STATE COMMISSION ON RAILWAY ACCIDENT INVESTIGATION
Ministry of the Interior and Administration

REPORT No. PKBWK 04/2023

on the investigation of a railway accident
that occurred on 12 December 2022 at 02:35 hrs on the Koziegłowy – Poznań Piątkowo route,
track no. 2, km 11.788 of railway line no. 395 Zieliniec – Kiekrz,
a Category C level crossing
area of the infrastructure manager PKP PLK S.A. Railway Line Plant in Poznań

WARSAW, 11 December 2023

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

Pursuant to Article 28f (3) of the Act of 28 March 2003 on rail transport, the Commission's investigation determines neither guilt nor liability.

This Report has been prepared under the provisions of *Commission Implementing Regulation (EU) 2020/572 of 24 April 2020 on the reporting structure to be used for railway accidents and incidents investigation report (OJ L 132 of 27 April 2020)*

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I. SUMMARY

Type of the occurrence: Accident.

Description: An occurrence at a Category C level crossing during which a passenger car went directly in front of an incoming train during as road signals ordered not to go beyond them, which led to a collision of a freight train with the passenger car.

Date of the occurrence: 12 December 2022, 02:35 hrs.

Place of occurrence: C Category level crossing located on the Koziegłowy – Poznań Piątkowo route, track no. 2, km 11.788 of railway line no. 395 Zieliniec - Kiekrz, crossing identification number 395 11 788, geographical coordinates 52º46'61"N 16º91'30"E.

Consequences of the occurrence: As a result of the occurrence, a passenger car was destroyed and an ET22 -1082 locomotive was damaged. The driver of the road vehicle sustained injuries and was taken to hospital. The train was not derailed.

Causal factor:

(means any action, omission, event or condition, or a combination thereof that if corrected, eliminated, or avoided would have prevented the occurrence, in all likelihood)

Entry of a passenger car to a level crossing when a train was approaching that crossing.

Contributing factors:

(means any action, omission, event or condition that affects an occurrence by increasing its likelihood, accelerating the effect in time or increasing the severity of the consequences, but the elimination of which would not have prevented the occurrence)

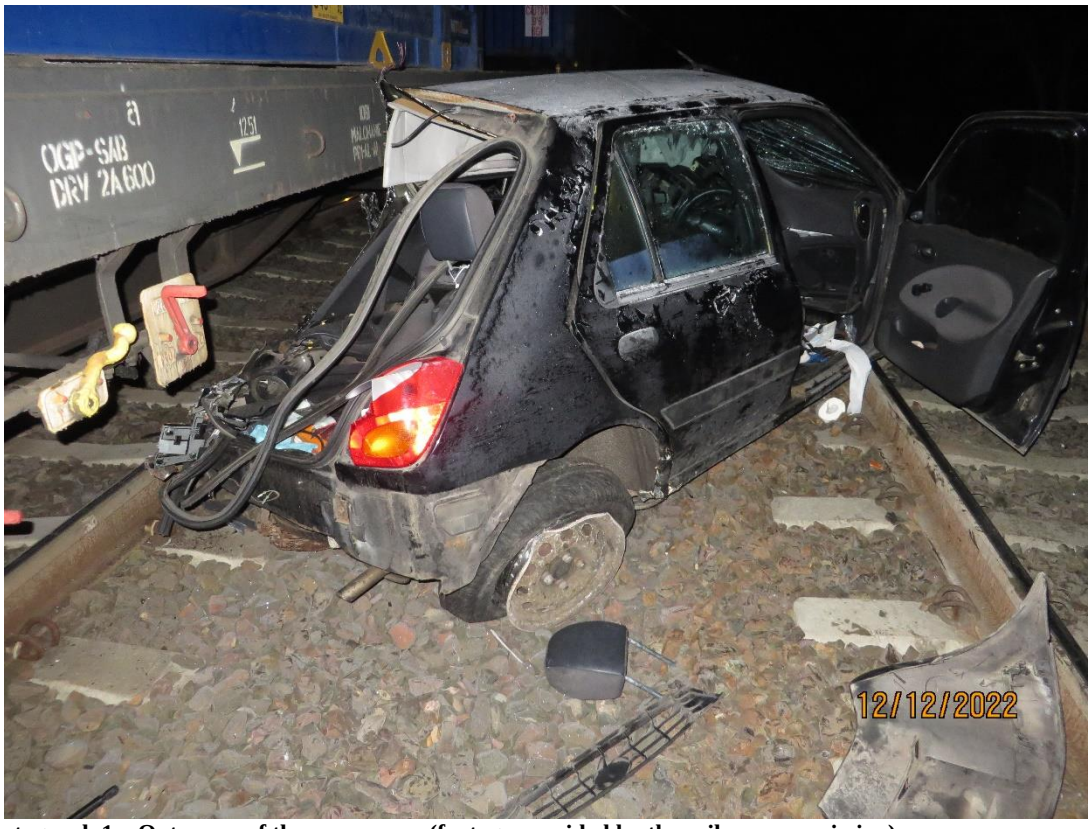
1) Failure of the driver of the road vehicle to take special caution before and after driving through the level crossing as the road signals ordered not to go beyond those signals, and failure to stop when the train was approaching.
2) Activation by a train dispatcher of train-controlled automatic crossing system devices at a Category C level crossing, which caused prolonged operation of the signalling system lasting non-stop for 9 hours and 30 minutes.
3) Absence of a 20 km/h speed limit for trains at the level crossing.
4) Reduced visibility of the head of trains at 5 metres for road users due to a container and a GSMR tower erected in the visibility triangle.

Systemic factors: None found.

Recommendations and their addressees:

1) Authorised infrastructure managers shall take targeted actions addressed to their personnel (operation, repair, maintenance) to refresh the uniform rules of conduct in the event of non-activity of traffic protection devices at level crossings.
2) In the event of a malfunction of automatic crossing system devices which cause the Osp-1 signal (Polish: *tarcza ostrzegawcza przejazdowa*, TOP) to be displayed by level crossing warning signal lights for one track of a given level crossing, infrastructure managers shall cause that the Osp-1 signal is displayed for all tracks within the level crossing concerned.
3) In the event of an unserviceability of the automatic crossing system due to a malfunction of its elements, infrastructure manager PKP PLK S.A. shall prohibit re-activation of the automatic crossing system from the remote control device level by the operating personnel after signalling by road signals is turned off by the operating personnel.
4) Infrastructure manager PKP PLK S.A. shall inspect and enhance supervision of the correctness and completeness of the provisions laid down in Books E1758.

5) Railway undertaking PKP CARGO S.A. shall enhance supervision of the management of rail vehicle maintenance documentation, in particular as regards its accuracy concerning the condition of the vehicle.
6) Infrastructure manager PKP PLK S.A. shall take effective actions to synchronise time in the electronic time system which it operates.
7) Authorised infrastructure managers shall include in their hazard records hazards related to any structures erected within the visibility triangle. In each case, they shall conduct a risk analysis at the stage of designing structures close to level crossings, taking into account the local conditions of a given level crossing.
8) Users of rail sidings, operators of narrow-gauge railways and infrastructure managers exempt from the obligation to obtain a safety authorisation and authorised to operate under a safety certificate shall inspect the conditions of development within visibility triangles, taking into account *inter alia* the provisions of paragraphs 14 and 15 of Part B of Annex 3 to the 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 sidings with roads, and on their positioning (Journal of Laws of 2015, item 1744, as amended).



Photograph 1 – Outcomes of the occurrence (footage provided by the railway commission)

STATE COMMISSION ON RAILWAY ACCIDENT INVESTIGATION
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II. THE INVESTIGATION AND ITS CONTEXT

1. The decision to establish an investigation

The Chairman of the State Commission on Rail Accident Investigation (hereinafter referred to as "PKBWK" or "the Commission") Tadeusz Ryś issued Decision no. PKBWK.590.2.2023 of 17 January 2023 on establishing an investigation to explain the causes and circumstances of an accident at a Category C level crossing at km 11.788. Considering this fact and the provisions of Article 28e(4) of the Act of 28 March 2003 on rail transport (consolidated text: Journal of Laws of 2021, item 1984, as amended), hereinafter referred to as the "Rail Transport Act", the occurrence was reported to the European Union Railway Agency and registered in its database under number PL-10357.

2. The motivation to the decision to establish an investigation

Based on analysis of the circumstances and considering the initial findings from an inspection of the accident site which did not provide the actual picture of the condition of the devices or their operation, or the compliance with the applicable procedures prior to and at the moment of the accident, the PKBWK Chairman decided to establish an investigation to be conducted by an Investigation Team pursuant to Article 28e(2a) of the Rail Transport Act.

3. The scope and limits of the investigation including a justification thereof, as well as an explanation of any delay that are considered a risk or other impact to the conduct of the investigation or its conclusions

There were no limits during the investigation that would have a negative impact on its course.
The investigation into the causes of the occurrence was conducted under Article 28h(1) of the Rail Transport Act and, in accordance with the provisions of Article 28f(3) does not determine guilt or liability.

4. An aggregated description of the technical capabilities and the functions in the team of investigators.

The Chairman of the Commission nominated a three-person Investigation Team from among the standing members of the Commission, equipping it with qualifications and competencies regarding the investigation concerned.

5. A description of the communication and consultation process established with persons or entities involved in the occurrence during the investigation and in relation to the information provided

Under Article 28h(2)(5) of he Rail Transport Act, the PKBWK Chairman obliged specific persons from the railway commission to cooperate with the Investigation Team (Letter no. PKBWK.590.2.1.2023 of 18 January 2023).
In accordance with Letter no. PKBWK.590.2.2.2023 of 18 January 2023, the chairman of the railway commission transferred formally the accumulated documentation to the Investigation Team on 24 January 2023.

6. A description of the level of cooperation offered by the entities involved

Cooperation with representatives of the entities linked with the circumstances of the occurrence which took place during the investigation into the causes and circumstances of the occurrence did not give rise to any objections of the Investigation Team.

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

Throughout the process aimed at investigating the causes and circumstances of the occurrence, the Investigation Team considered the provisions of national rules, internal rules of the infrastructure manager and the technical documentation. Furthermore, the Investigation Team relied on their own knowledge and experience, as well as on the documentation prepared by the Investigation Team and the railway commission. Within the investigation, the Investigation Team carried out *inter alia* the following activities:

- an inspection of the site and consequences of the occurrence on the day of the accident, including, but not limited to, an inspection of the level crossing, access roads and the railway line,
- interviews with the personnel related to the occurrence,
- preparation of photo and video documentation on the day of the accident and at later dates,
- analyses of the documentation transferred by the railway undertaking, railway line manager, and owner of the road vehicle,
- analyses of the data from the driving data recorder of the rail vehicle (locomotive ET22-1082),
- analyses of the data recorded by the Automatic Crossing System (Polish: *Samoczynny System Przejazdowy*, SSP),
- analyses of the documentation on the level crossing,
- analyses of the internal provisions of the infrastructure manager and railway undertaking applicable to the occurrence concerned,
- analyses of the Safety Management System (SMS) operated by the infrastructure manager and railway undertaking,
- analyses of the rail vehicle's maintenance system documentation (Polish: *Dokumentacja Systemu Utrzymania*, DSU).

Below is a list of selected legal acts, rules and internal instructions used during the investigation:

European Union rules:

1) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (OJ L 138, 26.05.2016, p. 102, as amended).
2) Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 04.05.2016, p. 1, as amended).
3) Commission Implementing Regulation (EU) 2020/572 of 24 April 2020 on the reporting structure to be followed for railway accident and incident investigation reports (OJ L 132, 27.04.2020).

National rules:

1) Act of 28 March 2003 on rail transport (consolidated text: Journal of Laws of 2021, item 1984, as amended).
2) Act of 7 July 1994 on the Construction Law (consolidated text: Journal of Laws of 2020, Item 1333, as amended).

3) Act of 20 June 1997 on the Road Traffic Law (consolidated text: Journal of Laws of 2022, item 988, as amended).
4) Act of 21 March 1985 on public roads (consolidated text: Journal of Laws z of 2021, item 1376, as amended).
5) Act of 10 May 2018 on the protection of personal data (Journal of Laws of 2018, item 1000).
6) 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 sidings with roads, and on their positioning (Journal of Laws of 2015, item 1744, as amended).
7) Regulation of the Minister of Infrastructure of 11 January 2021 on personnel employed on positions related directly to the conduct and safety of rail traffic and to driving of specific types of rails vehicles (Journal of Laws of 2021, item 101, as amended).
8) Regulation of the Minister of Infrastructure and Construction of 16 March 2016 on serious accidents, accidents and incidents in rail transport (Journal of Laws of 2016, item 369).
9) Regulation of the Minister of Infrastructure of 18 July 2005 on general conditions for rail traffic and signalling (consolidated text: Journal of Laws of 2015, item 360, as amended).
10) Regulation of the ministers of Infrastructure and of the Interior and Administration of 31 July 2002 on road signs and signals (consolidated text: Journal of Laws of 2019, item 2310, as amended).
11) Regulation of the Minister of Transport and Maritime Economy of 2 March 1999 on the technical conditions to be met by public roads and on their positioning (consolidated text: Journal of Laws of 2016, item 124, as amended).

Internal instructions of railway undertaking PKP CARGO S.A.

1) Instruction for a driver of a traction vehicle – Ct-1.
2) Instruction on maintenance of traction vehicles – Ct-3.

Internal instructions of infrastructure manager PKP PLK S.A.

1) Ir – 8 Instruction on the handling of serious accidents, accidents and incidents in rail transport.
2) Ir – 1 Instruction on the conduct of train traffic operations.
3) Ie – 4 (WTB-E10) Technical guidelines on the construction of rail traffic control devices.
4) Id – 1 Technical conditions on the maintenance of the surface of railway lines.
5) Ik – 2 Instruction on rail traffic safety supervision.
6) Id – 7 Instruction on surveillance of railway lines.
7) Ir – 7 Instruction on the maintenance of level crossings and passages.

8. A description of the difficulties and specific challenges encountered during the investigation

Members of the Investigation Team did not encounter any difficulties or problems that could have impact on the course, timeliness or conclusions of the investigation.

9. Any interaction with the judicial authorities

No interaction with the judicial authorities was required.

10. Other information relevant in the context of the investigation

The Investigation Team did not identify any other information relevant in the context of the investigation into the causes of the occurrence.

III. DESCRIPTION OF THE OCCURRENCE

1. The occurrence and background information

1.1. The description of the occurrence type

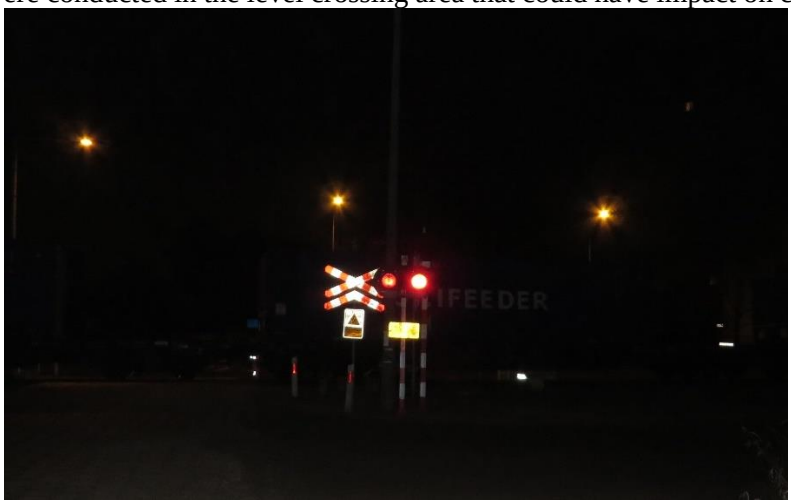
An accident-category occurrence at a level crossing. An occurrence at a Category C level crossing during which a passenger car went directly in front of an incoming train during as road signals ordered not to go beyond them, which led to a collision of a freight train with the passenger car.

1.2. The date, exact time and location of the occurrence

The occurrence took place on 12 December 2022 at 02:35 hrs at a Category C level crossing, track no. 2, located on the Koziegłowy – Poznań Piątkowo route, at km 11.788 of railway line no. 395 Zieliniec - Kiekrz.

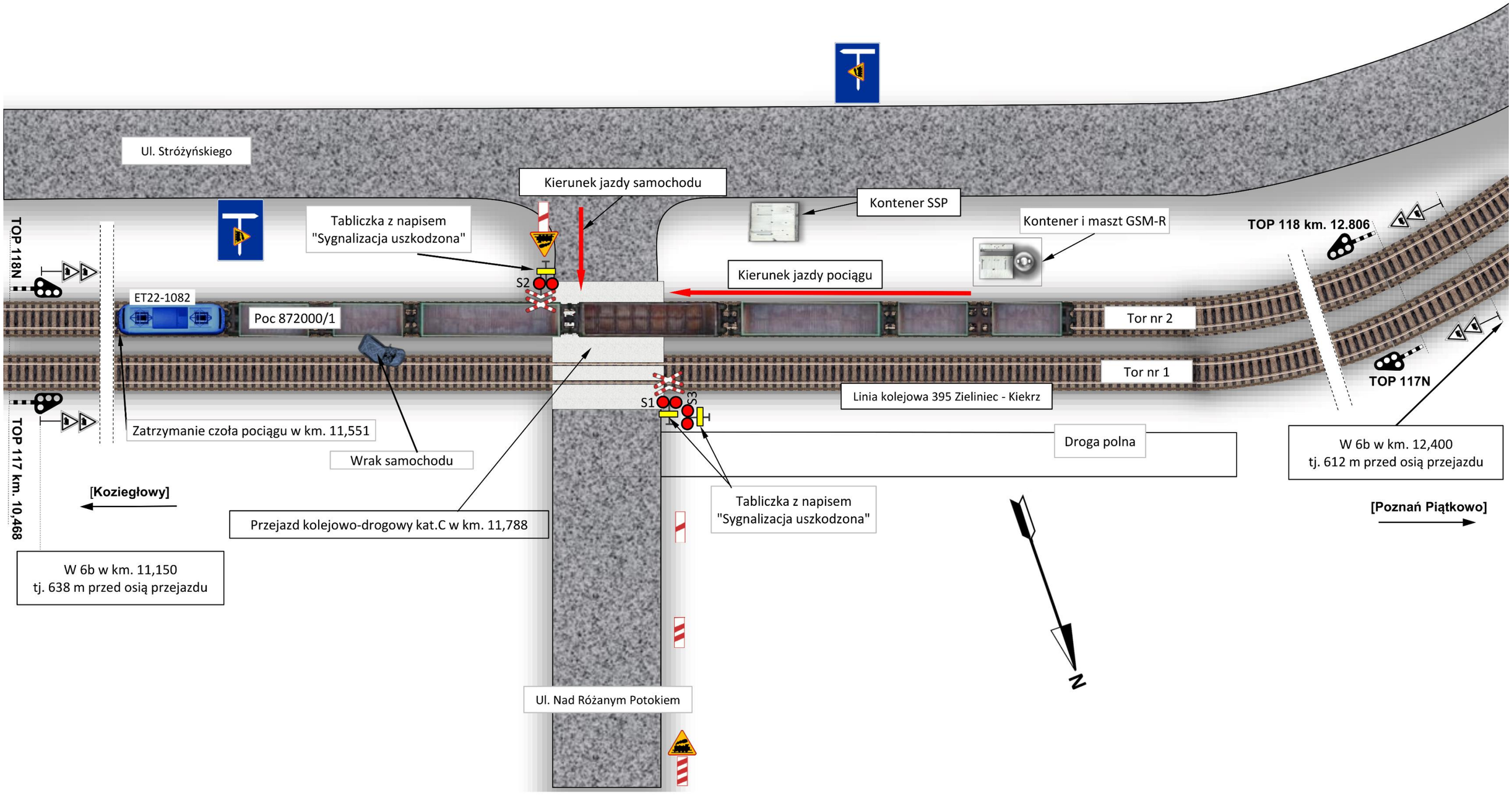
1.3. The description of the occurrence site, including weather and geographical conditions at the moment of the occurrence and if any works were carried out at or in the vicinity of the site

The level crossing (a.k.a. railway-road crossing) where the accident occurred is located on municipal road no. 877837P at ul. Nad Różanym Potokiem (street) which is composed of bitumen surface and earthen roadside. The roadway width on the approaches is 6.00 m. As shown in the level crossing data sheet, the permitted speed of road vehicles on the road in the area of the level crossing is 30 km/h.
The road crosses the railway track at a 90º angle. The area where the road crosses the railway line is located in an urban area. From the side of ul. Stróżyńskiego (street) Municipal road no. 877837P at ul. Nad Różanym Potokiem (street) is marked on both sides by warning signs A-10 and a G-1c indicator post. Before the level crossing there is a G-4 "St. Andrew's Cross" which is obscured by a roadside signal of the automatic crossing system (SSP). The distance of the roadside signal from the outermost rail of track no. 2 is: S2 – 8.5 m. Visibility of signalling provided by the roadside signals is correct.
The signals had the board hung on them that read "Signalling out of order" (Polish: *Sygnalizacja uszkodzona*), without the B-20 "STOP" sign (Photograph 2).
Geographical coordinates of the level crossing are 52º46'61"N 16º91'30"E. The occurrence took place in the dark with no precipitations or for, at the ambient temperature of -3ºC.
No works were conducted in the level crossing area that could have impact on causing the occurrence.



Photograph 2 – A view of level crossing signalling immediately after the accident (source: the railway commission).

Figure 1 - a drawing of the accident (author: PKBWK)



1.4. Deaths, injuries and material damage

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

The driver of the road vehicle sustained injuries as a result of the accident.

b) cargo, luggage and other property

The road vehicle was destroyed as a result of the accident (passenger car).

c) rolling stock, infrastructure and the environment

Rolling stock
The train was not derailed.
Damage to the ET22-1082 locomotive:
- brake cock on the driver assistant's side,
- torn off brake hose on the driver assistant's side,
- bent brake hose support on the driver assistant's side,
- damaged step to the buffer beam on the driver assistant's side,
- damaged glass on the lower signal headlamp on the driver's side.

Infrastructure
No damage to the railway infrastructure was found.
Environment
No environment pollution took place as a result of the occurrence.

1.5. The description of other consequences, including the impact of the occurrence in the regular operations of the actors involved

The consequences of the occurrence caused the necessity to a shut-down of railway traffic on the Koziegłowy – Poznań Piątkowo route, Line 395, on track no. 2 between 02:45 hrs and 09:40 hrs, and on track no. 1 between 02:45 hrs and 06:40 hrs.
During the interruption of traffic, six freight trains were delayed by 968 minutes.

1.6. The identification of the persons, their functions, and entities involved, including possible interfaces to contractors and/or other relevant parties

The following persons were directly involved in the occurrence:
- the driver of train no. 872000 - an employee of railway undertaking PKP CARGO S.A.,
- the driver of the road vehicle (passenger car).

The train dispatcher at the Poznań Piątkowo station was involved in the occurrence indirectly.

1.7. The description and identifiers of train(s) and their composition including the rolling stock involved and their registration numbers

Train no. 872000 was put together from an ET22-1082 locomotive and 29 freight wagons. The ET22-1082 locomotive has technical railworthiness certificate for a rail vehicle no. COTO24/10/2020, for which rail vehicle type operation approval certificate no. T/99/0043 was issued. The certificate is valid from 5 October 2020 to 29 June 2024 or for the mileage of 243,398 km counted from 256,602 km. The mileage at the moment of the occurrence recorded by the Hasler Bern Rt-9 recorder installed in the locomotive was 448,921 km. The locomotive had identifier PL- PKP C 91 51 3 150 123-0.

Details of train 872000 – from the brake test sheet:

– train length……..……	190 m
– total weight of the train……..	863 tonnes
– required braked mass percentage……	57%
– actual braked mass percentage……	95%

- required braked mass…… 492 tonnes
- actual braked mass…… 822 tonnes.

1.8. A description of the relevant parts of the infrastructure and signalling system – track type, switch, interlocking, signal, train protection systems

Track:

Rail type……..	–	60E1 (UIC60) – year laid: 2010,
Sleepers…….	–	prestressed concrete, type PS94,
Attachment type……	–	flexible, type Sb3,
Ballast type……..	–	gravel, thickness of 30 cm,
Maximum permitted train speed en route…	–	90 km/h.

Level crossing:

- the Category C level crossing is a crossing on the same level of railway line no. 395 Zieliniec - Kiekrz with the municipal road ul. Nad Różanym Potokiem, equipped with an Automatic Crossing System,
- individual level crossing identification number (yellow sticker): 395 011 788,
- crossing axis - km 11.788,
- angle of railway line-road crossing – 90°,
- the surface of the level crossing is built of 4 sets (2 sets per track) of CBP- type crossing slabs,
- road surface on the approaches - bitumen,
- access road gradeline:
  - left side +4.195% along the length of 17.5 m,
  - right side (the direction of entry of the road vehicle to the level crossing) +1.166% along the length of 30 m,
- exposure factor on the level crossing – 15158; the latest measurement was taken on 14-15 April 2021,
- total length of the level crossing - 13.8 m,
- width of the road crown on the level crossing – 6.0 m,
- width of the roadway on the level crossing –5.7 m,
- width of the roadway on the approaches, left side – 6.0 m,
- width of the roadway on the approaches, right side – 6.0 m,
- maximum speed of road vehicles on the level crossing – 30 km/h,
- the level crossing is illuminated – two lighting columns.

Automatic Crossing System (SSP):

- type of automatic crossing system devices – SPA5,
- type of signals – EHZ-7 – 3 items,
- electronic sound generator – 2 items,
- type of level crossing warning signal – EHZ-5 - 4 items,
- type of remote control device – ERP–7 installed at the Piątkowo station,
- devices installed for the speed of 120 km/h.

Signage of the level crossing on the day of the occurrence:

Signage of the road to the level crossing

On the approach to the level crossing at Nad Różanym Potokiem street, there is an A-10 warning sign with a G-1c indicator post on each side of the road.. Before the level crossing on the right side there is a light signal SSP (S2), behind which there is a G-4 sign – St. Andrew's Cross. Signals indicated by the signal on Stróżyńskiego street are visible from 60 metres.

At Stróżyńskiego street before Nad Różanym Potokiem street there are complementary signs F-6a.

Signage from the side of the track
W6b indicators:
- in the ascending direction of the railway line chainage, at km 11.150, i.e. 638 metres from the axis of the level crossing,
- in the descending direction of the railway line chainage, at km 12.400, i.e. 412 metres from the axis of the level crossing.

1.9. Other information relevant for the purpose of the description of the occurrence and background information

The Investigation Team did not identify any other information relevant for the purpose of the description of the occurrence.

2. The factual description of the events

2.1. The proximate chain of events leading up to the occurrence, including actions taken by persons involved, the functioning of rolling stock and technical installations, the functioning of the operating system.

On 11 December 2022 at around 11:40 hrs, the ERP-7 remote control device in a dispatching switch tower at the Poznań Piątkowo station displayed the following message: "Malfunction of communication with wheel sensor" (Polish: *Usterka komunikacji z czujnikiem koła*). The malfunction affected track no. 1 of the Automatic Crossing System (SSP) located at km 11.788 of railway line no. 395. Consequently, an ISE Poznań Franowo control engineer went to the site and commenced an inspection of the level crossing devices at 12:10 hrs. At 16:00 hrs, the control engineer reported the following to the train dispatcher at the Poznań Piątkowo station by telephone: *"The malfunction on the level crossing at km 11.788 is caused by a damaged, devastated wheel sensor; the malfunction shall be in force until the sensor is replaced. The level crossing has signals from the side of the road, the control engineer reported from the apparatus cabinet (...). Speed limit 20 km/h*". The report was recorded in Book E1758. After submitting the report, the control engineer finished work on the level crossing concerned. After receiving the report, the train dispatcher activated the sensors from the level of the remote control devices (Polish: *urządzenia zdalnej kontroli*, UZK). There is no information in the traffic documentation concerning the imposition of the 20 km/h speed limit for trains on the level crossing concerned.
On the same day at 19:42 hrs, freight train 872000 of railway undertaking PKP CARGO S.A. left the Szczecin Port Centralny station for the Szczecin Port Centralny – Nowe Skalmierzyce route. The train was formed from a ET22-1082 locomotive and 29 loadable flat wagons of the Sgs series. The movement of the train from the Szczecin Port Centralny station to the Poznań Piątkowo station was undisturbed.
At 02:17 hrs on 12 December 2022, freight train no. 674015 left the Koziegłowy station on track no. 1 in the direction of the Poznań Piątkowo station. Due to the active sensor malfunction, the sensors on track no. 1 were turned off. Despite the malfunction, the train dispatcher activated the sensors at 02:20 hrs for the movement of train no 674015. The SSP devices detected the sensor malfunction and switched to the safe state, i.e. warning state (two interchangeably flashing red lights on roadside signals and a sound signal). The information about the wheel sensor malfunction was recorded again and forwarded to the train dispatcher through the ERP-7 remote control device. The train dispatcher acknowledged it and confirmed that fact by performing relevant actions on the ERP-7 remote control device. The SSP system remained in the warning state and at the same time the level crossing warning signal Top117 (i.e. the one informing train drivers on track no. 1 about serviceability of the SSP at km 11.788) indicated the OSP1 signal (*Osp 1 signal - "Signalling devices on the level crossing to which the signal refers are unserviceable; movement through the crossing at the speed of 20 km/h"*). At 02:32 hrs, train no. 674015 moving on track no. 1 passed the level crossing at km 11.788. Due to the malfunction, the train's exit from the level crossing did not turn off the devices and left them in the warning state. At 02:32, the train dispatcher at the Poznań Piątkowo station dispatched train no. 872000 on track no. 2 in the direction of the Koziegłowy station. At 02:33 hrs, that train automatically activated the SSP at km 11.788 on track no. 2 and, at the same time, the level crossing warning signal Top118 (ti.e. the one informing train drivers on track no. 1 about serviceability of the SSP at km 11.788) indicated the OSP 2 signal (*Osp 2 signal - "Signalling devices on the level crossing to which the*

signal refers are serviceable; movement through the crossing at the maximum permitted speed"). According to explanations provided by the driver of train no. 872000, while approaching the level crossing at km 11.788 of railway line no. 395, he noticed a stationary passenger car before the level crossing, and the car pulled out after a moment. The train driver initiated train emergency braking. Despite that, the train collided with the passenger car at the speed of around 60 km/h. As a result of the impact, the road vehicle turned by 90 degrees and was subsequently thrown aside to the space between tracks no. 1 and 2, looking in the movement direction of the train. The freight train head stopped at km 11.551 (237 metres from the level crossing).

2.2. The chain of events from the occurrence until the end of the actions of the rescue services, including measures taken to protect and safeguard the site of the occurrence, the efforts of the rescue and emergency services

Immediately after the accident, the driver of train no. 872000 reported the collision with a passenger car to the train dispatcher at the Poznań Piątkowo station and went to assess the outcomes of the occurrence. There was one injured person in the car, i.e. the car driver. The driver door was jammed and could not be opened. The train driver returned to the locomotive and informed the train dispatcher through train radio communication devices about the effects of the occurrence and the need to call rescue services.

After receiving the information about the accident, the train dispatcher at the Poznań Piątkowo station communicated with the train of another train incoming from the Koziegłowy station on track no. 1 in the direction of the Poznań Piątkowo station and instructed him to stop before the occurrence site. After that, the train dispatcher closed tracks no. 1 and 2 of the Koziegłowy – Poznań Piątkowo route. He also forwarded the information about the occurrence to the plant dispatcher, who notified relevant services and members of the railway commission. According to the plant dispatcher's note, the ambulance service, police and firefighters arrived at the accident scene at 02:45 hrs, and a representative of the infrastructure manager arrived at 03.30 hrs. When recovered from the car by the firefighters, the injured passenger car driver was transported to a hospital in Poznań. At 06:37 hrs, the train moving on track no. 1 from the Koziegłowy station which had been stopped before the occurrence site entered the Poznań Piątkowo station on station track no. 3, and train traffic was restored on track no. 1 of the Koziegłowy – Poznań Piątkowo route. At 09:37 hrs, after the rescue services finished their actions, the train involved in the occurrence (no. 872000) entered the Koziegłowy station and train traffic was restored on track no. 2 of that route.

According to the documentation gathered, the railway commission finished their work at 9:40 hrs. On 12 December 2022 at 11:30 hrs, on the instruction of the management of ISE Poznań Franowo, the train dispatcher at the Poznań Piątkowo station imposed a 20 km/h speed limit on the Poznań Piątkowo – Koziegłowy route on tracks no. 1 and 2 of railway line 395 due to a malfunction of SRK devices. Following the replacement of the wheel sensor, the serviceability of the traffic protection devices on the level crossing at km 11.788 was restored and the related road signage was removed on 12 December 2022 at 17:00 hrs.

IV. ANALYSIS OF THE OCCURRENCE

1. Roles and duties

1.1. Railway undertaking(s) or infrastructure manager(s)

Infrastructure Manager – PKP PLK S.A. Railway Line Plant in Poznań

The infrastructure manager is responsible for *inter alia* appropriate maintenance of the railway line, including level crossings. The responsibilities of the infrastructure manager are laid down in *inter alia* Article 62 of the Act of 7 July 1994 on the Construction Law. The said provision requires the infrastructure managers to conduct annual and five-year reviews of construction works (including level crossings and traffic protection devices installed thereon). §31 of Internal instruction Id-1 of the infrastructure manager imposes an obligation to conduct diagnostic examinations of level crossings (including as regards railway and road surface, visibility conditions, lighting). Furthermore, Instruction Ie-7 (E-14) sets forth the scope, timing and methods of examination of rail traffic control devices (including traffic protection devices on level crossings). The timing of reviews of construction works set forth in the applicable instructions are compliant with Article 62 of the Act of 7 July 1994 on the Construction Law. The Investigation Team does not raise any objections concerning satisfaction of the aforementioned responsibilities.

Under §82 of the 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 sidings with roads, and on their positioning (consolidated text: Journal of Laws of 2015, item 1744, as amended), hereinafter referred to as "Regulation 1744", the responsibility for appropriate signage and maintenance of a level crossing rests on the railway manager.
Due to the malfunction of the Automatic Crossing System (SSP), boards reading "Signalling out of order" were put on the signals. In the event of unserviceability of SSP devices, the infrastructure manager is required to mark the level crossing concerned with the sign B-20 "STOP". The sign was not there at the moment of the accident (Photograph 3).

Photograph 3 – Signage of the level crossing immediately after the accident (footage provided by the railway commission)

According As it transpires from interviews with employees of the infrastructure manager, the B-20 „STOP" sign placed after the malfunction occurred on 11 December 2022 had been stolen. Based on an analysis of the investigation material gathered and photographic documentation made immediately after the accident, the Investigation Team was unable to state clearly whether the level crossing had been marked with a B-20 "STOP" sign following the malfunction. Following the receipt of the theft report, the police communicated on 22 December 2022 that no request for punishment had been brought to court as no perpetrator(s) had been found. In accordance with applicable regulations, a Category C level crossing should be marked with *inter alia* sign G-4 "St. Andrew's Cross". The railway manager did place such a sign, but its positioning does not ensure good visibility for road users, for it is obscured by a roadside signal S2 of the Automatic Crossing System (Photograph 4).
The sign B-20 "STOP" was placed in the morning of 12 December 2022.

Photograph 4 – Signage of the level crossing after the arrival of PKBWK representatives

In accordance with "Instruction Ir–8 on the handling of serious accidents, accidents and incidents in rail transport" the railway commission investigated the causes of the railway occurrence. An analysis of documents gathered by the railway commission and the manner of conducting the investigation into the causes of the occurrence until its take-over by PKBWK showed substantive shortcomings. The Investigation Team was provided with three photographs which showed the effects of the occurrence. The photographic documentation did not include the condition of the devices on the level crossing or on access roads leading to the level crossing. No description was the condition of the devices immediately after the occurrence was recorded in Book E-1758. The documentation stored in the container put at the level crossing and documents held by the train dispatcher at the Poznań Piątkowo station do not include notes about the post-accident examination of the condition of the infrastructure and devices conducted at the request of the railway commission, or about their findings. The railway commission left the occurrence site without informing the train dispatcher that they had finished their work and that traffic could be restored following the occurrence, which led to leaving the SSP devices in the warning state (no instruction was issued to the train dispatcher to restore the SSP devices to the base state). Point "V.3 Signage and signalling from the side of the road" of the "Occurrence site inspection report" contains an entry saying that "Signalling out of order" boards were hanging on the signals, while in Point VI of that report ("VI. Findings of the examination of the crossing devices") the commission stated that, quote, "the traffic protection devices on the level crossing were working correctly", end of quote. Furthermore, there is no information about the malfunction of the wheel sensor on track no. 1 which lasted from 11 December 2022 11:40 hrs. As it transpires from the interview with the train dispatcher, he imposed a 20 km/h train speed limit on the Poznań Piątkowo – Koziegłowy route on tracks no. 1 and 2 on the level crossing at km 11.788 on 12 December 2022 at 11:30 hrs based on the instruction from his superior from the Operation Section Poznań Franowo, although the malfunction had existed since 11 December 2022, 16:00 hrs.

The devices on the level crossing remained in the warning state from the moment of the occurrence until PKBWK members arrived at the site of the occurrence at 12:40 hrs. The PKBWK members established that no train was approaching the level crossing and that no works were in progress in the area of the level crossing. Following an intervention of the management of ISE Poznań Franowo, the train dispatcher performed actions related to restoring the devices to the base state at 12:50 hrs. The devices on track no. 2 were restored to the base state, whereas the devices on track no. 1 were turned off due to the malfunction of the wheel sensor which had existed since 11 December 2022. The boards "Signalling out of order" and B-20 "STOP" remained on the signal masts.
At 17:00 hrs on 12 December 2022, following replacement of the wheel sensor, the correct functioning of the traffic protection devices on the level crossing was restored.

Road and rail traffic is organised under applicable rules. Information on the current organisation of road traffic is provided through signs, signals and indicators. The main difference between the management rail traffic and road traffic is that in road traffic information about the current traffic organisation is provided only through signs and signals placed at the road, or by a person authorised to manage traffic in special circumstances, whereas the train dispatcher additionally supervises the correct transmission of information to train crews through railway signs and signals. In the event of any disruptions in information provided to a train crew by signs and signals, the information about the current rail traffic organisation must be immediately provided to the train crew by the train dispatcher.
In the event of unserviceability of Automatic Crossing System devices on a level crossing, the essential element of traffic organisation in the area of that level crossing aimed at ensuring the safety of all users of the crossing is to reduce the speed of trains and mark the area with signs and additional sound signals. Information about a change in the organisation of traffic in the area of the level crossing should be provided to the users of that level crossing as soon as possible. Any damage to traffic protection devices on the level crossing requires a change in the organisation of both road and rail traffic. As regards road users, the organisation of road traffic in the area of the level crossing is changed by means of placing an additional B-20 "STOP" sign with a board "Signalling out of order". The manner of managing train traffic in the event of unserviceability of devices on a level crossing is defined in the 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 sidings with roads, and on their positioning , hereinafter referred to as "Regulation 1744". Annex 4 to that Regulation provides:

"2 In the event of unserviceability of traffic protection devices on Category A level crossings, (...) and on Category B and C level crossing, train traffic shall be allowed after:

1) limiting the speed of train heads, along the entire width of the level crossing, to 20 km/h;

2) ordering that, where the W6b indicator is not set, the sound signal Rp 1 "Caution" is additionally provided between the W6a indicator and the level crossing, and that, where the W6a indicator is not set, such a signal is provided from the kilometre determined by the railway manager on a case-by-case basis for each level crossing – in accordance with § 84(2).

Furthermore, Point 3 regulates the signage of a level crossing for road users where the traffic protection devices are unserviceable:

"3 In the event referred to in Point 2, the railway manager shall immediately mark the level crossing with a B-20 "STOP" road sign, placing a board "barrier out of order" or "signalling out of order" below the sign. The signs shall be placed on both sides of the level crossing on the right side of the public road immediately before the barrier or road signal at the distance of 1 m from the edge of the roadway".

The infrastructure manager included the same provisions in §84(19) and (20) of Instruction Ir-1 on handling train traffic. They read as follows:

"19. In the event of unserviceability of traffic protection devices on level crossings and passages operated, where it is not possible to designate the employee referred to in Paragraph 18, and on level crossings or passages equipped with Automatic Crossing Systems (SSP), train traffic shall be allowed after:

1) limiting the speed of train heads, along the entire width of the level crossing or passage, to 20 km/h,

2) warning train crews through a written order that multiple Rp 1 "Caution" signals must be given until setting of the W6b indicator, and that the level crossing or passage must be immediately marked with

the B-20 "Stop" sign, with a board "barrier out of order" or "signalling out of order" placed below the sign.

20. Where a crossing warning signal preceded by the W11p indicator is placed before a level crossing or passage, a notification by the train dispatcher to the driver of the rail vehicle under a written order about a malfunction of traffic protection devices (barriers, additional, transmission of information etc.) and about the need to limit the train head speed along the entire width of the level crossing or passage to 20 km/h shall not be required."

As it transpires from the aforementioned provisions, the function of informing train crews about a change in the organisation of traffic on a level crossing is taken over by the crossing warning signal (TOP) where the traffic protection devices on that level crossing include that signal. In the case concerned, there was inconsistent information on the organisation of rail and road traffic in the area of the level crossing, i.e. information addressed to road traffic said that the devices on the level crossing were damaged on both tracks, whereas rail traffic received information that the devices for trains moving on track no. 1 were damaged, and that the devices for trains moving on track no. 2 were working correctly.

Marking the level crossing with a B-20 "STOP" sign and a board "Signalling out of order" clearly informs the road users that the warning system on the level crossing is not working. In such a case, in accordance with Point 2 of Annex 4 to Regulation 1744, train traffic is allowed after imposing a 20 km/h speed limit for train heads along the entire width of the level crossing.

As it transpires from the analysis of the documentation and clarifications provided, the 20 km/h speed limit was not imposed because that function had been taken over by the crossing warning signals (TOP) which provide train drivers with information on the serviceability status of the Automatic Crossing System devices 20 km/h speed limit. In the opinion of the Investigation Team, such an interpretation of §84(20) of Instruction Ir-1 is wrong because the TOP separates and provides information on the serviceability status of the devices on a given track, whereas the 20 km/h speed limit should apply to the entire level crossing (all tracks).

According to the Investigation Team, in order to meet the requirements specified in Regulation 1744, and after marking the level crossing on the side of the access road with a B-20 "STOP" sign and a board "Signalling out of order", the crossing warning signals (TOP) should indicate unserviceability of the devices on the level crossing to all trains passing that level crossing. Marking the level crossing only on the side of the road without imposing a 20 km/h speed limit for all trains passing that crossing meant a selective application of the provisions of the Regulation on unserviceability of traffic protection devices on a level crossing.

Furthermore, the train dispatcher made a wrong interpretation of the provision on turning off sensors on one track (in accordance with §28 of Instruction Ir-7, it is allowed to turn off sensors only where work is carried out by a working train on a closed track). In the case concerned, as of 16:00 hrs on 11 December 2022, train traffic for every train moving on track no. 1 was conducted in the following manner:

1. After receiving information from the Koziegłowy station on a train movement, the train dispatcher would manually activate the sensors which detected the malfunction of the traffic protection devices and the Osp-1 signal was displayed on the warning signal.
2. After a train passed the level crossing at km 11.788, the train dispatcher would turn off the sensors on track no. 1.

Such non-compliance with the instructions resulted in movement of trains on track no. 1 with the speed of up to 20 km/h, and on track no. 2 with the scheduled speed.

During the malfunction, the train dispatcher controlled the devices on Category C level crossing that were meant to be controlled by trains, by which he caused a long lasting activation of the signalling.

Such management of traffic is in conflict with the provisions of §69(2)(2) of Regulation 1744.

The dispersion of the manner of behaviour of train drivers in the event of unserviceability of traffic protection devices on a level crossing requires conducting targeted training for this group of personnel until

uniform and detailed rules are developed for cases of unserviceability of traffic security devices on a level crossing.

PKP PLK S.A. Railway Line Plant in Poznań submitted reports on annual and five-year inspections (controls) of the surface and traffic protection devices on the level crossing concerned. The Investigation Team analysed the reports on annual, five-year and ad hoc inspections of a construction work which were carried out in 2020 and 2021 as regards the technical condition and suitability for use of the rail traffic control devices and as regards a diagnostic examination of those devices. On examining the devices, the diagnosing technician did not find any irregularities and described their technical condition as good. Therefore, it was not necessary to issue any recommendations and the construction work was cleared for further operation without any recommendations regarding required corrective actions.

Railway undertaking PKP CARGO S.A.

The rail vehicle designated to carry out a transport task by the railway undertaking held a rail vehicle type operation approval certificate and a technical railworthiness certificate. The designated train crew that operated the train held all ratings and qualifications required by law. The train was driven on the basis of a schedule.

The responsibilities of railway undertakings concerning safe operation of a rail vehicle are laid down in the infrastructure manager's Instruction Ir-1 on managing train traffic, Instruction Ie-1(E-1) – Signalling instruction and the internal instruction of the railway undertaking, and Instruction Ct-1 - Instruction of the driver of a traction vehicle. Based on an analysis of the material gathered in the case, the Investigation Team did not find any irregularities in the conduct of the train crew during operation of the train or after the occurrence.

1.2. The entities in charge of maintenance, the maintenance workshops, or any other maintenance suppliers

Railway undertaking PKP CARGO S.A., which provides the rolling stock, is responsible for its serviceability, technical condition and compliance with the vehicle maintenance process. The locomotive on the head of the train had a rail vehicle type certificate and a valid technical railworthiness certificate. The railway undertaking submitted documentation concerning the latest technical inspections of its rail vehicles. The Investigation Team found an irregularity in the documentation as regards maintenance and operation of the rolling stock. The irregularity involved inconsistency between the number of the HASLER Bern RT9 recorder installed in the vehicle and the number shown in the maintenance documentation. While the documentation shown that the recorder number was RT9- 31524, the number of the recorder installed in the vehicle was RT9- 20627. Furthermore, the Investigation Team found irregularities in the mileage recorded for rail vehicle ET22-1082. The mileage recorded in the documentation was 430,598 km, whereas the actual mileage recorded in the recorder was 423,710 km.
The technical condition of the rail vehicle had no impact on the occurrence concerned.

1.3. Manufacturers of rolling stock or other suppliers of rail products

Based on the investigation material gathered, the Investigation Team did not identify any factors related to manufacturers of rolling stock and suppliers of rail products that could have impact on the occurrence.

1.4. National safety authorities or the European Union Agency for Railways

The President of the Rail Transport Office (Polish: *Urząd Transportu Kolejowego*, UTK) supervises the safety of rail traffic. Based on the investigation material gathered in the case, the Investigation team did not identify any factors on the side of the national safety authority that would have impact on the occurrence. Between 2021 and the date of the accident, the President of the Rail Transport Office carried out 14 inspections of the Railway Line Plant in Poznań as regards the technical condition and maintenance process of the railway infrastructure, and 4 inspections as regards management of train

traffic. The inspections covered 25 level crossings. The level crossing concerned was not subject of an inspection by the President of the Rail Transport Office.

1.5. Notified bodies, designated bodies or risk assessment bodies

Based on the investigation materials gathered, the Investigation Team did not identify any factors related to notified bodies and risk assessment bodies that could have impact on the occurrence.

1.6. Certification bodies of entities in charge of maintenance mentioned under Point 1.2

PKP CARGO S.A. holds certificate of conformity no. PL/31/0022/0098 for an entity in charge of maintenance issued by the President of the Rail Transport Office; the certificate covers: freight wagons (excluding special vehicles adapted to transport of dangerous goods), locomotives and special vehicles; the certificate is valid until 29 May 2024 and confirms the establishment of the Maintenance Management System. Based on the investigation material gathered in the case, the Investigation team did not identify any factors on the side of the certification body of the railway undertaking that would have impact on the occurrence.

1.7. Any other person or entity relevant to the occurrence, documented or not in one of the relevant safety management systems or referred to in a register or relevant legal framework

Not applicable

2. Rolling stock and technical installations

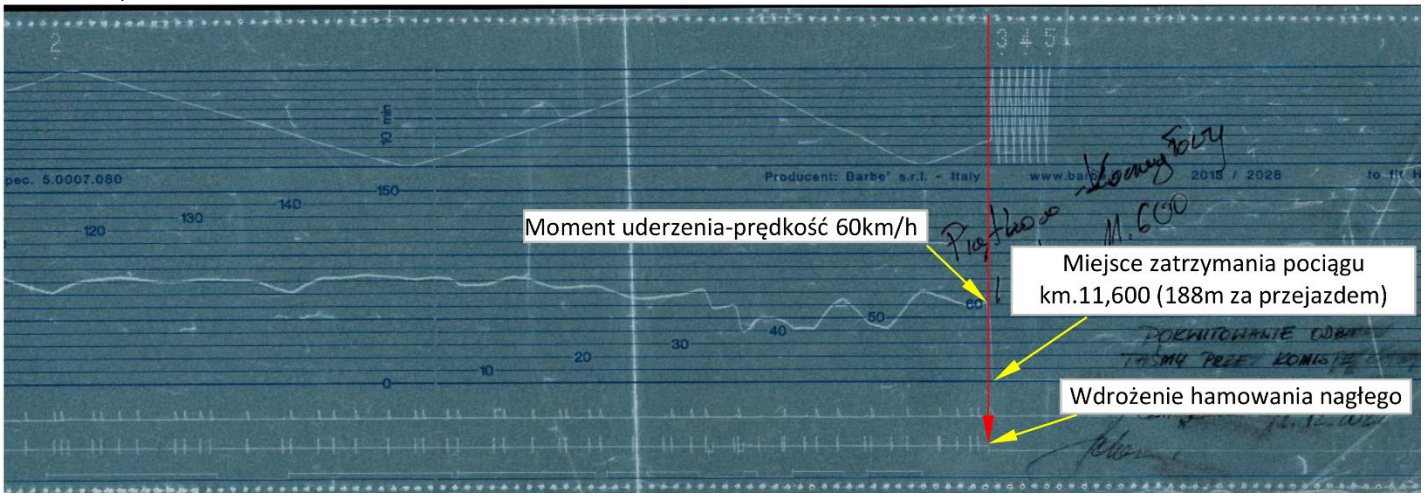
Powered rail vehicle

The electric locomotive ET22-1082 is equipped by the manufacturer with the recording speedometer system Hasler Bern RT9.

The Investigation Team analysed the speedometer's tape.

The charts below show the following performance parameters of train 872000:

1) time,
2) speed in km/h,
3) braking - activation of emergency braking,
4) use of the vigilance button (CA and SHP),
5) movement with power intake,
6) control from Cabin B,
7) distance covered.



Photograph 5 – A scan of the speedometer tape with the performance characteristics of train no. 872000

A description of performance parameters recorded between 02:20 hrs and 05:00 hrs

– 02:20.00 hrs movement with the speed from 40 to 70 km/h

- 02:24.00 hrs enabling of electric driving was recorded
- 02:27.00 hrs movement with a speed up to 62 km/h, with electric driving disabled, was recorded
- 02:27.30 hrs enabling of electric driving was recorded, movement with a speed between 50 and 70 km/h was recorded
- 02:30.00 hrs disabling of electric driving was recorded
- 02:30.30 hrs use of the vigilance button was recorded
- 02:31.00 hrs use of the vigilance button was recorded, speed decreased to 60 km/h
- 02:31.30 hrs use of the vigilance button was recorded
- 02:32.30 decrease in the speed was recorded, presence of pressure in the locomotive's brake cylinders
- 02:33.00 stop, the train covered around 150 m since emergency braking was enabled at the speed of around 60 km/h.

The train was immobile by 05:00 hrs, the tape was removed from the recorder.
Drive was controlled from Cabin B.
The ABP devices in the locomotive - serviceable.
The speedometer tape with the speed range up to 150 km/h.

Automatic Crossing System
The type SPA-5 Automatic Crossing System (SSP) has the functionality of recording occurrences and work status of devices that comprise the system. The time recorded by the crossing system is delayed by 3 minutes relative to the time indicated by the Electronic Traffic Log (Polish: *Elektroniczny Dziennik Ruchu*, EDR) at the Poznań Piątkowo railway station. The delay is the same relative to the time recorded in the Koliber radio installed in the ET22-1082 locomotive. The time indicated by the EDR and Koliber radio was considered the actual time. For the purpose of analysis, 3 minutes were added to the time recorded by the crossing system recorder.
For train no. 872000, the traffic officer at the Poznań Piątkowo station gave a signal clearing for exit at 02:32 hrs, and a warning signal was activated at the Category B level crossing at km 12.640. This is the first of five level crossings in the driving direction of train 872000 on the Koziegłowy - Poznań Piątkowo route.

3. Human factors

3.1. Human and individual characteristics

The investigation team established that on the day of the occurrence the driver of the road vehicle had been driving Stróżyńskiego street and turned into Nad Różanym Potokiem street.
According to information provided by the driver of train no. 872000, before the level crossing, the car stopped at a signalling device which was producing two interchangeably flashing red lights, after which it moved forward and went directly in front of the incoming train. Therefore, the course of the occurrence presented by the driver of train no. 872000 becomes a very likely picture of the behaviour of the driver of the road vehicle.
The investigation into the causes of the occurrence did not identify any impact of the train driver's individual characteristics.

3.2. Job factors

The job of the train driver was not a factor contributing to the occurrence.

3.3. Organisational factors and assignments

As it transpires from the material gathered by the Investigation Team, the employer provided the train driver involved in the occurrence the rest time required by law. The train driver's work time was in compliance with the applicable standards. The driver of train no. 872000 had had 21 hours of rest prior to starting work. He had received training required for operating ET22 series traction vehicles and had completed other training courses related to his job. The train driver held all ratings and authorisations required by the applicable law and instructions for actions performed on the job concerned. The Investigation team does not raise any objections concerning the railway undertaking's organisational tasks.

The rules of conducting rail traffic in the area of level crossings equipped with traffic protection devices are contained in various documents (Instructions Ir-1, Ir-7, Ie-1; Regulation 1744).

3.4. Environmental factors

The occurrence took place at nighttime, the sky was clouded, no precipitations, temperature ca. -3º C. No works were being carried out in the area of the level crossing.
The level crossing at Nad Różanym Potokiem street is located behind an elevation relative to Stróżyńskiego street. The approach to the crossing from Stróżyńskiego street is inclined by 4.195% along the length of 17.5 metres. At the point of measurement of the visibility triangle from 5 metres, looking to the left (from the direction of a moving car), there is a container with a GSM-R mast. The structure obscures visibility of trains incoming from the left for drivers of road vehicles. The structure also obstructs visibility for drivers of trains during observation of the approach leading to the level crossing. Photographs 6 and 7 show visibility from the road onto track no. 2 from 5 metres, and from track no. 2 onto the approach and level crossing at km 11.788 from around 80 metres before the level crossing.

Photograph 6 – A view of track no. 2 from the road from the distance of 5 metres from the outermost rail

Photograph 7 – A view from track no. 2 on the access road and the level crossing at km.11.788 from the distance of around 80 metres

Erecting the GSM-R container and mast within the visibility triangle at 5 m significantly reduced visibility for road users, making it more difficult to notice a train incoming on track no. 2, and also leaves the train driver with very little reaction time if he notices any irregularities in the behaviour of road vehicle drivers. A road vehicle that stopped before the level crossing is practically invisible for the train driver from the distance of around 80 metres before the level crossing. In accordance with the provisions of Paragraph 15, Part B, Annex 3 to the 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 sidings with roads, and on their positioning (Journal of Laws of 2015, items 1744, as amended), *"Within the boundaries of visibility triangles, no objects that reduce visibility shall be placed, in particular construction works, trees, shrubs and other high-growing plants, advertisements, elements of acoustic protection"*. The erection of the construction works in the 5 m visibility triangle started in 2019. PKP PLK S.A. is the investor. Photograph 8 shows boards placed on the object.

Photograph 8 – Boards placed on the fence of the construction work

3.5. Any other factors relevant for the purpose of the investigation

On their arrival at the site of the occurrence on 12 December 2022 at around 12:30 hrs, members of the Commission saw the traffic protection devices on the level crossing in the warning state (active light and sound signalling) and additional signage with a B-20 "STOP" sign with a board "Signalling out of order". During an inspection of the occurrence site, the Investigation Team observed confusion among road users who wanted to drive through the level crossing.

Seeing the situation at the crossing, a small part of the drivers chose a different way and decided against entering the crossing. Some road users stopped at the B-20 "STOP" sign after a short stop without any train in sight decided to drive through the crossing despite the signals prohibiting any movement beyond the line set by the signals. Other road users completely ignored the light signals and drove through the crossing without taking care, saying that the signals had been like that since early morning and trains are not going because of an accident. Some drivers said that the signage of the level crossing was illogical because where a B-20 "STOP" with a board "Signalling out of order" is in place, it is allowed to drive through the crossing after making sure there is no train, but there is also a different regulation that prohibits going beyond the flashing signal line. Based on the observation of the behaviour and information provided by the drivers, leaving the system in the warning state for a long time causes irritation and disregard of the signals indicated.

In the assessment of the Investigation Team, the light signals on the level crossing should have been disabled after the malfunction and, at the same time, the crossing should have been marked with a B-20 "STOP" with an information board "Signalling out of order".
Additional confusion among road users was caused by train movements on track no. 1 with a speed below 20 km/h and on track no. 2 with the scheduled speed, despite the signals from the road side indicated that the signalling was out of order.
The Traffic Law of 20 June 1997, also known as the "Traffic Code", is the primary regulation applicable to users of public roads.
Specific rules concerning level crossings and applicable to road vehicle drivers are contained in Article 28 of the Traffic Law. They provide that:
"1. When approaching and driving through a level crossing, the driver of a vehicle is obliged to take special caution. Before entering the track, he is obliged to make sure whether or not a rail vehicle is approaching and take appropriate precautions, in particular where air transparency is reduced due to fog or other causes.
2. The driver of a vehicle is obliged to drive his vehicle with a speed that allows him to stop the vehicle in a safe place if a rail vehicle is approaching or if a protection device or signal indicated prohibits entry to the crossing."
Furthermore, §98(5) of the Regulation of the Ministers of Infrastructure and the Interior and Administration of 31 July 2002 on road signs and signals (Journal of Laws of 2019, item 2310, as amended) provides that
"The flashing red signal or two interchangeably flashing red signals shall mean prohibition of going behind the signal or other device emitting those signals"
and § 78(5) provides that:
"1.The G-4 "St. Andrew's Cross" sign before a multi-track level crossing determines the place for stopping due to the movement of a train or any other rail vehicle on a level crossing with no barriers or half-barriers,..."

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

The Investigation Team did not identify any systemic factors that had impact on the occurrence concerned. No feedback or control mechanisms, including risk and safety management or the monitoring process, did not have impact on the occurrence.

5. Previous occurrences of a similar character

As part of the investigation, the Investigation Team analysed accidents that took place in similar circumstances at level crossings in 2019 - 2021.
A brief description of the events and their consequences.

1) An occurrence that took place on 15 June 2019 on the Kąty Wrocławskie – Junction Post Mietków route, railway line no. 274 Wrocław Świebodzki – Zgorzelec, at a Category C level crossing at km 22.788.
When moving, train MOE 67900 travelling from Szklarska Poręba Górna to Luboń near Poznań on track no. 2 collided with a road vehicle (a Peugeot Partner passenger car) which had not stopped before the road signal showing two interchangeably flashing red lights prohibiting the entry to the level crossing and a "B-20" sign.
As a result of the occurrence, five persons in the passenger car were killed. The passenger car was destroyed and the train head locomotive was damaged.
2) An occurrence that occurred on 29 April 2020 at 17:32 hrs on the Bolechowo – Murowana Goślina route, track no. 1, Category B level crossing at km 15.753 of railway line no. 356 Poznań Wschód – Bydgoszcz Główna.

On 29 April 2020, passenger train no. 77472/3 (RZEPICHA) of railway undertaking Koleje Wielkopolskie Sp. z o. o. travelling from Gołańcz to Wolsztyn on track no. 1 on the Bolechowo – Murowana Goślina route, at km 15.753 of railway line no. 356 Poznań Wschód – Bydgoszcz Główna, at a Category B level crossing, collided with a road vehicle - a MAN lorry with a trailer filled with peat. The lorry did not stop behind two other cars that correctly stopped before the level crossing, drove around them on the left side, ignored two interchangeably flashing red lights shown by a roadside signal, and entered the level crossing directly in front of an incoming train. As a result of the occurrence, 16 persons were injured, of whom 5 were seriously injured. There was also serious damage to the rail vehicle, level crossing and rail infrastructure elements.

3) The occurrence took place on 29 July 2021 at 06:15 hrs at a Category C level crossing, the Szczecin Gumieńce – State Border (Tantow) route, track no. 1, km 7.585, railway line no. 409 Szczecin Gumieńce – State Border (Tantow).
Passenger train RMM 80681/5801 of railway undertaking DB Regio AG (formed from 3 VT646 three-car Diesel traction units) travelling from Szczecin Główny to Berlin Gesundbrunnen collided with a road vehicle filled with gravel on a Category C level crossing at km 7.585 of railway line no. 409 Szczecin Gumieńce – State Border (Tantow). The vehicle driver ignored the two interchangeably flashing red lights shown by a roadside signal and entered the level crossing immediately before the incoming train. The train colided with the left side of the road vehicle's trailer. W wyniku tego uderzenia i działających sił nastąpiło wykolejenie pierwszego trójczłonowego spalinowego zespołu trakcyjnego. The road vehicle was thrown aside to the left of the track in such a way that the cabin turned by 90 degrees relative to the direction in which the car had been driving, and the undercarriage of the trailer got under the first section of the VT646 traffic unit. The rest of the train, i.e. 2 three-car Diesel VT646 traction units were not derailed.

An analysis of the aforementioned occurrences shows that the main cause of the accidents was entry of a road vehicle to a level crossing immediately before an incoming train, with serviceable devices on the crossings concerned. The drivers of the road vehicles disregarded the two interchangeably flashing red lights shown by roadside signals prohibiting entry beyond those signals, which is required under §98(5) of the Regulation of the Ministers of Infrastructure and the Interior and Administration of 31 July 2002 on road signs and signals. Furthermore, the driver of road vehicles did not take special caution when approaching the level crossing, which is required under Article 28(1) and (2) of the Act of 20 June 1997 on the Traffic Law.

V. CONCLUSIONS

1. A summary of the analysis and conclusions with regard to the causes of the occurrence

The causal factor of the occurrence was entry of a passenger car to a level crossing when a train was approaching that crossing.

Failure of the driver of the road vehicle to take special caution before and during driving through the level crossing while the light signals prohibiting entry beyond those signals were shown, and failure to stop wjen a train was approaching was considered by the Investigation Team as a factor contributing to the occurrence.

The rules that lay down the conditions for organisation of traffic on level crossings with the traffic protection devices damaged are contained in various documents (including Ir-1, Ir-7, 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 sidings with roads, and on their positioning, hereinafter referred to as "Regulation 1744"). A provision contained in Instruction Ir-1 was interpreted inappropriately. The said rule provides says that it is not required to inform the train crew about a malfunction of traffic protection devices on the level crossing and a 20 km/h speed limit, and it was interpreted as no need to impose a 20 km/h train speed limit on the level crossing where it is equipped with crossing warning signals (TOP). Furthermore Regulation 1744 imposes the obligation to impose a 20 km/h speed limit for all trains going through a level crossing, regardless whether the crossing is equipped with crossing warning signals (TOP) or not. The absence of a 20 km/h speed limit for trains on the level crossing was considered by the Investigation Team as a factor contributing to the occurrence.

The train dispatcher controlled the devices on the Category C level crossing that were meant to be controlled by trains, by which he caused a long lasting activation of the signalling in conflict with §69(2)(2) of Regulation 1744. Marking a level crossing with on the side of the road with a B-20 "STOP" sign and a board "Signalling out of order", coupled with the possibility to enable damaged elements of the system results in providing wrong information to road users concerning serviceability of road signals. The fact that the train dispatcher enabled the train-controlled Automatic Crossing System devices on a Category C level crossing caused a prolonged operation of the signalling non-stop for 9 hours and 30 minutes, and was considered by the Investigation Team as a factor contributing to the occurrence.

Although the provision of Paragraph 14 and 15 of Part B, Appendix 3 to Regulation 1744 mentions a prohibition of erecting objects that reduce visibility, permission was granted to erect a GSMR container and tower in the visibility triangle, which significantly reduced visibility of the train head from 5 metres for road users. Reduced visibility of the head of trains at 5 metres for road users due to a container and a GSMR tower erected in the visibility triangle was considered by the Investigation Team as a factor contributing to the occurrence.

2. Measures taken since the occurrence

On their arrival at the occurrence site, representatives of the Commission saw that the light signals had been enabled and the level crossing had been marked with a B-20 "STOP" sign with a board "Signalling out of order", and they contacted the Deputy Head of the Operation Section Poznań Franowo to inform him about the situation at the crossing. The Deputy Head of the Section instructed the train dispatcher at the Poznań Piątkowo station to disable the singalling on the crossing.

VI. SAFETY RECOMMENDATIONS

1) Authorised infrastructure managers shall take targeted actions addressed to their personnel (operation, repair, maintenance) to refresh the uniform rules of conduct in the event of non-activity of traffic protection devices at level crossings.
2) In the event of a malfunction of automatic crossing system devices which cause the Osp-1 signal to be displayed by level crossing warning signal lights for one track of a given level crossing, infrastructure managers shall cause that the Osp-1 signal is displayed for all tracks within the level crossing concerned.
3) In the event of an unserviceability of the automatic crossing system due to a malfunction of its elements, infrastructure manager PKP PLK S.A. shall prohibit re-activation of the automatic crossing system from the remote control device level by the operating personnel after signalling by road signals is turned off by the operating personnel.
4) Infrastructure manager PKP PLK S.A. shall inspect and enhance supervision of the correctness and completeness of the provisions laid down in Books E1758.
5) Railway undertaking PKP CARGO S.A. shall enhance supervision of the management of rail vehicle maintenance documentation, in particular as regards its accuracy concerning the condition of the vehicle.
6) Infrastructure manager PKP PLK S.A. shall take effective actions to synchronise time in the electronic time system which it operates.
7) Authorised infrastructure managers shall include in their hazard records hazards related to any structures erected within the visibility triangle. In each case, they shall conduct a risk analysis at the stage of designing structures close to level crossings, taking into account the local conditions of a given level crossing.
8) Users of rail sidings, operators of narrow-gauge railways and infrastructure managers exempt from the obligation to obtain a safety authorisation and authorised to operate under a safety certificate shall inspect the conditions of development within visibility triangles, taking into account inter alia the provisions of paragraphs 14 and 15 of Part B of Annex 3 to the 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 sidings with roads, and on their positioning (Journal of Laws of 2015, item 1744, as amended).

STATE COMMISSION ON RAILWAY ACCIDENT INVESTIGATION
CHAIRMAN

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Tadeusz Ryś

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List of acronyms used in Report **No. PKBWK 04/2023**

#	Symbol (acronym)	Explanation
1	*2*	*3*
1.	EUAR	European Union Agency for Railways
2.	PKBWK	State Commission on Railway Accident Investigation (Polish: *Państwowa Komisja Badania Wypadków Kolejowych*)
3.	UTK	Office of Rail Transport (Polish: *Urząd Transportu Kolejowego*)
4.	IZ	PKP PLK S.A. Railway Line Plant
5.	ISE	Operation Section of the Railway Line Plant
6.	Book E1758	"Book on oversight of railway traffic control devices / level crossing devices, and on introduction and cancellation of restrictions"
7.	PKP CARGO S.A.	Railway undertaking
8.	RTPR	Traffic Post Technical Rules (Polish: *Regulamin Techniczny Posterunku Ruchu*)
9.	SSP	Automatic Crossing System (Polish: *Samoczynny System Przejazdowy*)
10.	SRK	Rail Traffic Control (Polish *Sterowanie Ruchem Kolejowym*)