing, the road surface is made of an asphalt concrete coating, while the level-crossing roadway is made of rubber elements from the Czech manufacturer Gumokov.

The level crossing of the road with the railway line between Brezovica and Preserje stations at km 575+460 has been constructed according to the valid standards. At level crossings, trains have priority over road users. At the level crossing in question, road users are protected by an automatic electronic safety device with a remote control (RC) system.

The device is equipped with two half barriers closing the two driving lanes in front of the level crossing and with three light and acoustic signals.

Automatic protection is activated for periods during which trains are running on either the regular track or the neighbouring track. The operation of the device is supervised at Brezovica station and at the Postojna Traffic Control Centre.

Level-crossing protection is adjusted to the maximum line speed of 120 kph. The signalling/safety device is activated after the train traverses the activation switch. Upon the

activation of the device, the flashing lights on the light and acoustic signals turn on and flash alternately at a frequency of 1 Hz (1 flash per second). At the same time, warning bells are also activated; these sound with the same frequency as the flashing lights. After the 'pre-ringing time' has passed, i.e. after 15 seconds of the lights flashing and the bells sounding, the half barriers begin to lower. When, during lowering, the half barriers reach the position of an 85° angle to the road, the flashing position lights installed on the road side of the half-barrier arms turn on. When the half barriers reach a 10° angle to the fully lowered position, the bells turn off, while the lights remain flashing while the device protecting the level crossing is turned on, i.e. until the half barriers are in the fully raised position again (at an angle of 90° to the road). The half barriers take 10 seconds to lower.

The device is turned off by the deactivation switch after seven seconds' elapse from the time the last axle of the train has traversed the deactivation switch. The half barriers take 6 seconds to rise. If the entire train journey has not been completed, the level-crossing protection device re-establishes its basic mode within 5 minutes. This means that in the event that the train stops at a deactivation switch and more than five minutes elapse from the moment the train traversed the activation switch, the half barriers would rise automatically and the device would be set in its basic mode: 'unprotected level crossing'.

2.5.4 Means of communication

Electric multiple unit no. 312-113/114 of regional train no. 2615 has a radio transceiver installed which provides a direct connection between the locomotive driver and the line signalman at the Postojna Traffic Control Centre. The line signalman at the Postojna Traffic Control Centre is responsible for establishing contact between the locomotive driver and the signalman at any station on the Sežana–Ljubljana railway line section.

At every level crossing protected by barriers or half barriers along this railway line, there is a signal box with a telephone installed. The telephone provides for a direct phone connection with the signalmen at the two neighbouring stations.

The signal box of the Vnanje Gorice level crossing is fixed to the outer wall of the concrete building with installed level-crossing protection devices, which is located in the direct vicinity of the level crossing along the left-hand railway track. The telephone is connected to the Preserje–Brezovica watchman line. The signal box can be locked and unlocked by key SŽ 000T.

2.5.5 Building works carried out at or in the vicinity of the accident site

At the time of the accident, no railway infrastructure works were being carried out on the line section where the accident happened. Some 500 m ahead of the level crossing – in the direction from which the road vehicle involved in the accident was driving – final reconstruction works were being carried out; the site and the works were properly marked.

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

The locomotive driver of train no. 2615 informed his superiors and the line signalman at the Postojna Traffic Control Centre of the accident by phone; the superiors and the line signalmen then initiated procedures for rescuing the persons involved in the accident. Despite resuscitation efforts, the rescue team of the Ljubljana Rescue Centre did not succeed in bringing the driver of the motor vehicle back to life.

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 line signalman of the Postojna Traffic Control Centre was informed of the accident by the locomotive driver of train no. 2615, he immediately notified the information centre thereof.

Employees of the Ljubljana Traffic Police Station were called to the scene of the accident by the employee of the regional information centre who was on duty at the time.

After the collision, the driver of the road vehicle was trapped in his cabin. He was cut free from his vehicle by the Ljubljana Professional Fire Brigade.

The wrecked light goods vehicle which ended up beside the right-hand railway track was removed from the accident site by a towing service.

2.6 Fatalities, injuries and material damage

The 32-year-old driver of the road vehicle from the vicinity of Trebnje, a citizen of the Republic of Slovenia, sustained fatal injuries in the accident.

In the accident, the electric multiple unit of train no. 2615 was badly damaged (damage to the front side of the unit and parts of the left-hand side of the unit in the driving direction). The damage as estimated by the *Sekcija za vleko Ljubljana* (Ljubljana Traction Section) amounted to EUR 30 000.00.

The road goods vehicle was completely written off in the accident. The material damage to the vehicle, according to a non-expert assessment, amounted to approximately EUR 5 000.00.

2.7 External circumstances

The weather conditions at the time the accident occurred were as follows: sunny, +26°C, very good visibility.

The final layer of the local road is made of an asphalt concrete coating, while the level crossing roadway is covered by special rubber elements. At the time of the accident, the roadway was dry and tyre adhesion very good.

3 RECORD OF INVESTIGATIONS AND INQUIRIES

On 10 June 2010, the Chief Investigator of Railway Accidents and Incidents at the Ministry of Transport inspected the scene of the accident.

On 17 June 2010, the Ministry of Transport received accident notification no. 16/2010 drawn up by Slovenske železnice d.o.o., *Sekcija za vodenje prometa Postojna* (Postojna Traffic Control Section), *Nadzorna postaja Logatec* (Logatec Supervisory Station).

On 5 July 2010, the Ministry received commission report no. 16/2010 of 1 July 2010 on the investigation of the accident drawn up by the Postojna Traffic Control Section of Slovenske železnice d.o.o.

On 14 December 2011, the Railway Accident and Incident Investigation Division received investigation material from Slovenske železnice d.o.o., *Služba za interni nadzor* (Internal Control Service), no. 1.0.4./12-1216/10, dated 4 December 2011, which contained the following reports:

- Ev-49 daily incident report no. 301-10 Di, drawn up by the locomotive driver of train 50354;
- Ev-49 daily incident report no. 300-10 Di, drawn up by the locomotive driver of train no. 2615.

On 10 October 2011, the chief investigator of railway accidents and incidents at the Ministry of Transport visited the accident site again and inspected the equipment at the level crossing.

3.1 Summary of testimonies

The locomotive driver of train no. 2615 stated in 'Daily Incident Report no. 300-10 Di' of 11 June 2010 that at the time train no. 2615 was running between Preserje and Borovnica stations at km 5750+550, a collision occurred because a multiple-purpose vehicle had circumvented the lowered half barriers and driven onto the level crossing. The train stopped after approximately 300 m. Since at the same time a freight train was approaching on the neighbouring track from the opposite direction, he also stopped this train by signalling 'Stop' to avoid the possibility of overriding. Later, the passengers were transferred to train no. 2617. After the police procedure was completed, the electric multiple unit was taken over by a train driving instructor from Ljubljana. The competent services were informed thereof. Although the locomotive driver sounded warning signals using the locomotive whistle, the road vehicle did not stop and drove, without reducing speed, onto the railway line.

The driver of freight train no. 50354 approaching from the opposite direction stated in 'Daily Incident Report no. 301-10 Di' of 11 June 2010 that while he was passing Brezovica station he received a message from the line signalman to stop the train immediately. He stopped the train after approximately 300 m in front of Brezovica station. He was notified that an accident (involving a passenger train and a road vehicle) had happened at the level crossing. After he had received the call, he cautiously continued his journey and sounded several 'Caution' warning signs. The train stopped for approximately 15 minutes.

3.2 The safety management system

When approaching the level crossing, road users are warned of the level crossing between Preserje and Brezovica stations at km 575+460 by road signs no. I-39 'Approach to a crossing of the road with a railway line with barriers or half barriers' (countdown marker) that indicates the distance to a grade-intersection between railway and road which is protected by barriers or half barriers, and by road sign I-36 'Level crossing with barriers or half barriers ahead' that warns of a grade-intersection between railway and road ahead which is protected by barriers or half barriers.

Road users are protected from trains, which have priority over road vehicles, by automatic electronic safety equipment with a remote control system.

The equipment features two half barriers closing the two lanes in front of the level crossing and three road acoustic and light signals.

Automatic protection is activated for train journeys on either the regular track or the neighbouring track. The operation is controlled at Brezovica station and at the Postojna Traffic Control Centre.



Figure 4: Presentation of visibility of road signs I-39: owing to the buildings and facilities located along the road, these signs are completely absorbed into their surroundings

3.3 Rules and regulations

Safety at protected level crossings at intersections between railway and road is prescribed in Article 51 of the Railway Transport Safety Act (official consolidated text) (ZVZelP-UPB1), *Uradni list RS* [Official Gazette of the Republic of Slovenia], no. 36/2010 of 4 May 2010, and in Articles 50 and 51 of the Road Transport Safety Act (official consolidated text) (ZVCP-1-UPB5), *Uradni list RS*, no. 56/2008 of 6 June 2008.

Intersections between railway and road at level crossings are regulated in more detail in the Rules on Railway Level Crossings published in *Uradni list RS*, no. 85/2008 of 29 August 2008.

3.4 Operation of rolling stock, technical facilities and technical installations

On 11 June 2010, regional passenger train no. 2615 involved in the accident was travelling along the Sežana–Ljubljana railway section. The brake system of train no. 2615 was clearly working faultlessly, as the train, travelling at a speed of 100 kph, stopped in a distance of 359 m.

At the time of registration, the light goods vehicle, a Citroen Jumper, reg. no. LJ 36-5EG, passed a roadworthiness test.

3.5 Documentation on the operating system

The documentation on the operation of the automatic electronic safety equipment of a remote control system equipped with two half barriers closing the two road lanes in front of the level crossing and three road acoustic and light signals is available as prescribed.

3.6 Man–machine–organisation interface

Neither locomotive drivers nor drivers of road motor vehicles have special safety devices installed in their vehicles to reduce speed or stop at the Vnanje Gorice level crossing between Preserje and Brezovica stations. They operate their vehicles directly by increasing or releasing traction power and applying their brakes.

Railway vehicles have pneumatic brake systems. The response time of a brake system with quick-acting brakes is between 3.5 and 4 seconds. Because of this response time, the braking distance of trains is relatively long.

The prescribed priority of trains over road vehicles at level crossings is due to the characteristics of the railway vehicles' brake systems and the rigidity of running railway vehicles.

The locomotive driver of train no. 2615 involved in the railway accident on 10 June 2010 at 18.45 at Vnanje Gorice level crossing at km 575+460 between Preserje and Brezovica stations had passed all the required qualifying examinations to operate an electric multiple unit of series 312-113/114 type; he was physically and mentally fit for driving, had had the statutory rest break between the last two working shifts and had not exceeded the working hours in the shift. He passed the locomotive driver examination in 2009.

The driver of the road vehicle who suffered fatal injuries in the accident was a holder of a statutory category B driving licence, which complies with the regulations for operating a road vehicle of the type involved in the accident.

3.7 Previous incidents of a similar nature

At this level crossing, a similar accident happened on 5 September 2009 at 2.40, when a road passenger vehicle, a Renault Clio, circumvented the half barriers and drove directly in front of international freight train no. 42772. The road vehicle was also driving from the direction of Brezovica towards Vnanje Gorice, and the train was also travelling from the direction of Preserje station towards Brezovica station on the right-hand track (railway line 2). Due to serious injuries sustained in the accident, the driver of the road vehicle died on the following day at the University Medical Centre Ljubljana, i.e. on 6 September 2009.

On 9 October 2007 at 8.30, a passenger train hit a vehicle of the G7 Security Company. The driver of the road vehicle circumvented the lowered half barrier and drove across the level crossing at the moment when a freight train, which was travelling along the right-hand track (railway line 2) from the direction of Preserje station towards Brezovica station, entered the level crossing, while at the same time a passenger train was approaching on the neighbouring left-hand track from the direction of Brezovica towards Preserje. The 29-year-old driver drove his vehicle directly in front of the train, which hit the rear of the road vehicle, and the road vehicle was thrown to the edge of the railway line. The driver and the 43-year-old passenger in the road vehicle suffered minor physical injuries.

4 ANALYSIS AND CONCLUSIONS

On the basis of the marks left on the rubber elements on the roadway of the level crossing, it can be concluded that the road vehicle drove onto the level crossing on the left-hand side of the road in the driving direction.

The photographs of the accident site show that the left-hand side of the front of traction unit 312-113 of the electric multiple unit hit the motor vehicle at the height of the right tyre on the right-hand side of the driver's cabin.

During the day, an average of 350 road vehicles cross the railway line in one hour at this level crossing. The average traffic on the Divača–Ljubljana line section is 100 trains per day.

The average time from the moment the level-crossing protection devices are turned on until the moment they are turned off is 90 seconds.

Each time the level crossing is protected (during daytime), an average of 6 vehicles stop in front of it.

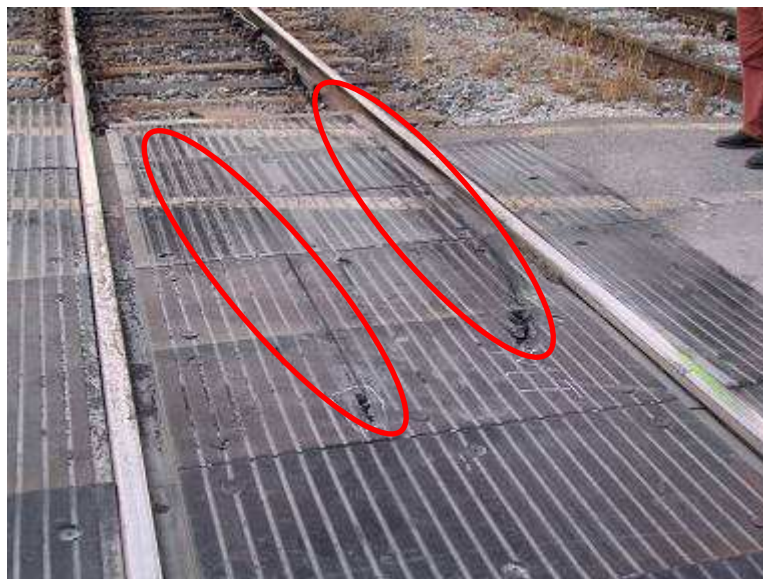


Figure 5: Traces of the road vehicle on the rubber elements of the level crossing after the collision

4.1 Final account of the chain of events

An analysis was carried out for similar events that have happened in the past three years and resulted in broken half barriers. Statistical data from Slovenske železnice d.o.o. show that a total of 124 broken barriers was recorded in 2009; in 2010 this number was 115, while in 2011 it was 89. The perpetrators usually flee from the scene of the incident before the police arrive so as to avoid paying a fine for the traffic offence and compensation for damage. It cannot be claimed with certainty that all such events were caused by road passenger vehicles circumventing the lowered half barriers. There might be various reasons for the broken barriers, for example the possibility that the barriers were broken in acts of vandalism or by pedestrians or cyclists leaning on them while waiting for a train to pass. However, despite the aforementioned cases, it can be claimed with great certainty that in most cases the half barriers are broken because the drivers of road motor vehicles circumvent the barriers when they are in the lowered position and thereby hit them or drive onto the level crossing at the time the barriers begin to lower. Such cases are very often reported by locomotive drivers who notice these events during their journeys.

Moreover, the fact also needs to be taken into consideration that a great number of cases where road motor vehicles circumvent lowered half barriers do not result in injuries, damage or

broken half barriers. However, the data of Slovenske železnice d.o.o. do not cover such events. The stated data clearly demonstrate that the number of cases where road passenger vehicles circumvent lowered half barriers is relatively high.

This fact can be attributed to the driving culture of the citizens of the Republic of Slovenia, who often do not consider the consequences of such behaviour: that by circumventing a lowered half barrier they put both their own lives and those of their passengers at risk.

People are different, of course, and have different characters and levels of cultural knowledge; and sometimes they are not willing to behave in a responsible manner. They are also exposed to both positive and negative examples and there is a possibility that every one of us is sometimes tempted to circumvent an obstacle that is in our way. With this in mind, we should consider improving safety at any point where we might be tempted to take undue risks.

4.2 Discussion

The reasons for and consequences of accidents have been discussed at several levels. Among other things, there has been a discussion on whether level crossings are appropriately protected.

Far too often drivers of road vehicles tempt fate and circumvent a lowered half barrier by driving on the opposite lane at a level crossing protected by half barriers which block only oncoming traffic. With regard to the daily dynamics and the way of life we live in these modern times, a minute of waiting is often seen to be more important than the fact that we might be involved in a serious accident if we tempt fate in such a way. Increasingly frequently we find ourselves running short of time and therefore try to find ways to circumvent obstacles that are in our way.

Human nature is such that similar temptations might gradually turn into a habit, in particular if the consequent actions have turned out well a few times before.

Considering similar events, it can be concluded with great certainty that the road vehicle driver involved in the accident would not have driven onto the railway line if at the level crossing both lanes of the road had been protected by half barriers or full barriers.

4.3 Conclusions

It was established during the investigation that non-observance of the right-of-way rule resulting in a dangerous situation caused by the road vehicle driver was the direct cause of the collision of train no. 2615 and the light goods vehicle at the half-barrier-protected level crossing between Brezovica and Preserje stations at km 575+460. Although the road signs operated faultlessly and the level crossing was protected by two lowered half barriers warning road users unambiguously of approaching trains, the driver of the road vehicle proceeded onto the opposite road lane for an unknown reason, then circumvented the half barrier and drove onto the railway line right in front of the electric multiple unit of the regional passenger train.

If a level crossing is fully protected, i.e. is a level crossing with full barriers or double half barriers extending over the entire width of the road, road users take this into consideration and respect it; they stop unconditionally and wait until the barriers are in their fully raised position again. Lowered full barriers or double half barriers at such level crossings cannot be circumvented and drivers of road vehicles can only proceed with their journey if they break the barrier or half barrier. In such cases, their property, i.e. their vehicles, is also damaged, which is usually an adequate reason for them not to even consider this option.

At level crossings with half barriers that protect only one half of the roadway and at which the half barriers can be circumvented, individuals often think about ways how to avoid waiting in front of the half barrier and at such moments may not even consider the consequences of such action; their minds are usually elsewhere and not focused on safe driving.

4.4 Additional observations

Due to the reconstruction of the road infrastructure, the road traffic from the direction of Brezovica towards the level crossing was obstructed for an extended period of time. During the reconstruction works, road users were exposed to stressful situations, as the traffic regime in

that area was constantly changing, which certainly affected the concentration of drivers and indirectly caused nervousness.

The road signs indicating the distance from the level crossing protected by half barriers are also inadequate, since on traffic sign I-39 (three-line countdown marker), located at a distance of 240 m from the level crossing, the I-36 sign is missing.

4.5 Measures that have been taken

There is no record of any special measures having been previously taken or taken as a result of such an accident – the collision of a train and a road motor vehicle – at this level crossing. Back in 2009, a similar accident happened at the same level crossing, on the basis of which a recommendation was issued. The recommendation is identical to the recommendation described below, but has not yet been implemented.

4.6 Recommendation

Since road vehicles frequently circumvent lowered half barriers at level crossings where the lowered half barriers protect only one half of the road, i.e. the lane in the travelling direction and not the opposite lane, a gradual modification of protection at this type of level crossing, with half barriers for both lanes from both directions or barriers extending over the entire width of the road, is recommended.

5 Bibliography

Safety of Railway Transport Act (official consolidated text) (ZVZeIP-UPB1), (*Uradni list RS*, no. 36/2010 of 4 May 2010);

Road Transport Safety Act (official consolidated text) (ZVCP-UPB5), (*Uradni list RS*, no. 56/2008 of 6 June 2010);

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Rules on Signalling-Safety Devices (*Uradni list RS*, no. 123/2007 of 28 December 2007);

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Rules on Railway Level Crossings (*Uradni list RS*, no. 85/2008 of 29 August 2008);

Rules on Traffic Signs and Equipment on Public Roads (*Uradni list RS*, no. 46/2000 of 31 May 2000).

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