STATE COMMISSION ON RAILWAY ACCIDENT
Ministry of the Interior and Administration

REPORT No. PKBWK 01/2022

from the procedure in case of serious train accident on 04 April 2021 at 09:10 on route from Oborniki Wielkopolskie - Rogoźno Wielkopolskie, on track no. 1, railway-road crossing category D at km 30.453 of railway line no. 354 Poznań Główny POD – Piła Główna

the area of the railway infrastructure managed by PKP PLK S.A. Railway Company in Poznań

WARSAW, 23.02.2022 r.

https://www.gov.pl/web/mswia/panstwowa-komisja-badania-wypadkow-kolejowych

This Report is based on the provisions of *Commission Implementing Regulation (EU) 2020/572 of 24 April 2020 concerning the reporting structure to be used for rail accident and incident investigation reports (Official Journal of the European Union No. 132 of 27 April 2020)*

SPIS TREŚCI

I. SUMMARY

Type of event: Serious accident.

Event description: The collision of a railway vehicle, i.e. EN57ALc-2207 electric multiple unit of POLREGIO sp. z o.o. railway undertaking running as train ROJ 78471 relation Poznań Główny – Piła Główna with a road vehicle (passenger car Citroen Saxo) that entered the road-rail crossing directly in front of the head of the train.

Date of event: 04.04.2021 at 09:10.

Event location: Railway line no. 354 Poznań Główny POD – Piła Główna, route Oborniki Wielkopolskie – Rogoźno Wielkopolskie track no. 1, cat. D at km 30.453, railway-road crossing identification number (yellow sticker) 354 030 453, geographical location 52°40'22"N, 16°51'34 "E.

Consequences of the event: As a result of the incident, the driver of the road vehicle died on the spot, a passenger car was destroyed and a railway vehicle was damaged.

Causal factor: Passenger's car entry at a cat. D, rail-road crossing directly in front of the oncoming passenger train No ROJ 78471.

Contributing factors:

1) Road vehicle's driver failure to comply with the traffic regulations in force when and passing a railway and road crossing, art. 28 of the Act of 20 June 1997 - Road Traffic Law (i.e. Journal of Laws 2021, item 450, as amended), including failure to stop a vehicle in connection with a B-20 "Stop" sign.
2) Insufficient visibility of the train front, from the position of the driver of the road vehicle when approaching a level crossing (lack of the required visibility triangles), caused by a concrete fence and concrete traction posts in the vicinity of the railway line.
3) The sharp angle of the road crossing with the railway line of 67°, making it difficult for the driver to see the front of the approaching train.
4) The rays of the sun being at low altitude shone on the windscreen of the car making it difficult for the driver to see the front of the approaching train.
5) Haste of the driver of a road vehicle due to an appointment.

Systemic factor: Failure to reassess the significance of the change before raising train speeds from 100 km/h to 120 km/h.

Recommendations and their addressees:

1) The infrastructure manager PKP PLK S.A., in order to ensure safety in the area of the railway-road crossing, will implement the arrangements for upgrading the crossing category resulting from Protocol No. IZ16KI.505.36.2021 of 20.04.2021.
2) Infrastructure managers shall take measures regarding the effectiveness of supervision of the implementation of SMS procedures or internal rules. In the case of changes to the railway line parameters concerning an increase in train speeds in the area of level crossings, an assessment of the significance of the change shall be carried out individually for each level crossing.
3) Infrastructure managers shall take measures to improve the quality and depth of inspections, diagnostic tests and the way the visibility triangle of level crossings is measured. When measuring visibility triangles account must be taken of the fact that the visibility of the train head from 5 metres from the outermost rail must be continuous (not obscured by any objects as the train approaches the level crossing) and must include the front end signal lanterns. If this condition is not complied with, the speed of trains in the area of level crossings shall be reduced in accordance with the legislation in force.

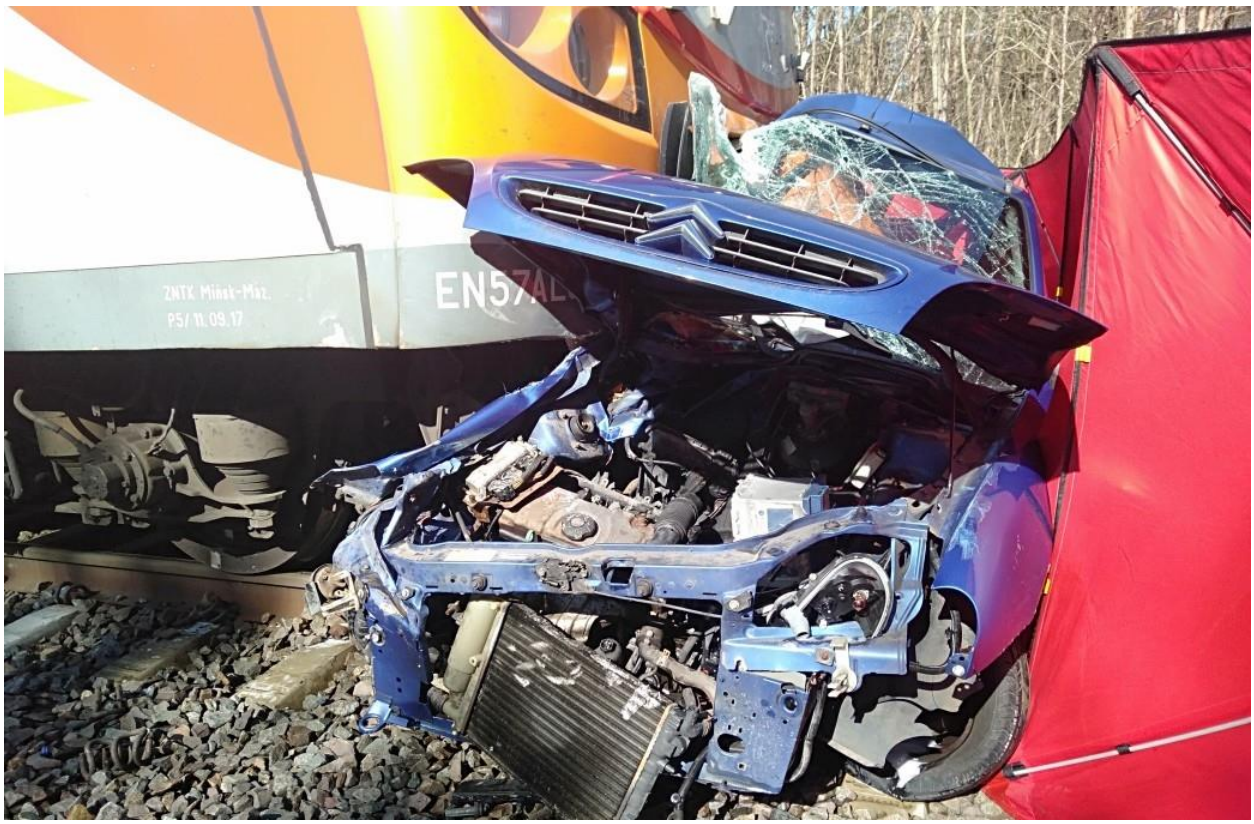

Photo 1. Image of the effects of the incident (source: GDPWK)

Photo 2. View of the scene(source: GDPWK)

Photo 3. View of a level crossing from the cab of a railway vehicle from the direction of train travel (source: GDPWK)

II. PROCEEDINGS AND CONTEXT

1. Decision to initiate procedure

The Chairman of the State Commission for Investigation of Railway Accidents (hereinafter referred to as "PKBWK" or "the Commission") Tadeusz Ryś issued the decision No. PKBWK.4631.4.2021 of 09 April 2021 on undertaking the procedure in the case of the severe accidental a category D level crossing at km 30.453 of railway line No. 354 Poznań Główny POD - Piła Główna. Taking into account this fact and the provisions of Article 28e (4) of the Railway Transport Act (Dz. U. of 2020, item 1043, as amended), hereinafter referred to as the "Railway Transport Act", on 12 April 2021, the event was reported to the European Union Railway Agency and was registered in its database under number PL-10041.

2. Grounds for the decision to open procedure

On the basis of the analysis of the circumstances of the incident, taking into account that the incident was a serious accident, in accordance with Article 28e (1) of the Railway Transport Act, the Chairman of the PKBWK decided to undertake procedure by the Commission's Investigation Team.

3. The scope and limitations of the procedure, including the reasons for them, and an explanation of any delays that are considered to be a risk or otherwise affecting the conduct of the procedure or the conclusions of the procedure

The procedure to determine the causes of the incident were conducted under Article 28h (1) of the Railway Transport Act, which, in accordance with the provision of Article 28f (3), does not determine fault or liability. There were no constraints during the course of the procedure that would adversely affect the procedure.

4. Aggregate description of the technical capacity of the functions in the team of investigators

The Chairperson of the Commission has appointed from among the standing members of the Commission a Study Team that meets the technical requirements for the procedure.

5. Description of the communication and consultation process conducted with persons or entities involved in the incident, during the investigation and in relation to the information provided

The Chairman of the PKBWK, pursuant to Article 28h (2) (5) of the Railway Transport Act, obliged the indicated persons from among the members of the railway commission to cooperate with the Study Team on a permanent basis on the basis of a written commitment addressed to their employers by letter No. PKBWK. 4631.4.1.2021 of 09.04.2021 and to hand over the collected documents from the procedure.

On 20.04.2021, at the headquarters of the Commission's branch in Poznań, a protocol transfer of the collected documentation by the railway commission took place.

As part of the investigation, the Chairman of the Commission requested the cooperation of the entities related to the incident under investigation, i.e.:

- Railway Undertaking – PKP Polskie Linie Kolejowe S.A.,
- railway undertaking - POLREGIO sp. z o. o.

STATE COMMISSION FOR THE INVESTIGATION OF RAILWAY ACCCIDENTS, ul. Chałubińskiego 4/6, 00-928 Warsaw main office telephone no.: 22 630 1433, e-mail: pkbwk@mswia.gov.pl

In accordance with the provisions of Article 28k of the Railway Transport Act, it allowed the entities involved in the serious accident to become acquainted with the course of the procedure with the possibility to review the draft report in order to submit any comments. The opinions of stakeholders obtained, were examined at the Commission meeting on 23.02.2022.

6. Description of the level of cooperation proposed by the actors involved

During the course of the investigation, the level of cooperation with representatives of entities related to the circumstances of the incident was standard and did not raise any concerns for the Investigation Team.

7. A description of the methods and techniques used in the investigation and the methods of analysis applied to establish the facts and make the findings referred to in the report

Throughout the process to clarify the causes and circumstances of the incident, the Investigation Team relied on its own knowledge, experience and findings.
They used their own documentation as well as documentation gathered by the Railway Commission, the Public Prosecution Service and the Police.
As part of the event investigation, the Research Team used the following methods, among others:

- visual examination of the scene after the accident,
- local inspections of the site,
- conducting hearings of the driver and the train manager,
- carrying out visibility triangle measurements at the crossing using a railway vehicle,
- analysis of the documentation collected,
- analysis of the recorder of the train driving parameters,
- analysis of the recorded image of the train foreground.

The following is a selection of the legislation, regulations and internal instructions used in the course of the procedure:

National legislation:

1) Act of 28 March 2003 on trail transport – hereinafter "Act"; Journal of Laws of 2020, item 1043). as amended, and i.e. Journal of Laws of 2021, item 1984).
2) regulation of the Minister of Infrastructure and Development of 20 October 2015 on the technical conditions to be met by crossings of railway lines and railway sidings with roads and their location (Journal of Laws, item 1744, as amended. as amended),
3) regulation of the Minister of Infrastructure of 11 January 2021 on workers employed in positions directly related to the operation and safety of railway traffic and to the operation of certain types of railway vehicles (Journal of Laws, item 101),
4) In accordance with the§ 25 section 1 of the Regulation of the Minister of Infrastructure of 18 July 2005 on general conditions for railway traffic and signalling: Dz.U. z 2015 r. item 360, as amended),
5) act of 7 July 1994 Construction Law (consolidated text. Dz.U. z 2020 r. item 1333, as amended),
6) law of 20 June 1997. "Law on Road Traffic" (i.e. Dz.U. z 2021 r. item 450 as amended),
7) ordinance of the Ministers of Infrastructure and Internal Affairs and Administration on road signs and signals (i.e. OJ 2019 item 2310, as amended).

Internal instructions of railway undertaking POLREGIO sp. z o.o.

1) Pt-2 Instruction for the traction vehicle crew

2) Pt-5 Manual of maintenance for powered railway vehicles.

Internal instructions of railway infrastructure manager PKP PLK S.A.

1) Ie-1 (E-1) signalling instructions
2) Ir-1 Driver's rule book
3) Ir-8 Instruction on dealing with serious accidents, incidents and accidents in rail transport
4) Id-1 (D-1) Technical conditions for pavement maintenance on railway lines
5) Ik-2 Railway Safety Inspection Manual
6) Id-7 Railway line supervision instruction.

8. Description of the difficulties and specific challenges encountered during the procedure

The members of the Investigation Team did not encounter difficulties or problems that could affect the procedure, timeliness or their conclusions.

9. Any interaction with the judicial authorities.

The President of the PKBWK applied by letter No. PKBWK.4631.4.6.2021 of 20 July 2021 to the District Public Prosecutor's Office in Oborniki, in order to obtain access to the documents collected in the course of the criminal procedure conducted by it in connection with the incident, and which are related to establishing the circumstances and causes of the incident. These documents were made available to the extent specified in the letter in question.

10. Other information relevant to the procedure

Lack of other relevant information.

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III. DESCRIPTION OF THE ACCIDENT

1. Event and background information

1.1. Description of the type of event

During the train journey between Poznań Główny and Piła Główny, on the cat. D (not equipped with traffic protection systems and devices), the driver of a road vehicle (Citroen Saxo passenger car) drove directly in front of the front of electric multiple unit EN57ALc-2207 of railway undertaking POLREGIO sp. z o.o., travelling as passenger train ROJ 78471. The road vehicle entered the level crossing from the left of the moving train. This resulted in a collision between a train and a road vehicle. The railway vehicle struck the right side of the passenger car. As a result of the impact, the car was pushed until the train came to a complete stop. The driver of the road vehicle died at the scene. The railway vehicle did not derail.

1.2. Date, exact time and place of event

The incident occurred on 04.04.2021 at 09:10 on the Oborniki Wielkopolskie - Rogoźno Wielkopolskie track no. 1, cat. D at km 30,453 of railway line no. 354 Poznań Główny POD - Piła Główna, crossing ID 354 030 453 (yellow sticker on St. Cross). St. Andrew's Church located on the side of the track).

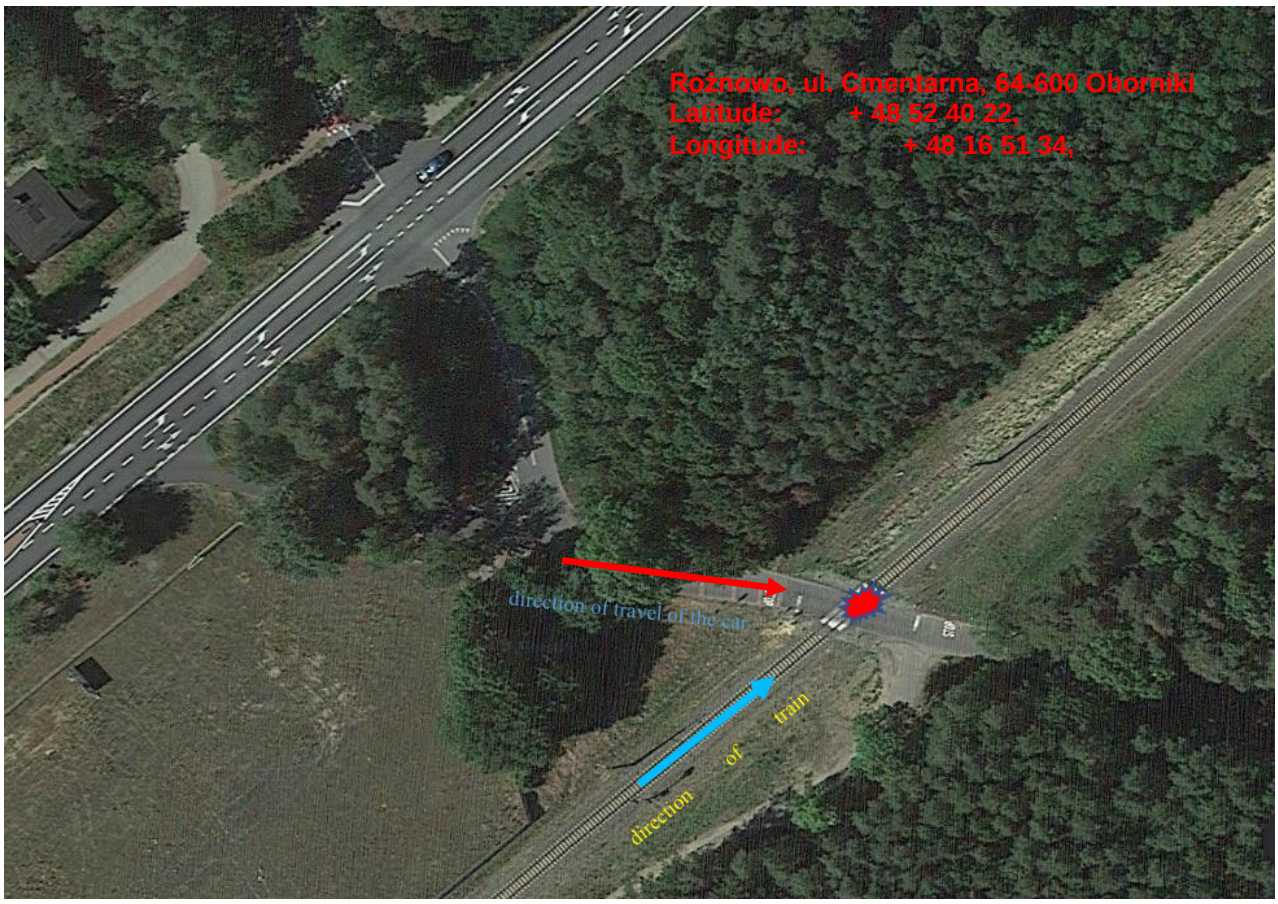


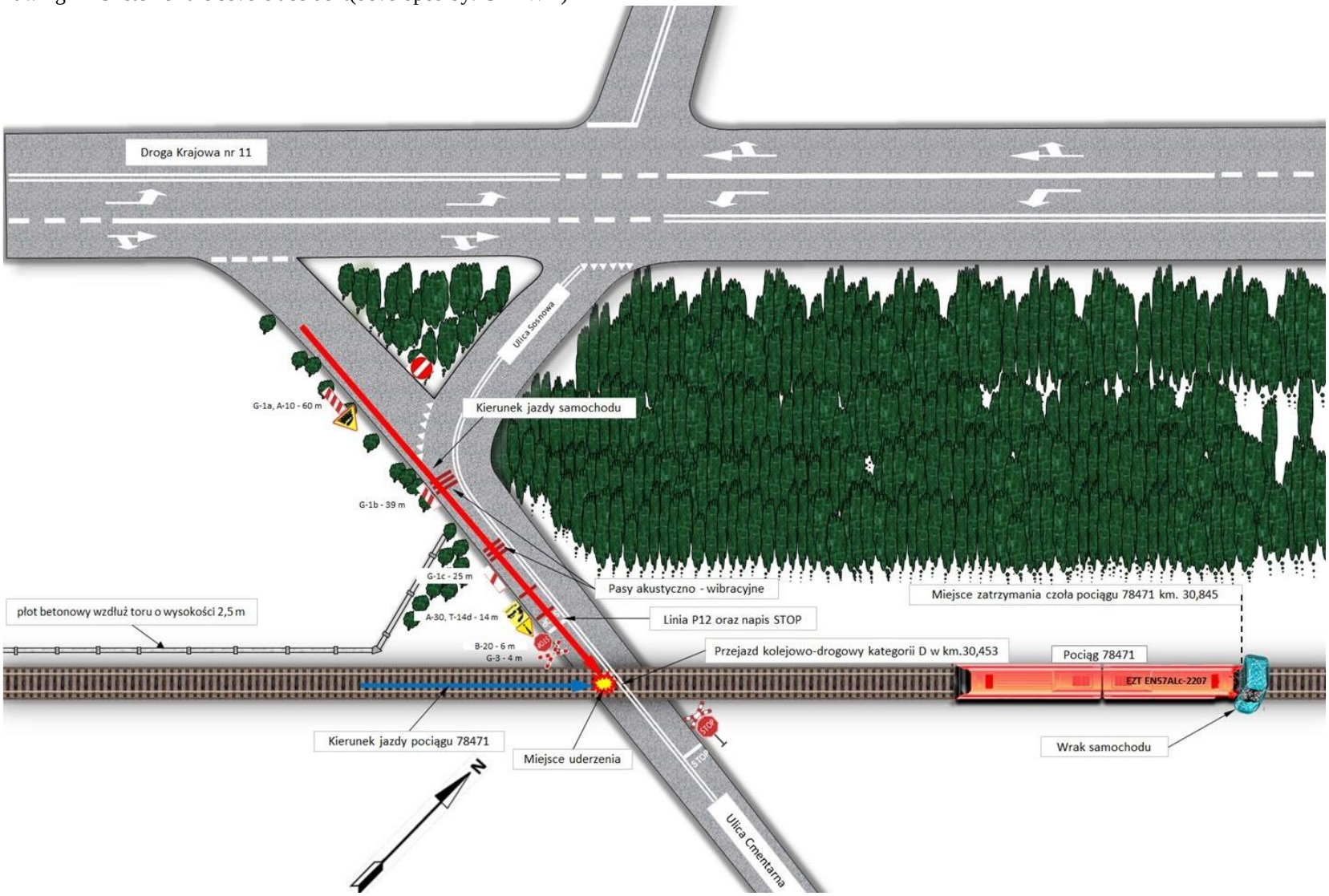
Photo 4. General view of the scene (source: Google maps)

1.3. Description of the site, including meteorological and geographical conditions at the time of the incident and any works carried out on or near the site

The category D level crossing where the incident occurred is located within municipal road No. 271632P - ul. Cmentarna in Rożnowo. The coordinates of the location of the rail-road crossing are 52°40'22 "N, 16°51'34 "E. The road surface is bituminous. The permissible speed of vehicles on the road in the area of the railway-road crossing is 50 km/h. The road crosses the railway track at an angle of 67°. The area where the railway line crosses the road is located in plain undeveloped terrain, the area is partly wooded. Visibility of the level crossing from the road in the direction of travel of the vehicle is normal. There is a 2.5 m high concrete fence in the triangular field of view of the train front from the direction of travel of the car, adjacent to the track. There is also a string of concrete traction poles along the track limiting the field of vision. In front of the level crossing, there are B-20 "Stop" signs on both sides of the level crossing and painted P-12 absolute stop lines. In addition, there are vibration and acoustic strips on the approaches to the level crossing. On the day of the incident, no work was being carried out on the rail and road infrastructure in the area of the level crossing. There were good weather conditions that day, no rain or fog. Early morning, cloudless sky, sunny, sun at 24o above the horizon, sun rays falling along the road on the windscreen of the oncoming car, temperature about 5º C. Within the railway-road crossing at the time of the incident there were no other road users likely to absorb the attention of the driver of the road vehicle.

Photo 5. The position of the sun at the time of the event (source: Sunearthtools.com)

Drawing 1 - Sketch of the severe accident(developed by: GDPWK)



1.4. Deaths, injuries and damage to property

a) passengers, employees or contractors, level crossing users, trespassers, other persons on the platform, other persons not on the platform

As a result of the incident, the occupant of the crossing - the driver of the road vehicle - died on the spot. There were no injuries to the railway undertaking's staff or to the passengers on the train.

b) cargo, luggage and other property

Citroen Saxo passenger car destroyed.
There was no damage to the belongings and luggage carried on the train.

c) rolling stock, infrastructure and environment

The extent of damage to the EN57ALc-2207 rail vehicle prevented further travel. The vehicle suffered damage to the coupling, front scraper, brake coupling, headlamp laminates and a broken left headlight.
In the track between the level crossing and the place where the train head stopped, 46 pieces of spring fixings of SB4 type were damaged. There was no environmental damage.

1.5. Description of other effects, including the impact of the event on the regular activities of the entities involved

As a result of the incident, track no. 1 of the Oborniki Wielkopolskie - Rogoźno Wielkopolskie route was closed for train traffic from 09:12 to 13:55. 43 passenger trains were delayed for a total of 1131 minutes.
Travellers from trac. ROJ 78471, involved in the incident, were taken by a replacement bus service at 11:20am. The train was cancelled on a further route. For trains no. 48101 and no. 86102 (PKP Intercity S.A.) on the section Poznań Główny - Piła Główna substitute bus service was launched (3 buses). For trains no. 78211 and 87208 (Koleje Wielkopolskie Sp. z o.o.) on the section Oborniki Wielkopolskie - Dziembówko (1 bus). For train no. 87470 (POLREGIO sp. z o.o.) on the section Piła Główna - Poznań Główny (1 bus).

1.6. Identification of persons, their functions and entities involved, including possible links with contractors or other relevant parties

The research team identified individuals directly linked to the incident:

- train driver ROJ 78471 - employee of railway undertaking POLREGIO sp. z o.o.
- train manager ROJ 78471 - employee of railway undertaking POLREGIO sp. z o.o.
- the driver of the road vehicle (Citroen Saxo passenger car) - the user of the crossing.

1.7. Description and identifiers of trains and their composition including associated rolling stock and registration numbers

Passenger train ROJ 78471 was set with electric multiple unit series EN57ALc-2207 operated by railway undertaking POLREGIO sp. z o. o.
The vehicle had Technical Performance Certificate No. PBU1/8-7/207 for railway vehicle - electric unit EN57ALc (5B+6B+5B), year of construction 1990, serial number 2207 produced by PAFAWAG Wrocław, issued on the basis of Railway Vehicle Type Approval Certificate No. PL 51 2017 0058, Railway Vehicle Identifier PL-PREGEVN 94 51 2 122 589-6 segment A, 94 51 2 122 590-4 segment B, 94 51 2 122 591-2 segment C.
Railway vehicle certificate of roadworthiness issued on 11.09.2017 in Minsk Mazowiecki and valid until 10.09.2022, or for a mileage of 500,000 km calculated from the odometer value of 214 km. The mileage at the time of the incident was 441,594 km. The P2 level inspection was performed on 03/03/2021 at 428,938 km. The P1 level inspection was performed on 02/04/2021 at 440,982 km.

Train data ROJ 78471:

– train length	64,97 m
– total mass of the train	156 ton
– percentage of braking mass required	104 %
– braking mass required	163 tony
– actual braking mass	166 Tons

1.8. Description of the relevant parts of the infrastructure and signalling - track type, switch, interlocking, signal, train protection systems

1) Track:

type rails	–	60E1 - vintage 2010
primers	–	pre-stressed concrete PS94 type
type of attachment	–	type SB4
type of ballast	–	gravel
maximum permissible train speed on the route	–	120 km/h
gradient of the track in the area of level crossings	–	1.64 ‰ over 305 m length from km 30.175 to km 30.480

2) Rail-road crossing:
- D category rail-road crossing constituting the crossing of railway line No. 354 Poznań Główny POD - Piła Główna with municipal road No. 271632P in the course of ul. Cmentarna in Rożnów, the road manager - Mayor of Oborniki,
- an individual journey identification number: 354 030 453 (yellow sticker on Holy Cross). St. Andrew's Church located on the side of the track),
- Rail/road crossing axis - km 30.453,
- the angle of intersection of the road with the railway track - 67°,
- The surface of the railway-road crossing is made of prefabricated reinforced concrete CBP crossing slabs - 3 sets,
- access road surface - bituminous,
- The level of the access road:
  - right side - 0.1% gradient towards the crossing over a length of 50 m,
  - left side (direction of vehicle entrance to the level crossing) - 0.8% gradient towards the crossing on the length of 50 m,
- crossing traffic product - 19350 measurements were taken on 18 and 19 April 2018,
- visibility of the level crossing from the access road:
  - left side - 78 m with 60 m required,
  - right side - 81 m with 60 m required,
- the length of the straight section of road, measured from the extreme rail:
  - left side - 50.4 m,
  - right side - 9.18 m,
- length of railway-road crossing - 9.5 m,
- width of the road crown at the level crossing - 6.0 m,
- Roadway width at the crossing - 5.5 m,
- width of roadway on access road left and right - 5.0 m,
- fencing of level crossings - none,
- maximum speed of road vehicles through the level crossing - 50 km/h,
- the level crossing is not illuminated in the dark.

3) Markings of the level crossing on the day of the incident:

- from the side of the road a railway-road crossing marked with G-3 signs - St. Crosses St Andrew's, with signs B-20 "Stop", A-10, A-30 with plate T-14d, G-1a, G-1b, G-1c positioned on the right-hand side of the road on both sides of the track,
- W6b indicators set on the track side:
- from the direction of the oncoming train located 753 metres before the level crossing, i.e. at km 29,700,
- from the opposite direction at km 31.200, i.e. 747 metres before the level crossing.

4) Conditions for visibility of level crossings and train fronts from the road.

The required minimum visibility of the level crossing from the access road is 60 metres. The actual visibility of the level crossing from the road is:
- left side - 78 m,
- right side - 81 m.

The conditions of visibility of the railway-road crossing from the road meet the requirements of the *Regulation of the Minister of Infrastructure and Development of 20 October 2015 on technical conditions* to be met *by crossings of railway lines and railway sidings with roads and their location (Journal of Laws of 2015, item 1744, as amended)*.

On the day of the incident, the metrics of the level crossing included data on the visibility conditions of the train front from the road from measurements taken on 20.08.2020. (Table 1).

Table 1 - Conditions for visibility of train head from the road included in the level crossing metric (point 6.1 metrics)

distance measured from the extreme rail												distance between axes tracks "d"	speed V in the passing area	required visibility conditions		
5 m track side				10 m track side				20 m track side								
rights		left		rights		left		rights		left						
right	left	right	left	right	left	right	left	right	left	right	left			from 5 and 10 m	20 m	4 m
1200	**1000**	**780**	**1200**	**1200**	**1000**	**200**	**400**	**600**	**350**	**100**	**100**	**-**	**100 km/h**	**550**	**360**	**-**

Orange colour indicates distances of train head visibility from the road vehicle direction, included in the rail-road crossing metric.

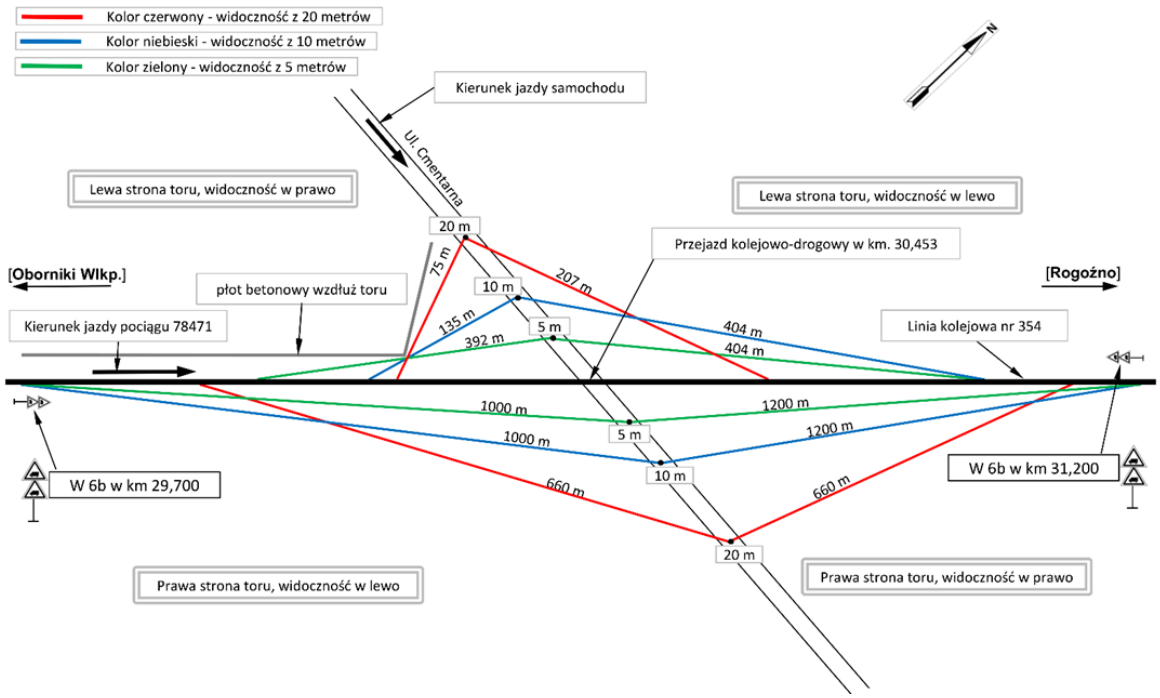
On 27.04.2021. The research team measured the visibility of the train front from the road.
The results of the measurements arFce included below in Table 2 and Figure 2.

Table 2 - Liability of train fronts from the road - GDPWK measurement

distance measured from the extreme rail											
5 m				10 m				20 m			
track side				track side				track side			
rights		left		rights		left		rights		left	
right	left	right	left	right	left	right	left	right	left	right	left
1200	**1000**	**392**	**404**	**1200**	**1000**	**135**	**404**	**660**	**660**	**75**	**207**

The yellow colour in Table 2 indicates the distances measured by the Study Team for visibility of the train front from the direction of travel of the road vehicle.

Figure 2 - Triangles of visibility of the train front from the road measured by the Study Team (developed by GDPWK)



The maximum permissible speed for trains in the level crossing area shall be calculated on the basis of the measured real headway visibility distances. Table 3 gives the required front visibility distances for the three selected train speeds.

Table 3 - Required conditions for visibility of train front from the road depending on train speed

for train speeds at level crossing	visibility required from 5 m and 10 m	visibility required from 20 m
120 km/h	660 metres	432 metres
100 km/h	550 metres	360 metres
60 km/h	330 metres	216 metres

The investigation team found that the visibility parameters for the train front from the access road as stated in the level crossing metric were not consistent with the facts. On the day of the accident, a train speed of up to 120 km/h was in force at the level crossing. The visibility values given in the rail-road crossing metric allowed train speeds of up to 100 km/h. Taking into account the non-conformities found, the Chairman of the GDPRC issued a recommendation to measure the visibility of the train front from the approach road using a railway vehicle of the same type as in the incident. The results of the measurements are entered in Table 2 and plotted in Figure 2.
Analysing the collected material, the Investigation Team found that the visibility conditions had not changed since the date of the entry of the visibility measurements in the metric of the level crossing, i.e. 20.08.2020. The visibility of the train front was mainly limited by a concrete fence and concrete traction poles (Photo 6). From the measurements made by the Research Team, it is clear that with a train head visibility of 392 metres from 5 metres, the speed of trains within the railway-road crossing should not exceed 70 km/h.
In the opinion of the Investigation Team, the data contained in the rail-road crossing metric regarding the visibility of the train front did not reflect the actual situation. The actual conditions of visibility of the train front from the road indicated that the speed of the trains had to be reduced.

Photo 6. Visibility from 5 m (source: GDPWK)

1.9. Any other information relevant to the description of the event and background information

There was a 375 m long fence made of prefabricated concrete elements on the left side of the track before the level crossing from the Oborniki Wlkp station. The height of the fence was 2.0 - 2.5 m, the distance from the rail from 5.0 m to 7.5 m. The fence ends approximately 50m before the level crossing and restricts visibility for drivers of railway and road vehicles.
On the same side of the track as the fence there are concrete catenary poles also limiting the field of vision.

Photo 7. Fence and traction poles restricting visibility (source: GDPWK)

2. A factual account of events

2.1. The chain of discrete events leading up to the event, including: actions taken by the persons involved; operation of rolling stock and technical installations; operation of the operating system

On 04 April 2021 (first day of Easter) a road vehicle (Citroen Saxo passenger car) left Oborniki. The driver of the road vehicle was travelling to visit family in Rożnovo for a Christmas appointment. The route had been travelled many times before by the driver of the road vehicle. After turning off the national road No. 11 and entering the municipal road No. 271632P - ul. Cemetery Street, the car was travelling at low speed towards the level crossing. While approaching a rail-road crossing, the driver of a road vehicle failed to obey the B-20 "Stop" sign and continued driving without stopping. Based on the recording from the pre-field camera from the driver's cab of train ROJ 78471, the speed of the road vehicle on the approach to the level crossing was approximately 10 km/h.

On the same day at 08:31 according to the timetable a passenger train ROJ 78471 relation Poznań Główny - Piła Główna was pulled out from Poznań Główny station. The train made its last scheduled stop at Oborniki Wielkopolskie station at 09:07. After departing from this station, the train was approaching the level crossing at kilometre 30.453 at a speed of 118 km/h. After passing the W6b indicator relating to this crossing, the driver gave the audible signal "Attention" three times. As he continued driving, the driver noticed a passenger car slowly approaching the level crossing from the left. At 88 m before the level crossing, the driver, seeing the passenger car driver's lack of reaction to the audible signals, again gave the "Attention" signal and applied the emergency brake. The car continued driving and drove directly in front of a moving passenger train ROJ 78471. The impact was on the right side of the passenger car. The speed of the train when it hit the road vehicle was 115 km/h. The front of the train stopped at kilometre 30.845, i.e. 392 metres behind the axis of the level crossing. As a result of this impact, the driver of the road vehicle died on the spot and the road vehicle was pushed by the train until it came to a complete stop. The incident did not derail the train.

Photos 8 - 11 show the course of the incident as recorded by the forecourt camera from the driver's cab of train ROJ 78471.

Photo 8. View from the driver's cab just before the collision - about 100m to the level crossing, 09:09:59 (source: GDPWK)

Photo 9. View from the driver's cab just before the crash - about 64m to the rail-road crossing, 09:10:00 (source: GDPWK)

Photo 10. View from the driver's cab just before the crash - approximately 39m to the level crossing, 09:10:01 (source: GDPWK)

Photo 11. View from the driver's cab at the time of the crash - 09:10:02 (source: GDPWK)

2.2. The sequence of events from the occurrence of the incident until the end of the emergency services' operations, including: measures taken to protect and secure the scene of the incident; the efforts of the rescue and emergency services

After stopping the train, the driver informed about the incident by means of a train radio telephone to the duty officer of the nearest Oborniki Wielkopolskie station (LCS stand IV) and remained in the cab of the vehicle until the arrival of the Police. The traffic officer then notified the accident to: company dispatcher at 09:15, deputy head of the operations section at 09:17 and line dispatcher at 09:17.

The train driver was in the middle of the train at the time of the collision. After the train came to a sudden halt, he went to the driver's cab, where he learned of the accident with the car. He then got off the train to check what had happened. On reaching the front of the train, he informed the telephone operator of the accident. 112 and attempted to get into the car to check the driver's condition and provide possible assistance. The car door and boot lid could not be opened and the driver did not respond to calls and gave no sign of life. The train manager then proceeded to the level crossing to give the 112 operator the exact location of the scene, as shown on the yellow sticker on the inside of the St. John's cross. Andrew.

The ambulance service arrived at the scene at 09:25, the Fire Brigade and Police at 09:40, the head of the operations section at 10:00, the Prosecutor at 11:15.

The rescue operation was completed at 13:55.

IV. ANALYSIS OF THE ACCIDENT

1. Roles and responsibilities

1.1. Railway undertakings or infrastructure managers

Infrastructure manager PKP PLK S.A. Railway Company in Poznań

The Railway Infrastructure Manager is responsible for the proper maintenance of the railway line and level crossings. Obligations imposed on the manager are set out, inter alia, in the provisions of art. 62. par. 1, items 1 and 2 of the Act - Construction Law, which obliges managers to carry out periodic (annual and five-year) inspections of construction objects (including railway and road crossings). The infrastructure manager's internal instruction Id-1 in §31 obliges to carry out a diagnostic survey of the building at least once a year.
The last periodic inspection (five years) before the accident took place on 20.08.2020 for a scheduled speed of 100 km/h. The infrastructure manager has carried out the required checks and recorded the results. The inspection found limited visibility due to shrubs and a fence. A recommendation has been made to trim shrubs to improve visibility. The recommendation was implemented, as confirmed by the protocol of acceptance of the works dated 21.09.2020.
The infrastructure manager's staff who first arrived at the scene of the incident acted in accordance with the provisions of §5 of Instruction *Ir-8 on dealing with serious railway accidents, incidents and accidents*.

Railway undertaking POLREGIO sp. z o.o. Greater Poznań Facility

The Railway Undertaking has designated a railway vehicle for the performance of the transport task which has been granted a certificate of authorisation for the type of railway vehicle and a certificate of technical fitness of the vehicle. The designated train crew operating the train had all the authorisations and qualifications required by the regulations. The train was run on a timetable.
Responsibilities of railway undertakings for safe driving of railway vehicle are defined in infrastructure manager's instruction Ir-1 - train running, Ie-1(E-1) - instruction for signalling and railway undertaking's internal instruction Pt-2 - instruction for traction vehicle crew. On the basis of the analysis of the collected material, the Investigation Team did not find any irregularities in the behaviour of the train crew during and after the incident.

1.2. Entities in charge of maintenance, maintenance workshops or any other providers of maintenance services

POLREGIO sp. z o.o. is responsible for maintenance of railway vehicles. With regard to the maintenance of levels P1 and P2 (in accordance with the Maintenance System Documentation - DSU), the company performs the tasks on its own, while the remaining levels of inspections (P3, P4) included in the DSU are performed by external entities. The maintenance inspections identified in the DSU were carried out in accordance with the cycles specified in the documentation. The investigation team, based on the investigation material collected, did not find a link between the way the railway vehicles were maintained and the incident.

1.3. Rolling stock manufacturers or other suppliers of railway products

Based on the research material collected, the research team did not find a link between rolling stock manufacturers and service providers and the incident.

1.4. The national safety authorities or the European Union Railway Agency

The President of the Railway Transport Office (UTK) supervises railway traffic safety. The research team, on the basis of the collected research material, did not establish a link between the national security authority and the investigated event.

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1.5. Notified bodies, designated bodies or risk assessment bodies

The investigation team, on the basis of the investigation material collected, did not identify a link to the accident between notified bodies and risk assessment bodies.

1.6. The certification bodies of entities in charge of maintenance listed in point 1.2.

The investigation team, on the basis of the investigation material collected, did not find a link between the railway undertaking's certification body and the incident under investigation.

1.7. Any other person or entity involved in the incident, as may be documented in one of the relevant safety management systems, or as referred to in the register or relevant legal framework

The obligation to properly mark the access road to the level crossing belongs to the administrator of the municipal road, i.e. the Mayor of Oborniki.
The survey team found no irregularities in the road markings based on the survey material collected.

2. Rolling stock and technical installations

The EN57ALc powered railway vehicle is equipped by the manufacturer with Deuta Werke's electronic system for recording driving parameters and with a system for recording foreground images and voice recordings from inside the vehicle.
The research team analysed selected driving parameters recorded on the electronic data recorder to investigate the driving characteristics of the train immediately before the incident. Driving parameters of the railway vehicle on the section from the station Oborniki Wielkopolskie to the moment of stopping after the event are presented in the diagram below.

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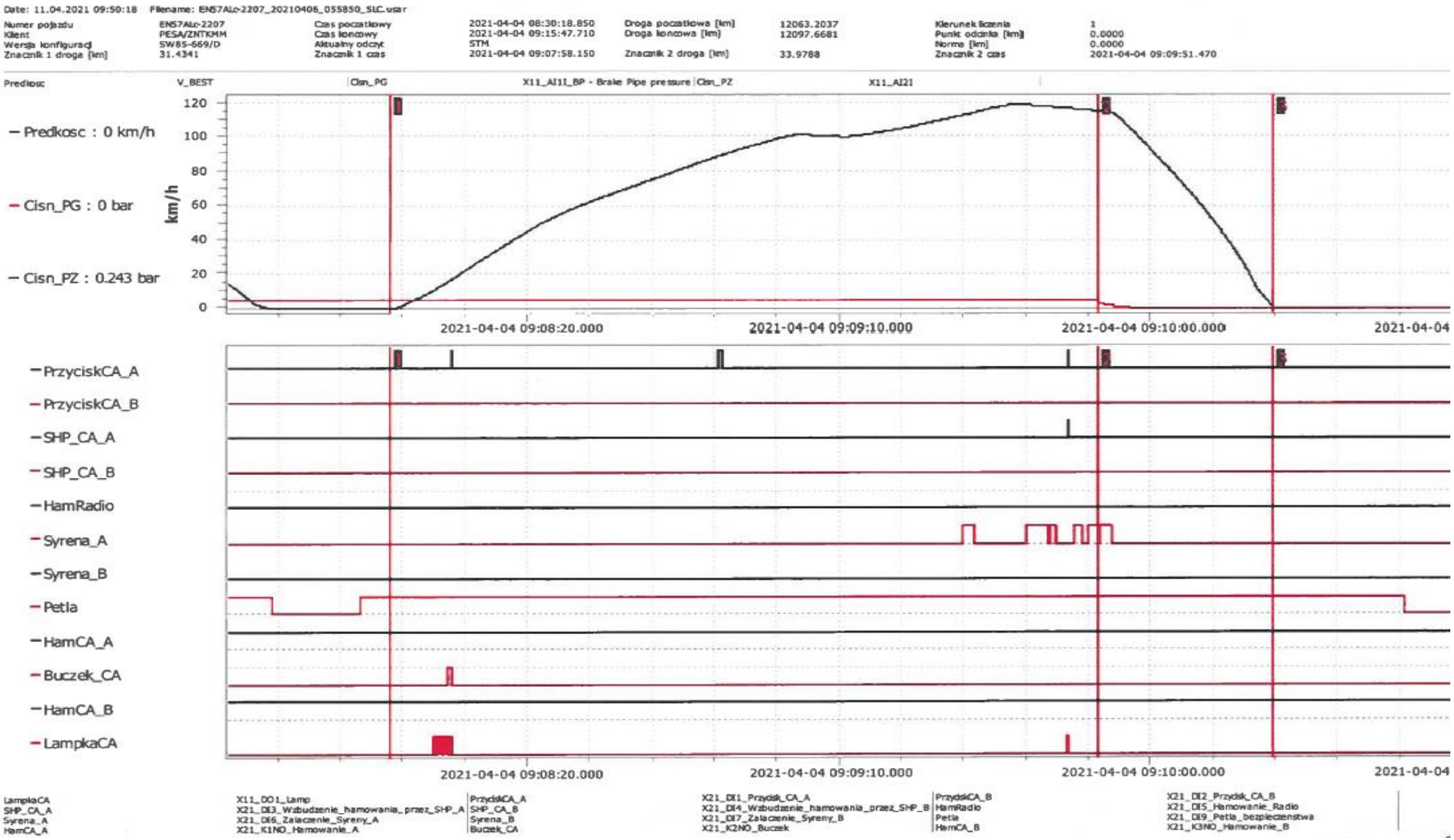
Figure 3 - Graph of EN57ALc-2207 driving parameters as a function of time (developed by GDPWK)



The above diagram shows, inter alia, the following running parameters of train ROJ 78471:

1. speed,
2. pressure in the main line,
3. pressure in the air reservoir,
4. use of the active standby button,
5. use of the SHP button,
6. use of an audible signal,
7. cab identification - control from cab B.

Description of recording of parameters of the Deuta Werke type recorder, device number RBF4S5pycnag, installed on EN57 ALC - 2207 vehicle dated 04.04.2021 during the train journey 78471 between Poznań Główny and Piła Główna.

The analysis covers train travel between 08:30 and 09:15 on railway line no. 354 Poznań Główny POD - Piła Główna. At 08:31, the train is started up to 40 km/h and performs a control brake, reducing the speed to 20 km/h. At 09:07 arrival at Oborniki Wlkp station. Standstill 30 seconds. Once the train has started up, the speed reaches 118 km/h. Hour 09:09:51 there is a sudden drop in air pressure from the main line to 0 MPA. The driver applied the emergency brake using the air brake and at the same time gave the signal Rp1 "Attention". The braking distance according to the recorder was 480 metres. The train is stopped at 09:10:19. On the basis of the analysis of the data, it can be concluded that the driver drove the train in accordance with the internal timetable and complied with the applicable speeds included in the timetable, the list of permanent warnings and ad hoc warnings included in Written Order "O" No. 884. The driver's vigilance control devices on the vehicle were operational and functioning.
Passing the W6b indicator relating to the level crossing at km 30,453, the driver gave the audible signal Rp1 "Attention" several times. The start of a continuous audible signal is recorded 108 metres before the level crossing. At 88 m before the level crossing, the driver applied the emergency brake. The speed of the train when it hit the road vehicle was 115 km/h. The front of the train stopped at kilometre 30.845, that is 392 metres behind the axis of the level crossing.

The image recording from the vehicle's forecourt image recording system confirmed the above findings in the DVR data analysis. The video recording also confirmed that the driver of the passenger car did not obey the B20 "STOP" sign and did not stop before the level crossing by driving directly in front of the train.

3. Human factors

3.1. Human and individual characteristics

The investigation did not reveal the influence of the individual characteristics of the driver on the incident. A sobriety test on the driver and the train manager showed no alcohol in their breath.
The presence of alcohol and other psychoactive compounds was also not detected in the blood of the driver of the road vehicle. The driver knew the route well and had travelled it many times. In view of the driver's death, it was not possible to establish the influence of the driver's individual characteristics on the failure to comply with the applicable regulations. According to information provided by the family, the driver of the road vehicle was travelling to a family Christmas gathering in Rożnovo that had been arranged for 09:15. Having regard to the time of the accident, i.e. 09:10, a likely additional contributing factor was the driver's haste in driving the road vehicle.

3.2. Job-related factors

The EN57ALc-220 electric multiple unit has the relevant authorisation for operation on the Polish railway network. Working time for the train crew in accordance with the applicable standards. The team did not raise objections to factors related to the job of a traction vehicle driver.

3.3. Organisational factors and tasks

The material collected by the Investigation Team shows that the employer provided the statutorily required rest time to the train crew involved in the incident. Railway carrier POLREGIO sp. z o.o., in accordance with the acquired Safety Management System, within the framework of competence management in positions directly related to railway traffic operation and safety as well as engine driver and vehicle driver, provided cyclical trainings for employees. The employees involved in the incident had all the authorisations and licences required by law and instructions in relation to the activities carried out on the job. These workers were provided with the necessary instructions and regulations to ensure that their work was carried out safely.

3.4. Environmental factors

The incident took place in good weather conditions, without rain or fog. It was early morning, the sky was cloudless, sunny, the sun was low above the horizon, the direction of the sun's rays was along the road towards the oncoming car, the temperature was about 5º C. Within the railway-road crossing at the time of the incident there were no other road users likely to absorb the attention of the driver of the road vehicle. No work was carried out in the area of the rail-road crossing.

The investigation team concluded that the contributing factors to the accident were:

- insufficient visibility of the train head from the driving position of the road vehicle when approaching a level crossing (lack of the required visibility triangles) due to a concrete fence and concrete catenary poles in the vicinity of the railway line,
- an acute angle of intersection between the road and the railway line of 67°, making it even more difficult for the driver to see the front of the approaching train,
- the rays of the sun being at a low height shining on the windscreen of the car, making it difficult for the driver to see the front of the approaching train.

3.5. Any other factors relevant to the procedure

The basic regulation for users of public roads is the Road Traffic Law referred to as the "Traffic Code", i.e. the provisions of the Act of 20 June 1997. - Road Traffic Law.

Special provisions concerning level crossings are contained in Article 28 of this Act and state that:

§ 1. *The driver of a vehicle, when approaching a railway-road crossing and crossing a crossing, is obliged to exercise particular caution. Before entering the track, he must ensure that no rail vehicles are approaching and take the necessary precautions, especially if air clarity is reduced by fog or other reasons.*

2. *The driver shall be required to drive the vehicle at such a speed as to stop it in a safe place when a rail vehicle is approaching or when a safety device or signal prohibits entry at a crossing."*

The Regulation of the Ministers of Infrastructure and Internal Affairs and Administration of 31 July 2002 on road signs and signals (consolidated text. Journal of Laws 2019, item 2310, as amended), which in § 78(5) states that:

1. *Sign G-3" cross of St. George St. Andrew's Cathedral before a level crossing - designates a place to stop in connection with the movement of a train or other railway vehicle at a level crossing without barriers or without half barriers,...*"

and in § 21:

1. The B-20 "stop" sign means:

(1) prohibit entering a junction without stopping in front of a road with priority;

2) a duty to give way to drivers travelling on that road.

2. Stopping shall take place in a designated place or, failing that, in a place where the driver can ensure that he will not obstruct traffic on a road with priority.

3. A B-20 sign located within a junction only applies to the nearest carriageway ahead of which it is erected.

4. The provisions of paragraphs 1 to 3 shall apply mutatis mutandis to a B-20 sign placed in front of a rail vehicle track or at other points of intersection of traffic directions."

Entry of a road vehicle at a level crossing cat. D, directly in front of an oncoming passenger train No. ROJ 78471, the Investigation Team considered the causal factor of the incident.

Failure of a driver of a road vehicle to comply with the traffic regulations in force when approaching and passing a railway and road crossing, art. 28 of the Act of 20 June 1997 - Road Traffic Law (i.e. OJ 2021, item 450 as amended), including failure to stop the vehicle in relation to the B-20 "Stop" sign, the Study Team considered as a contributing factor.

The passenger car involved in the accident, a 2005 Citroen Saxo, was assessed by a court expert of the District Court in Poznań. According to the expert's opinion, the car was technically sound and the damage to the vehicle was the result of the accident.

4. Feedback and control mechanisms, including risk and safety management and monitoring processes

4.1. Conditions for an appropriate regulatory framework

Within the framework of the procedure in question, the Commission's Research Team conducted an analysis of the content of the "Threat Register", which is one of the most important elements of the Safety Management System of the infrastructure manager PKP Polskie Linie Kolejowe S.A.
Chapter 5 covers those risks associated with level crossings and pedestrian crossings as part of the railway infrastructure. These are risks caused by various irregularities in the formal and legal requirements, diagnostics, operation of equipment and maintenance of the crossing or crossing. The chapter also includes hazards caused by users of level or level crossings and other causes.
The following risks are associated with the event under investigation:
(1) Clause 5.7.3 'Limited visibility conditions at level crossing - failure to maintain visibility triangle',
(2) Point 5.9.4 'Failure to comply with the information provided by vertical road signs',
3) point. 8.6.12 "Failure to take action to introduce speed limits in the area of level crossings",
4) Paragraph 13.1.60 "Failure to conduct/improperly conduct an assessment of the significance of the change".
The study team found that the required visibility conditions were not checked and the significance of the change was not reassessed before the train speed was raised from 100 km/h to 120 km/h. This fact is recognised by the Research Team as a systemic cause.

4.2. The processes, methods, content and results of risk assessment and monitoring activities carried out by any of the parties involved: railway undertakings, infrastructure managers, entities in charge of maintenance, maintenance workshops, other maintenance providers, manufacturers and other entities and the independent assessment reports referred to in Article 6 of Implementing Regulation (EU) No 402/2013

In the Register of Significant Risks in POLREGIO sp. z o.o. prepared on 17 December 2020 under item no. 20 there is a risk described as *"an impact of a railway vehicle on a road vehicle (other road machine, agricultural machine) or vice versa at a railway-road crossing not equipped with a crossing system (cat.* D This risk was assessed by the interdisciplinary team as a third party risk, for which a value of 150 was taken and based on the risk matrix, the risk was identified as tolerable ($120 \leq R \leq 150$).

4.3. The safety management system of the railway undertakings and infrastructure managers involved, taking into account the essential elements set out in Article 9(3) of Directive (EU) 2016/798 and any EU implementing acts

Zarządca infrastruktury kolejowej PKP Polskie Linie Kolejowe S.A.

Safety Management System (SMS) in the company PKP Polskie Linie Kolejowe S.A., was introduced by the Resolution no. 30/2011 of 24 January 2011 on adopting an order introducing Safety Management System in PKP Polskie Linie Kolejowe S.A. A summary of selected SMS elements binding in PKP PLK S.A. is presented in the table below.

Table 4 - List of selected SMS elements used by PKP PLK S.A. related to the incident

No.	Symbol/ Procedure no	Name of document / procedure
Main process		
1.	SMS-PG-01	Provision of railway infrastructure and traffic operation
Supporting process procedures		
2.	SMS-PW-01	Maintaining the railway line in a technically and organisationally sound manner
	SMS/MMS-PR-02	Technical and operational risk assessment
	SMS/MMS-PR-03	Change management
	SMS/MMS-PD-05	Corrective and preventive action
3.	SMS/MMS-PW-03	Handling of railway incidents
4.	SMS-PW-04	Carrying out rail accident recovery operations
5.		Hazard register
6.		Safety improvement programme 2021

Staff familiarity with the SMS was analysed, including procedures for maintaining the railway line in technical and organisational efficiency, dealing with railway incidents and dealing with their consequences, and accessibility to up-to-date versions of individual procedures. A risk register is being maintained and a safety improvement programme for 2021 is being implemented.

As part of the Infrastructure Manager's Safety Management System (SMS), there is a Safety Management System procedure SMS/MMS-PR-03, entitled "Change Management". 'Change Management' - Its purpose is to define the process of change management in the railway system starting from the assessment of the importance of the change for this system until the implementation of this change. The procedure shall be used to determine the significance of the intended change to the railway system. The procedure applies to all organisational units of PKP PLK S.A. It stipulates that, in the event of an intention to introduce a change related to the technique, operation or organisation of the Company, the SMS or MMS coordinator in a particular cell or organisational unit introducing the change is obliged to apply to the Director of the Safety Office for a decision appointing a team to carry out an assessment of the significance of the change. In the event that a change is deemed to be significant, the Director of the Security Office shall appoint an interdisciplinary team to assess the risk of a significant change, which shall immediately proceed to define the system and implement the risk assessment process, in accordance with European Commission Regulation (EC) No 402/2013.
If a risk is found to be "tolerable" or "unacceptable", procedure SMS-PD-05, "Corrective and preventive actions", is applied. "Corrective and preventive actions". Once corrective actions have been identified, the team proceeds to reassess the risk in accordance with procedure SMS/MMS-PR-02 "Technical and Operational Risk Assessment". In the case of the incident under investigation, the railway infrastructure manager, whose responsibility it is to manage the infrastructure at the crossing, increased the speed on the line from 100 km/h to 120 km/h. During the examination, it was noted that on 04.09.2020, Amendment No. 24 to the Network Rules 2019/2020 was introduced which, among other things, raised the scheduled speed on railway line No. 354 to 120 km/h. The increase in speed required a prior update in the Running Network Description (POS) database. According to the procedure in force, it is necessary to indicate the number of the accepted "Significance of Change Assessment Report" when entering the uplift data.

No assessment of the safety impact of the change was undertaken prior to the submission of the change of speed application to the Carriage Performance Centre ("CRP"), despite such an obligation under the Safety Management System meaning that a change management and risk assessment process was not initiated. According to the GDPWK Study Team, the intention to increase the speed of trains through the level

crossing was a key reason to initiate the process of assessing the safety impact of the change. Furthermore, the change should have been considered significant due to the lack of required visibility at the crossing for the increased train speed parameters, a risk assessment should have been carried out in accordance with procedure SMS/MMS-PR-02. In addition, appropriate risk mitigation measures had to be proposed at the crossing, in accordance with procedure SMS/MMS-PD-05 "Corrective and preventive action".

As a result of the analysis of the SMS documentation in force at the infrastructure manager PKP PLK S.A., the Research Team concluded that no assessment of the significance of the change before raising the speed of trains within the railway-road crossing at km 30.453 from 100 km/h to 120 km/h has been carried out. The research team considers the failure to reassess the significance of the change as a systemic factor related to the incident.

Rail carrier: POLREGIO sp. z o. o., and from December 1st, 2021 as POLREGIO S.A.

The Safety Management System (SMS) at POLREGIO sp. z o. o., was introduced by Resolution No. 312/2020 of 23 September 2020 on the adoption of the Order introducing the Safety Management System Issue III at POLREGIO sp. z o. o. List of selected SMS elements used in POLREGIO sp. z o.o.

Table 5 - List of selected elements of SMS POLREGIO sp. z o.o. connected with the event

No.	Document number	Name of document / procedure
1.	01	Transport process
SUBSYSTEMS OF THE SAFETY MANAGEMENT SYSTEM		
2.	11	Purchase and maintenance of railway vehicles
3.	21	Competence management in posts: 1. directly related to the operation and safety of railway traffic and to the driver and the driver of vehicles, 2. indirectly linked to the operation and safety of rail traffic.
4.		Register of risks and hazards
5.		Safety Improvement Programme 2020
6.		Safety improvement programme 2021

As a result of analysis of SMS documentation of railway undertaking POLREGIO sp. z o. o. in relation to circumstances, course and results of the incident, the examination team does not raise any objections to the way SMS operates in the scope of execution of transport process, management of competences of employees, knowledge of SMS system by employees, procedure in case of railway traffic danger, availability of up-to-date versions of particular procedures. The company maintains a register of risks and identified threats.

4.4. The management system of the entity/entities in charge of maintenance and maintenance workshops, taking into account the functions laid down in Article 14(3) of and Annex III to Directive (EU) 2016/798 and any subsequent implementing acts

Not applicable.

4.5. Results of supervision by national safety authorities in accordance with Article 17 of Directive (EU) 2016/798

Within the framework of supervision, representatives of Railway Transport Office conducted the following inspections of railway infrastructure manager PKP PLK S.A. Railway Line Company in Poznań:

- from 20.01.2020 to 10.02.2020,
- from 17.01.2021 to 2.03.2021

The scope of the checks carried out included:

- technical condition and maintenance of railway traffic control devices, operation of railway traffic, technical condition, maintenance and classification of crossings of railway lines with roads on railway lines No. 352 Swarzędz - Poznań Starołęka and No. 272 Kluczbork - Poznań Główny located in Exploitation Section Poznań Franowo,
- technical condition, maintenance process and classification of railway line junctions with roads in selected locations on railway lines nr 236 Wągrowiec - Bzowo Goraj, nr 356 Poznań Wschód - Bydgoszcz Główna, nr 357 Powodowo - Luboń near Poznań, nr 394 Krzesiny - Kobylnica and nr 395 Zieliniec - Kiekrz.

Inspections did not concern railway line No. 354 Poznań Główny - Piła Główna, on which there is a level crossing at km 30.453, where the serious accident under investigation occurred.

4.6. Authorisations, certificates and assessment reports issued by the Agency, national safety authorities or other conformity assessment bodies

Railway Infrastructure Manager: PKP Polskie Linie Kolejowe S.A. owns:

Security authorisation:

- eU number PL2120210000,
- date of issue 26.02.2021,
- expiry date 01.03.2026,
- type of infrastructure; normal rail (99.2%), broad gauge (0.8%).

Size of infrastructure under management as reported in the 2019 Annual Report:

- total length of railway lines 18 680 km,
- total length of track 35 951 km,
- 38,663 turnouts,
- 14 013 level crossings, including 12 156 on railway lines in service

Rail carrier: POLREGIO sp. z o. o. owns:

1) Safety Certificate - Part A:
   - eU number PL1120200052,
   - date of issue 22.10.2020,
   - expiry date 22.10.2025,
   - type of service ..... passenger services, excluding high-speed services,
   - transport volume .....200 million or more passenger-kilometres per year,
   - company size - large.

Safety certificate part A covers railway sidings operated by POLREGIO sp. z o.o.

2) Safety Certificate - Part B:
   - UE number PL1220200065.
   - date of issue 22.10.2020,
   - expiry date 22.10.2025,
   - type of service.....passenger services, excluding high-speed services,
   - lines operated: PKP Polskie Linie Kolejowe S.A., PMT Linie Kolejowe sp. z o. o., PKP Szybka Kolej Miejska w Trójmieście sp. z o. o., Pomorska Kolej Metropolitarna S.A.

4.7. Other systemic factors

The study team did not identify any other systemic factors influencing the incident.

5. Previous incidents of a similar nature

Short description of incidents occurring at the level crossing at km 30.453 of railway line No. 354 Poznań Główny POD - Piła Główna:

1) On 17.02.2017 at 14:10 at the level crossing cat. D located on the track Oborniki Wielkopolskie - Rogoźno Wielkopolskie at km 30.453 of the railway line no. 354 Poznań Główny POD - Piła Główna passenger train No 48103 of the railway operator PKP Intercity S.A. (Katowice - Kołobrzeg), driven by the locomotive EU07-316, crashed into the rear of a Mercedes Sprinter delivery van entering the level crossing from the left side just before the train. No one was injured as a result of the accident. Train scheduled speed 60 km/h. When the sudden braking started, the train speed was 52 km/h. Railroad crossing signalized with B-20 "Stop" signs. The railway commission conducting the investigation did not reach any conclusions.
2) On 01/04/2019 at 13:14 at the Cat. D located on the route Oborniki Wielkopolskie - Rogoźno Wielkopolskie at km 30.453 of the railway line no. 354 Poznań Główny POD - Piła Główna, a Renault Master delivery van crashed into the side of locomotive EP07-1026 leading train no. EIE 8306 of the railway operator PKP Intercity S.A. relation Kołobrzeg - Przemyśl Główny from the left side. The driver of the car was seriously injured as a result of the accident. Train scheduled speed 100 km/h. When the sudden braking started, the train speed was 98 km/h. The Railway Commission conducting the investigation has reached the following conclusions:
    - The Railway Company in Poznań will apply to the road manager to place an additional A-30 "Other danger" sign together with a T-14d plate on both sides of the level crossing.
    - The Railway Company in Poznań will submit a request to the SOK to intensify controls at the crossing with the use of monitoring devices to ensure that drivers comply with the Traffic Law.

   The committee's proposals have been implemented.

Brief description of selected events investigated by GDPWK and impacts:

1) On 03.06.2015 at 15:45 passenger train no APM 59715 relation Toruń Główny - Grudziądz operated by rail bus type SA106-012 (no EVN 95-51-2810-041-4 PL ARP), belonging to railway operator ARRIVA RP Sp. z o. o, at level crossing cat. "D", located on the route Kornatowo - Grudziądz Mniszek, track no. 1, at km. 36.658, railway line no. 207 Toruń Wschodni - Malbork, hit a passenger car Volkswagen Sharan. The incident resulted in the death of two people (children), while two others were seriously injured. A passenger car was completely destroyed.
2) On 23 August 2018 at 11:17 a.m. a red passenger car marked with a blue plate with the white letter "L" drove into the railway-road crossing of category "D" constituting the intersection of the internal road (under the administration of the Mayor of Nowy Targ) being an extension of ul. Kolorowa with the railway line No. 99 Chabówka - Zakopane at km 25.749 (railway station Szaflary) after passing the warning sign B20 "STOP" (driving school of the Małopolski Ośrodek Ruchu Drogowego in Nowy Targ). The test vehicle driven by the test person stopped on the platform of the level crossing centrally in the track centreline. After several seconds, the examiner got out of the said car and hurriedly walked away from the track towards Kolorowa Street. The car moved forward covering a distance of approximately 0.5 metres and was then run over by a passenger train No ROJ 33397 composed of EZT Electric Multiple Unit EN99-004 and EN63-003, Chabówka - Zakopane, of the railway operator Przewozy Regionalne Sp. z o.o. Małopolska Branch. The car was hit by the automatic coupling of the railway vehicle EZT EN99-004 in the right side, i.e. on the passenger's side, which slammed deeply into the body (passenger compartment) causing its destruction (significant crushing of the body) and displacement (pushing) of the car for the distance of 112 metres behind the railway-road crossing in the place where the train head stopped. At the time of the collision, the car was occupied by a driver taking a driving test who suffered serious injuries as a result of the accident. The person was taken to hospital in Nowy Targ in a serious condition, where he died despite the intensive rescue operation undertaken immediately.
3) On 02/08/2019 at 19:42 hours at the category D level crossing at km. 34.751 of railway line No. 64 Kozłów - Koniecpol, a passenger car of the make Toyota Yaris drove directly in front of the oncoming passenger train EIE 8306 relation Kołobrzeg - Przemyśl Główny. The train consisted of an EP09 locomotive and 12 passenger carriages (railway carrier PKP Intercity S.A.). The impact of the train

was on the centre section of the car. As a result of the incident, the driver of the car died at the scene. The train attendants and passengers and were not injured. A passenger car was completely destroyed.

4) On 03 September 2020, during the journey of train MPS 32102 of railway undertaking PKP Intercity S.A. zagórz - Lublin Główny on track no. 1, on the Przybówka - Jasło freight single-track railway line no. 106 Rzeszów Główny - Jasło, at the cat. D at km 55.924 at 13:50, a train crashed into a road vehicle, namely a passenger car Opel Mokka. The road vehicle failed to stop before the B-20 'stop' sign and entered the level crossing directly in front of the front of locomotive SU160-007 leading a passenger train from the right-hand side to the direction of travel of the train. As a result of the serious accident, the driver of the road vehicle and his passenger died on the spot. The train crew and passengers on that train were not injured. A road vehicle was completely destroyed and a railway vehicle was also damaged. There was no damage to the environment or to rail and road infrastructure.

The causes of the above incidents included:

- failure to take special care by drivers of road vehicles,
- inadequate visibility of the train head from the access road,
- failure of infrastructure managers and/or road managers to react to deficiencies in the visibility of train fronts from the approach road and level crossing markings,
- failure of the examiner to attempt to unbuckle the examinee's seat belt to give a strong evacuation order in an imminent collision with an oncoming train posing an immediate risk to life,
- the implementation of emergency braking by the candidate train driver by means of a 'running and braking set-top box', with the possibility of using the 'driver's emergency brake', resulting in a longer braking distance for the train.

V. CONCLUSIONS

1. Summary of analysis and conclusions on the causes of the incident

The research team found that:

1) the driver of a road vehicle, while approaching a level crossing, disregarded B-20 and G-3 signs, in spite of an approaching train warning the users of the level crossing with signal Rp 1 "Attention" and drove onto the level crossing directly in front of train ROJ 78471,
2) despite limited visibility conditions in the area of the level crossing at km 30.453, the required conditions were not checked before increasing the speed of trains at the crossing from 100 km/h to 120 km/h and the significance of the change was not assessed.

As a result of the analysis of the SMS documentation in force at the infrastructure manager PKP PLK S.A., the Research Team concluded that:

- there has been no reassessment of the significance of the change before increasing the train speed at the level crossing at km 30.453 from 100 km/h to 120 km/h,
- as a result of the failure to reassess the significance of the change and to carry out a risk analysis, the Railway Infrastructure Manager failed to take appropriate preventive action regarding the lack of sufficient visibility of the train front end from the approach road on the left-hand side of the level crossing, as required by SMS' internal rules,
- diagnostic tests and inspections were not carried out in sufficient depth, as a result of which the abnormal visibility of the train front from the access road on the left side from 5 m to the right was not detected,
- the possible blinding of the driver of a road vehicle by the rays of the sun shining along the road at low height,
- insufficient visibility of the train head from the driving position of the road vehicle when approaching a level crossing (lack of the required visibility triangles) due to a concrete fence and concrete catenary poles in the vicinity of the railway line,
- an acute angle of intersection of the road and the railway line of 67°, additionally making it difficult for the driver to observe the front of the approaching train - the driver was approaching the level crossing and observed the approaching train from the acute angle.

2. Measures taken since the incident

On 13 April 2021 The Chairman of PKBWK by letter No. PKBWK.4631.4.2.2021 addressed to the President of PKP PLK S.A. recommended in relation to the railway-road crossing at km 30.453 of line No. 354 Poznań Główny POD - Piła Główna:

1) introduce speed limits for trains Vogr= 60km/h on the length of L sections of the railway line for this level crossing in both directions and install W6b indicators according to this speed and leave B-20 "stop" signs on the public road.
   The above speed limit shall be in force until the road system is reconstructed or the railway-road crossing is upgraded
2) measure the visibility triangles of the train front (with Pc-1 signal) using a powered railway vehicle with the assistance of members of the Commission's Examination Team. This measurement, among others, will condition the maintenance or change of the speed of Vogr as stipulated in Annex 3, part B, point 6 to the Regulation of the Minister of Infrastructure of 20 October 2015 on the technical conditions to be met by crossings of railway lines and railway sidings with roads and their location (Dz. Journal of Laws of 2015, item 1744).
3) Take measures to measure exceptionally the volume of road and rail traffic in order to calculate the traffic product as laid down in point 8 of Annex 1 to the Regulation referred to in point 2.

The train speed restriction referred to in point 1 was introduced from 10:00 on 14.04.2021.

The measurement of the visibility triangles of the train front (with Pc-1 signal) using a powered railway vehicle with the participation of the members of the Commission's Study Team referred to in point 2 was carried out on 27.04.2021.

In addition, on 20.04.2021, the railway commission, chaired by the controller from the Department of Railways in Poznań with the participation of representatives of the Municipal Office in Oborniki and the Police, analysed the possibility of changing the category of the railway-road crossing at km 30.453 of the line No. 354 Poznań Główny POD - Piła Główna from category D to category B. In protocol no. IZ16KI.505.13.2021 the commission adopted the following findings:

- The railway operator will erect turnouts across the entire width of the level crossing.
- PKP Energetyka S.A. will supply power to the crossing facilities and will install lighting on the crossing.
- The railway manager is requesting that the road system be rebuilt so that, from the side of national road No. 11, the access to the railway-road crossing is at a 90o angle to the track.

The committee requested that the built-up concrete fence near the rail-road crossing be surveyed and replaced with an openwork fence by the property owners.
During the course of the investigation, the concrete fence was altered and part of it replaced with an openwork fence in order to improve the visibility of the front of the train and the approaching road vehicle.
A traffic volume measurement was carried out on 05/06/05/2021 and the results are included in the updated level crossing metric. The current traffic product is 35334.

3. ADDITIONAL REMARKS

It was not.

VI. SAFETY RECOMMENDATIONS

1. Interim recommendations

As described in Chapter V, point 2.

2. Recommendations resulting from the investigation:

1) The infrastructure manager PKP PLK S.A., in order to ensure safety in the area of the railway-road crossing, will implement the arrangements for upgrading the crossing category resulting from Protocol No. IZ16KI.505.36.2021 of 20.04.2021.
2) Infrastructure managers shall take measures regarding the effectiveness of supervision of the implementation of SMS procedures or internal rules. In the case of changes to the railway line parameters concerning an increase in train speeds in the area of level crossings, an assessment of the significance of the change shall be carried out individually for each level crossing.
3) Infrastructure managers shall take measures to improve the quality and depth of inspections, diagnostic tests and the way the visibility triangle of level crossings is measured. When measuring visibility triangles account must be taken of the fact that the visibility of the train head from 5 metres from the outermost rail must be continuous (not obscured by any objects as the train approaches the level crossing) and must include the front end signal lanterns.
If this condition is not complied with, the speed of trains in the area of level crossings shall be reduced in accordance with the legislation in force.

PRESIDENT
THE NATIONAL RAILWAY ACCIDENT INVESTIGATION BOARD

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Tadeusz Rys

List of abbreviations in the content of the Report **No. PKBWK 01/2022**

No.	Symbol (abbreviation)	Explanation
1	*2*	*3*
1.	EUAR	The European Union's Adhesive Agency
2.	MSWiA	Ministry of the Interior and Administration
3.	UTK	Railway Transport Office
4.	GDPWK	State Commission for the Investigation of Railway Accidents
5.	IZ	PKP CARGO S.A. - Department of Railways
6.	IZDD	PKP CARGO S.A. - Company dispatcher

Definitions of selected terms used in the Report:

"causal factor" means any act, omission, event or condition or combination thereof which, if corrected, eliminated or avoided, would most likely have prevented the event,

"Contributing factor" means any act, omission, event or condition which influences the occurrence of an event by increasing its probability, accelerating its consequences in time or increasing the severity of the consequences, but the elimination of which would not have prevented the event,

"systemic factor" means any causal or contributing factor of an organisational, managerial, societal or regulatory nature which could influence similar and related future events, taking into account in particular the conditions of the regulatory framework, the design and application of the safety management system, personnel skills, procedures and maintenance.

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