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

REPORT No. PKBWK 5/2023

on the investigation of a railway accident
that occurred on 20 February 2023 at 18:11 hrs on the Chałupki – Krzyżanowice route,
track no. 2, Category B level crossing, at km 47.973
of railway line no. 151 Kędzierzyn-Koźle – Chałupki,
the area of the infrastructure manager PKP PLK S.A. Railway Line Plant
in Tarnowskie Góry

WARSAW, 19 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 *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)*

Report on the investigation of a railway accident that occurred on 20 February 2023 at 18:11 hrs on the Chałupki – Krzyżanowice route, track no. 2, Cat. B level crossing at km 47.973 of railway line no. 151 Kędzierzyn-Koźle – Chałupki

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STATE COMMISSION ON RAILWAY ACCIDENT INVESTIGATION
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I. SUMMARY

Type of occurrence: Accident.

Description: An occurrence on a Cat. B level crossing *(as defined in the Act on Road Traffic Law)* in which freight train no. 441008 operated by carrier PKP CARGO S.A. ran into a stationary road tractor with a semi-trailer which had been enclosed by a barrier that blocked road traffic in the direction of the exit from the crossing (hereinafter referred to as a "closing barrier"), preventing the road tractor from exiting the crossing.

Date of the occurrence: 20 February 2023, 18:11 hrs.

Place of the occurrence: Railway line no. 151 Kędzierzyn-Koźle - Chałupki, track no. 2 of the Chałupki - Krzyżanowice route, Cat. B level crossing, km 47.973, crossing identification number 151 047 973, grid reference 49°57'54.5"N 18°17'38.9"E.

Consequences of the occurrence: As a result of the occurrence, an ET22-1062 locomotive and a road tractor with a semi-trailer sustained damage.

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)

Inability of a road tractor with a semi-trailer to exit a Cat. B level crossing due to a passenger car stopping in front of a pedestrian crossing, followed by the road tractor with a semi-trailer being enclosed by an exit barrier, as a result of which a train ran into the road tractor.

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. Inappropriate organisation of pedestrian traffic in the area of a level crossing.
2. The location of the pedestrian crossing at 2.5 m behind the exit barrier, hindering smooth passage and exit of road vehicles through and from the level crossing.
3. A passenger car stopping at the level crossing in front of the pedestrian crossing to give way to pedestrians, which prevented a road tractor with a semi-trailer following the passenger car from continuing to go.
4. Installation of lockable half-barriers on the exit lane from the level crossing, which prevented raising them manually.
5. Failure to implement recommendation no. 2) in Point 4.2 of the PKBWK's Annual Report 2018 concerning disassembly of exit barriers.

Systemic factors: *(means any causal or contributing factor of an organisational, managerial, societal or regulatory nature that is likely to affect similar*

1. Following the introduction of the rule on the obligation of vehicle drivers to give way to pedestrians at a pedestrian crossing there had been no changes in the organisation of traffic, which forced the driver to stop in the crossing's danger zone.

and related occurrences in the future, *including, in particular the regulatory framework conditions, the design and application of the safety management system, skills of the staff, procedures and maintenance)*	2. Absence of rules on positioning pedestrian crossings at level crossings in the implementing provisions to the Construction Law.

Recommendations and their addressees:

1. Recommendations issued during the investigation that require taking immediate actions and have impact on improving safety:

The General Directorate of National Roads and Motorways, Branch in Katowice (hereinafter referred to as "GDDKiA Katowice Branch) received the following recommendations:

1) change the organisation of pedestrian traffic in the area of the level crossing by removing the vertical and horizontal pedestrian crossing signage in the area of the level crossing concerned (the recommendation has been implemented; the pedestrian crossing vertical and horizontal signage has been removed),
2) install pavement fencing to protect pedestrians and channel pedestrian traffic at the drive of barrier N2 closing the entry to the level crossing and at the drive of barrier N3 closing the pedestrian pathway on the pavement in the direction of the tracks (the recommendation has not been implemented; it can be implemented after implementation of the recommendations imposed on PKP PLK S.A.),
3) take immediate actions to relocate the pedestrian crossing from the immediate vicinity of the level crossing to at least 22 metres away from the entrance barrier on the entry lane (the recommendation is under implementation).

PKP PLK S.A. Railway Line Plant in Tarnowskie Góry received the following recommendations:

4) remove the barrier and its drive (no. N4) closing the exit from the level crossing (the recommendation is under implementation),
5) change the function of the barrier (no. N3) from a barrier closing the exit from the level crossing to a barrier closing the pedestrian pathway on the pavement in the direction of the tracks for the duration of train passage; replace the bar of barrier N3 with a type that will secure only the pavement, and the barrier should operate in the entrance barrier sequence (the recommendation is under implementation),
6) change the location of the drive of barrier N2 closing the entrance to the level crossing to meet the conditions laid down in the Regulation (the recommendation is under implementation),
7) install lamps on the barrier bars to ensure their visibility in accordance with the provisions of the Regulation (the recommendation is under implementation),
8) change the location of the signals to ensure their visibility in accordance with the provisions of the Regulation (the recommendation is under implementation),

9) introduce a permanent 60 km/h speed limit for trains along the entire width of the Category B level crossing located on the Chałupki - Krzyżanowice route, km 47.973 of railway line no. 151 Kędzierzyn Koźle - Chałupki, until the barriers closing the road traffic in the direction of the exit from the level crossing (the recommendation has been implemented).

2. Recommendations arising from the investigation:

1) The Minister competent for transport shall lay down, among others, the conditions of positioning pedestrian crossings at level crossings in the implementing provisions to the Construction Law.
2) The Minister competent for transport shall take actions to amend the *Regulation of the Minister of Infrastructure and Development on the technical conditions to be met by crossings of railway lines and sidings with roads, and on their positioning* as regards activation of lights on all barrier bars simultaneously with the start of emitting signals on road signals.
3) Authorised rail infrastructure managers, users of railway 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 level crossings as regards the location of pedestrian crossings in their immediate vicinity. Shall any such pedestrian crossings be identified, they shall immediately act together with the relevant road manager to move those pedestrian crossings outside the level crossing's danger zone.
4) Rail infrastructure managers shall implement recommendation no. 2) from Point 4.2 issued by the Commission in the PKBWK's Annual Report 2018, i.e.
   "Infrastructure managers shall remove exit barriers in automatic crossing systems at Category B level crossings where solutions with four half-barriers are employed. Such a configuration is inconsistent with the provisions of Point 6.2 of Annex no. 4 to the Regulation of the Minister of Infrastructure of 3 July 2003 on the detailed technical conditions concerning road signs and signals and road traffic safety devices, and on the conditions of their installation on roads (consolidated text: Journal of Laws of 2019, item 2311), which provide that: "barriers U-13a and U-13b which close the entire width of the roadway shall be used at Category A level crossings, whereas half-barriers U-13c shall be used at Category B level crossings. Half-barriers shall be positioned so that they close the right half of the road on each side (also where half-barriers are installed on one-way roadways)".
   In addition to the recommendation of 2018, efforts should be made to separate traffic lanes on one-way roads by means of installing separators.
5) PKP PLK S.A. Railway Line Plant in Tarnowskie Góry shall:
   - change the position of the cameras at the level crossing to provide for monitoring of the area of the entire level crossing together with the road signals,
   - change the operation of the sound signal, which at present generates acoustic warning signals after rolling stock engages the switch-off sensor (as per the system's Technical and Operational Documentation, DTR).

Photograph 1 – Pedestrians entering the pedestrian crossing

Photograph 2 – Vehicles stationary at the crossing to give way to pedestrians

Photograph 3 – The moment of the occurrence

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") Mr Tadeusz Ryś issued Decision no. PKBWK.590.5.2023 of 1 March 2023 on establishing an investigation to explain the causes and circumstances of an accident at a Category B level crossing at km 47.973. 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 within the prescribed deadline to the European Union Railway Agency and registered in its database under number PL-10387.

2. The motivation to the decision to establish an investigation

Based on analysis of the circumstances and considering the nature of the occurrence, the PKBWK Chairman decided to establish an investigation to be conducted by an Investigation Team pursuant to Article 28e(2) 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

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. There were no limits during the investigation that would have a negative impact on its course.

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

The Chairman of the Commission nominated an 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 the Rail Transport Act, the PKBWK Chairman obliged specific persons from the railway commission to cooperate with the Investigation Team (Letter no. PKBWK.590.5.1.2023 of 1 March 2023).
The documentation accumulated by the railway commission was submitted formally by its chairman to the Commission on 10 March 2023, and the latter took over the investigation.

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 of PKP PLK S.A. and the railway carrier. Moreover, the Investigation Team relied on their own knowledge and experience.
The documentation prepared by the Investigation Team and the documentation gathered by the railway commission were used.
Within the investigation, the Investigation Team carried out *inter alia* the following activities:

- an inspection of the site and consequences of the occurrence, including, but not limited to, an inspection of the level crossing and the railway line,
- a detailed inspection of the road tractor's elements and structures on the premises of the road carrier's transport establishment,
- preparation of photo and video documentation,
- an analysis of the documentation submitted by the rail carrier, the rail infrastructure manager, the road manager and the owner of the road vehicle,
- an inspection of the vehicle concerned,
- an interview with the driver of the road tractor,
- an analysis of video recordings from the level crossing,
- an analysis of the data from the driving data recorder of the rail vehicle (ET22-1062),
- verification of the progress in the implementation of interim recommendations issued by PKBWK.

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

European Union rules:

1) 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).
2) Commission Regulation (EU) No 1158/2010 of 9 December 2010 on a common safety method for assessing conformity with the requirements for obtaining railway safety certificates.
3) Commission Regulation (EU) No 1169/2010 of 10 December 2010 on a common safety method for assessing conformity with the requirements for obtaining a railway safety authorisation.
4) 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).
5) 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).

National rules:

1) Act of 28 March 2003 on rail transport (consolidated text: Journal of Laws of 2023, item 602, 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) 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).
6) 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 rail vehicles (Journal of Laws of 2021, item 101, as amended).
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 (Journal of Laws of 2015, item 1744, as amended).
8) 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).
9) Regulation of the Minister of Transport and Maritime Economy of 26 February 1996 on the technical conditions to be met by crossings of railway lines and public roads, and on their positioning (consolidated text: Journal of Laws No. 33, item 144).
10) Act of 10 May 2018 on the protection of personal data (Journal of Laws of 2018, item 1000).
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 (Journal of Laws No. 43, item 430); consolidated text of 23 December 2015 (Journal of Laws of 2016, item 124).
12) Regulation of the Minister of Infrastructure of 24 June 2022 on the technical and construction rules applicable to public roads (Journal of Laws of 2022, item 1518).
13) Regulation of the Minister of Transport and Maritime Economy of 10 September 1998 on the technical conditions to be met by railway structures and on their positioning (Journal of Laws No. 151, item 987, as amended).

Internal instructions of infrastructure manager PKP PLK S.A.

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

Internal instructions of railway undertaking PKP CARGO S.A.

1) Pt-2 Traction unit crew manual.

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

Not applicable.

10. Other information relevant in the context of the investigation

The amendment to the Act of 20 June 1997 on the Road Traffic Law (Journal of Laws of 2021, item 450, as amended) caused that, effective on 1 June 2021, in accordance with Article 13 *"when approaching a pedestrian crossing, the driver of a vehicle is obliged to exercise special caution, reduce the speed so as not to endanger a pedestrian who at the time is either on the crossing or entering the crossing, and to give way to a pedestrian who is either on the crossing or entering the crossing"*.

While imposing the obligation to give way to a pedestrian, the legislation did not provide for a situation in which the driver of a vehicle must stop before a pedestrian crossing while still on a road crossing or level crossing. The legislator exempted only tramways from that obligation.

Where a pedestrian crossing is located in the immediate vicinity of a level crossing, a road vehicle, when giving way to a pedestrian, must stop on the level crossing, which is in conflict with Article 47(1)(1) of the Act that provides: *"A vehicle is forbidden to stop on a railway or tramway level crossing, or an intersection, or at a distance shorter than 10 m from the crossing or intersection"*.

The conflict of the said rules exposes drivers of road vehicles at a pedestrian crossing in the vicinity of a level crossing to non-compliance with the provisions of either of the said articles.

III. DESCRIPTION OF THE OCCURRENCE

1. The occurrence and background information

1.1. The description of the occurrence type

An occurrence at a level crossing. The occurrence involved freight train no. 441008 operated by railway carrier PKP CARGO S.A. on the Bohumin Vrbice - Tychy Fiat route, and a Scania road tractor with a Wielton semi-trailer (hereinafter referred to as the "road tractor with a semi-trailer"). The occurrence consisted in the train colliding with the side of the semi-trailer of the road tractor. The latter was prevented from exiting the level crossing by a passenger car which stopped to give way to pedestrians on a marked pedestrian crossing.
After the pedestrians left the pedestrian crossing, the passenger vehicle exited the level crossing while the road tractor with a semi-trailer remained enclosed between the barriers.

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

The occurrence took place on 20 February 2023 at 18:11 hrs on the Chałupki – Krzyżanowice route, track no. 2, the Category B level crossing at km 47.973 of railway line no. 151 Kędzierzyn-Koźle – Chałupki, the area of infrastructure manager PKP PLK S.A. Railway Line Plant in Tarnowskie Góry.

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

Photograph 4 - A general view of the occurrence site (evidence material of PKBWK)

Category B level crossing ID no. 151 047 973 on which the accident took place is located on Class G two-lane national road no. 45 Zabełków – Racibórz – Opole – Złoczew, at the 3.90 kilometre of that

road. The road consists of bitumen surface with an earthen shoulder and pavement pathways. The roadway width on the level crossing is 6.50 m. As of the day of the accident, the permitted speed of road vehicles on the road in the area of the level crossing was 50 km/h, and the angle at which the road crossed the rail tracks was 33°. The area where the road crosses the railway line is located in an urban area in the town of Roszków, Racibórz County (Polish: *powiat raciborski*). On the road, on both sides of the level crossing, there are road signs A-9, G-1a, G-1b, G-1c and G-2, and boards informing on the height of the suspension of the contact line. The level crossing has delineator posts U1a and fencing. Before the level crossing, on both sides of the approach road, there are road signals of the automatic crossing system with sound signalling and four half-barriers that close all traffic lanes (entrance and exit).

The occurrence took place in the dark, with good air transparency, medium cloud coverage, no precipitations, and ambient temperature +8 °C.

No works on the rail or road infrastructure were being carried out in the area of the level crossing at the time of the occurrence.

Photograph 5 - A view of the level crossing seen from the driving direction of the road tractor (evidence material of PKBWK)

Photograph 6 – Position of the pedestrian crossing

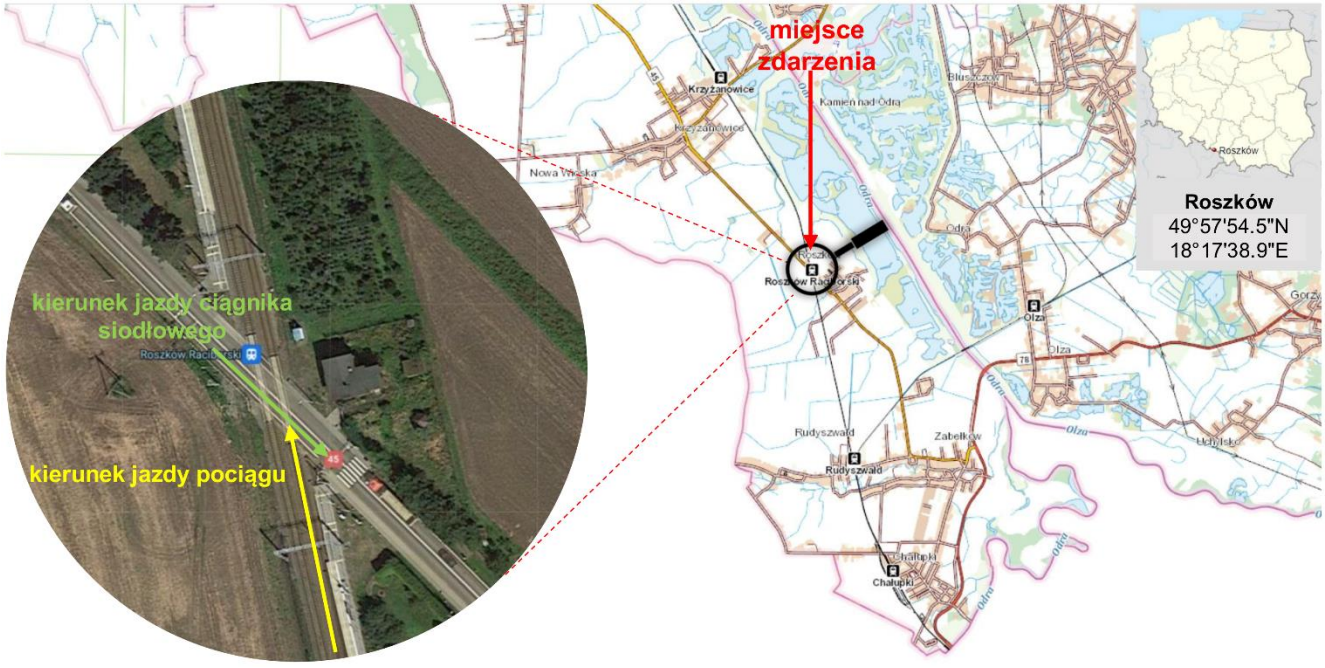


Figure 1 - A general view of the occurrence site (source: Geoportal)

Figure 2 - A sketch of the accident

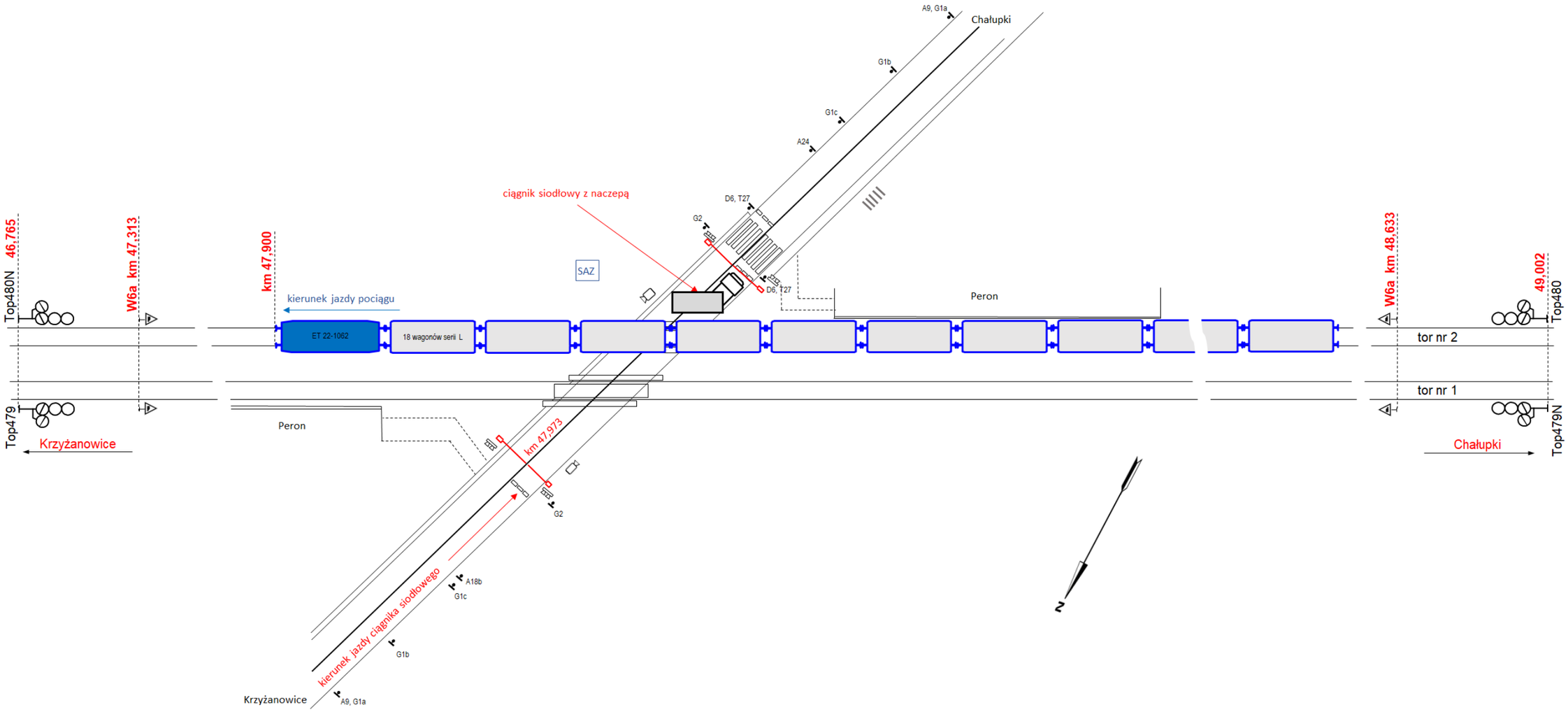
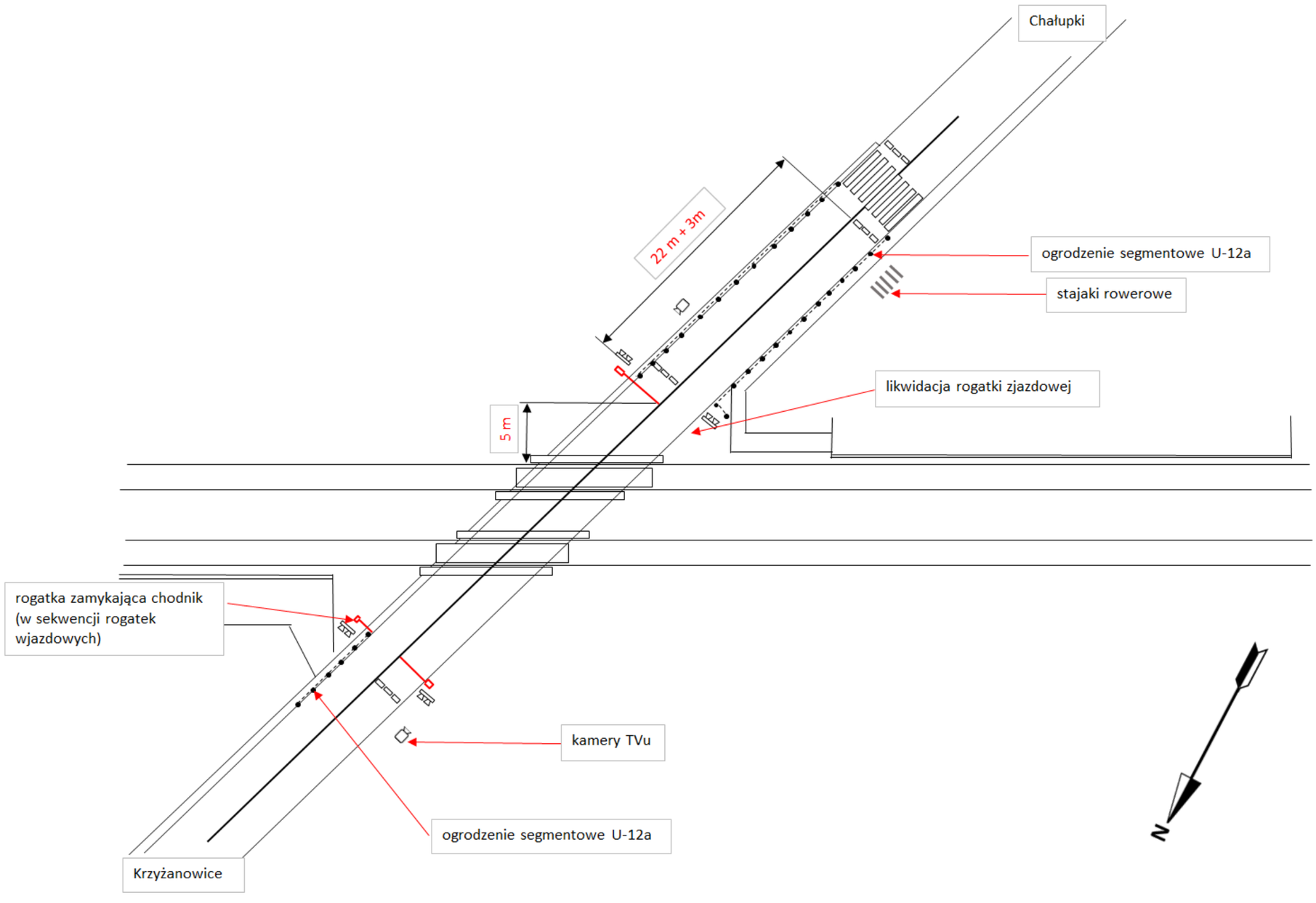


Figure 3 – A proposed solution of the organisation of traffic at the level crossing (one of possible solutions that ensure safety)



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

Nobody sustained any injuries as a result of the accident.

b) cargo, luggage and other property

A Scania R420 road tractor and a Wielton freight semi-trailer with the total mass of 31.68 t.
As a result of the accident, the following elements of the semi-trailer were damaged:
- the box body - floor with side walls,
- the frame of the semi-trailer - bent,
- the central axle of the semi-trailer - dislocated and bent,
- the kingpin,
- two rear wheels of the semi-trailer - two rims and tyres,
- two rear wheel arches,
- electrical lighting - side and rear (side marker lamps and main rear lamp).

Furthermore, the tractor's frame was bent and its coupling (fifth wheel) was damaged.

c) rolling stock, infrastructure and the environment

Train no. 441008 was not derailed. As a result of the collision, the ET22-1062 locomotive sustained the following damage: - deformed and grazed front on the right side of cabin A, from the rail fender to the corner window,
- broken corner window pane together with the window frame and seal,
- broken side window fairing on the train driver's side,
- broken and dented head lamp on the right side of the cabin,
- damaged train heating box and jumper, warped tubing with pipes,
- bent step and handle for climbing on the head of the locomotive and cowling,
- grazing and shear on the right bumper.

Photograph 7 – The place where the head of the road tractor stopped after the collision (material provided by the railway commission)

Photograph 8 – Stationary vehicles after the occurrence (material provided by the railway commission)

Photograph 9 – Damage sustained by the road tractor's semi-trailer (material provided by the railway commission)

Photograph 10 – Damage sustained by the ET22-1062 locomotive (material provided by the railway commission)

There was no damage to the infrastructure or losses in the natural environment.

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

As a result of the occurrence, track no. 1 of the Chałupki – Krzyżanowice route was closed from 18:13 hrs to 19:08 hrs on 20 February 2023, and track no. 2 of the Chałupki – Krzyżanowice route was closed from 18:13 hrs to 20:25 hrs on 20 February 2023. As a result of the occurrence, two trains, no. 44882 and no. 441008, were delayed by 6 minutes and 442 minutes respectively.
The level crossing was made passable and cleared for road traffic at 20:10 hrs on 20 February 2023, following the completion of the clear-up activities by the fire service and police.

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. 441008,
- the trainee driver under supervision of train no. 441008,
- the driver of the road tractor with a semi-trailer.

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

Freight train no. 441008 hauled by an ET22-1062 locomotive, including 18 platform wagons loaded with motor vehicles.
The locomotive had technical railworthiness certificate for a rail vehicle no. COTO74/04/2019 issued on 15 February 2019, for which rail vehicle type operation approval certificate no. T/99/0043 was issued; the rail vehicle identification number was 91 51 3 150 142-0 PL-PKPC (ET22-1062). The certificate is valid until 14 February 2027 or for 500,000 km counted from 212 km. The vehicle's mileage as of the day of the occurrence was 278,875 km.

Train data:
- length of the train……..…… 565.62 m
- total mass of the train…….788.74 t
- required braked mass percentage…..… 73 %
- actual braked mass percentage…..… 90 %
- required braked mass……... 576 t
- actual braked mass…… 713 t

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, year of manufacture 2017,
- Sleepers……. – prestressed concrete, PS94 type
- Attachment type…… – SB type
- Ballast type…….. – gravel
- Maximum permitted train speed en route… – 110 km/h

Track condition: good.

Level crossing:

- Category B level crossing,
- individual level crossing identification number (yellow sticker): 151 047 993,
- crossing axis - km 47.993,
- road - railway track crossing angle – 33°,
- the surface of the level crossing is made of GTP *betonfertigteile* concrete slabs,
- road surface on the approaches - bitumen,
- access road gradeline:
  - right side (the direction of entry of the road vehicle to the level crossing) +0% along the length of 400 m,
  - left side +1% along the length of 250 m,
- exposure factor on the level crossing – 369,009; the latest measurement was taken on 13-14 October 2021,
- total length of the level crossing - 45 m,
- width of the road crown on the level crossing – 21 m,
- width of the roadway on the level crossing –6.5 m,
- width of the roadway on the approaches from 6.5 m to 6.7 m,
- maximum speed of road vehicles on the level crossing – 50 km/h,
- the level crossing is illuminated – 4 lighting columns,
- visibility of the level crossing from the road – right side 400 m, left side 250 m, with the required visibility of 60 m.

The Cat. B level crossing is equipped with Bombardier's SPA5 automatic level crossing devices (Polish: *samoczynna sygnalizacja przejazdowa*, SSP) with eight ELS-95 wheel sensors, four roadside signals, two EDG-4 sound generators, four EEG34 drives with lockable half-barriers, CCTV with a video recorder, level crossing warning signals with automatic train stop, W1 and W11p indicators, ERP7 remote control devices in a dispatching switch tower at the Chałupki station. The protection devices at the level crossing were operational on the day of the occurrence.

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

The Investigation Team identified other information relevant for the purpose of the description of the occurrence.

- The electrical drives are fitted with locking devices that prevent manual lifting of the exit half-barrier.

Photograph 11 – Attempts to lift the barrier bar undertaken by the witnesses (source: Youtube)

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 20 February 2023, as per the driving schedule for that day, the driver of the road tractor with a semi-trailer left the base with cargo at around 07:00 hrs headed to Racibórz. After unloading, he headed to the town of Dzierżysław to load cargo and transport it to the town of Jastrzębie Zdrój. At around 16:30 hrs, the driver left the town of Dzierżysław with the cargo and drove on national road no. 45. Driving from the direction of the town of Krzyżanowice, in the town of Roszków, he approached a group of cars stationary at a Cat. B level crossing whose barriers closed road traffic for entry to and exit from the level crossing. The automatic level crossing system closed the road traffic for the duration of the passage of a passenger train travelling on track no. 1 in the direction of the Chałupki station. After the train passed, the road traffic was opened (the barriers vertical, lamps on the barrier bars off, roadside signals off) at 18:08:32 hrs and the road vehicles moved with a delay of around 3 seconds, as did two pedestrians who had been walking on the pavement in the direction of the town of Roszków. The vehicle traffic was smooth and uninterrupted in both directions. The road tractor with a semi-trailer continued driving as the sixth vehicle with the speed of around 20 km/h. When the road tractor was just at the roadside signals at 18:08:53 hrs, the automatic light and sound signalling was activated (with the barrier bars still vertical and lamps on the bars off). In that position, from where the driver of the road tractor was seated, it was impossible to see signals emitted by the right-hand side signal, and the left-hand side signal was obscured by the semi-trailer of a passing lorry. The Investigation Team notes that in order to increase the driver attention the lamps on the barrier bars should be switched on simultaneously with the start of the roadside signals, in accordance with §98(5) of the Regulation of the Ministers of Infrastructure and of the Interior and Administration on road signs and signals, which provides

that *"The red flashing signal or two interchangeably flashing red signals shall mean prohibition of going behind the signal or other device emitting those signals"*. At the same time, a pedestrian on the other side of the level crossing stopped at the pedestrian crossing. A passenger car in front of the road tractor with a semi-trailer stopped on the level crossing just before the zebra crossing at the raised exit half-barrier to give way to the pedestrians. After the pedestrians left the pedestrian crossing, the car in front of the road tractor managed to exit the level crossing before the exit half-barrier was closed, while the road tractor with a semi-trailer was denied the possibility of collision-free exit. The driver did not attempt to exit the level crossing by breaking the half-barrier. Other road users undertook unsuccessful attempts to lift he half-barrier.
Meanwhile, the level crossing was approached by freight train no. 441008 travelling on track no. 2 from the Chałupki station with the maximum speed of 65 km/h. The train driver noticed a car on the level crossing and initiated emergency braking at approximately 400 m from the level crossing. The position of the road tractor stationary before the closed exit half-barrier was that the rear section of the semi-trailer was within the gauge of the train travelling on track no. 2. The semi-trailer's rear wheel set stood on the right rail of track no. 2 (in the train's driving direction). The driver got out of the vehicle, stood on track no. 2 and started giving signals to the approaching train by waving a high visibility vest in order to stop it. Having realised that it was impossible to stop the approaching train, the driver moved away to a safe distance. The train collided with the road tractor with a semi-trailer at 18:10:47 hrs, i.e. 88 seconds after the barriers fully closed the level crossing. The right side of the locomotive head hit the right side of the semi-trailer at the wheel set. As a result of the impact, the semi-trailer was thrown away to the opposite lane, without being rolled over, completely blocking both lanes. The head of the train stopped at km 47.973, i.e. 73 m from the axis of the level crossing. The train was not derailed.

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.

The driver of train no. 441008 reported the occurrence by radio to the train dispatcher at the Chałupki station, who subsequently notified the plant and line dispatcher and the emergency number operator (112). The train dispatcher at the Chałupki station closed tracks no. 1 and 2 on the Chałupki – Krzyżanowice route at 18:13 hrs.
The fire service, police and railway commission arrived at the site of the occurrence and proceeded to a rescue action, clean-up and establishing the course of the occurrence.
Officers of the Police County Headquarters in Racibórz identified the driver of the road tractor as the perpetrator and fined him with a ticket for *"entering a level crossing without making sure that there is enough room to continue driving on the other side"*. At 19:20 hrs, on receiving a clearance, the damaged road tractor pulled over to a nearby car park, and at 20:10 hrs the fire service issued *"Acknowledgement of transfer of land, facility or property covered by a rescue operation"* to the driver for the road vehicle concerned. After the operation was completed, the fire service issued also *"Acknowledgement of transfer of land, facility or property covered by a rescue operation"* for the train and the area covered by the operation; it was delivered to the rail infrastructure manager at 20:05 hrs. Train no. 441008 was towed by a rescue train to the Chałupki station at 20:19 hrs. Under the permission of the railway commission, track no. 1 was opened at 19:08 hrs, and track no. 2 at 20:25 hrs.
The railway commission determined the category of the accident as B19, specifying the initial cause as "Stop of a road vehicle on tracks between closed crossing barriers".

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 Tarnowskie Góry

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 for 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 is compliant with Article 62 of the Act of 7 July 1994 on the Construction Law.

PKP PLK S.A. Railway Line Plant in Tarnowskie Góry submitted reports on building work maintenance as regards traffic protection devices on the level crossing.

Report no. IZ09ATA.5441.90.2022 of 17 June 2022 on an inspection of the technical condition under applicable provisions of the construction law. After examining the devices, the diagnostician did not identify any irregularities and assessed their technical condition as good; the devices are fit for further operation.
Report no. IZ09ATA4.5441.89.2022 on a diagnostic examination (check) of rail traffic control devices performed on 17 June 2022 at the level crossing concerned. The diagnostic examination found that defects had been rectified, except for the installation of watch-tower communications (letter by ISE Racibórz no. ISE535.0822.135.2022WA2 of 10 July 2022). The diagnostician cleared the devices for further operation, with a request to replace or overhaul the barrier drives.
PKP PLK S.A. Railway Line Plant in Tarnowskie Góry took the related actions under the name "Modernisation of level crossing devices and CCTV at the Cat. B level crossing at km 47.973 of line no. 151, including alignment with the provisions of the Regulation of the Minister of Infrastructure and Development of 2015." The expected date of completion and implementation of the recommendation is 13 December 2023.

Railway carrier PKP CARGO S.A. Silesian Plant of the Company in Tarnowskie Góry

The rail vehicle designated to carry out a transport task by the railway carrier 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 requirement by law. The train was driven on the basis of a schedule. The technical condition of the rail vehicles involved provided for their safe operation.
The responsibilities of railway carriers 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 carrier, and Instruction Ct-1 (Mt-1) - Instruction for the driver of a traction vehicle. Based on an analysis of the collected evidence material, the Investigation Team did not identify any irregularities in the conduct of the train crew while they were driving the train.

Road manager: General Directorate for National Roads and Motorways, Branch in Katowice

In accordance with Article 20 of the Act of 21 March 1985 on public roads (Journal of Laws.2023.645), the responsibilities of the road manager include, but are not limited to, *maintenance the parts of the road, road equipment, earthworks, road engineering objects, road signs, road signals and road traffic safety devices, except for the part of the roadway referred to in Article 20f(2)* and *performance of traffic engineering tasks.* During the investigation, the Investigation Team found irregularities regarding pedestrian traffic (platform, pavements) involving the location of the pedestrian crossing close to the level crossing, i.e. immediately behind the half-barriers in the danger zone of the level crossing. Hence, the Chairman of PKBWK sent letter no. PKBWK.590.5.7.2023 of 7 April 2023 to the road manager regarding actions to improve rail transport safety with respect to the level crossing on national road DK45 (km 3.978).

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

Not applicable.

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.

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

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 ET22-1062 electric locomotive is fitted by the manufacturer with an electromechanical system of recording driving parameters HASLER Bern RT9 no. M.01.156 with the measurement range of 150 km/h. The P4 maintenance check was carried out on 15 February 2019. The locomotive was not fitted with a drive front video recording system despite instruction no. DBK-550/R03/KB/12 of the President of the Rail Transport Office of 30 May 2012 addressed to railway carriers. In the opinion of the Investigation Team, due to the circumstances of occurrences, it is necessary for railway carriers to step up as far as possible the installation of drive front recording cameras pursuant to TSI Rail Traffic no. 4.2.3.5. *Recording of data.*

The Investigation Team analysed the driving parameters recorded on the tape of the speedometer to investigate the train's driving characteristics immediately prior to and after the occurrence.

The chart below shows the following driving parameters of train no. 441008:

– distance,

- time,
- speed,
- active cabin A or B,
- use of the vigilance device button (active vigilance button/automatic train stop),
- pressure in the brake cylinders,
- electric/non-electric drive.

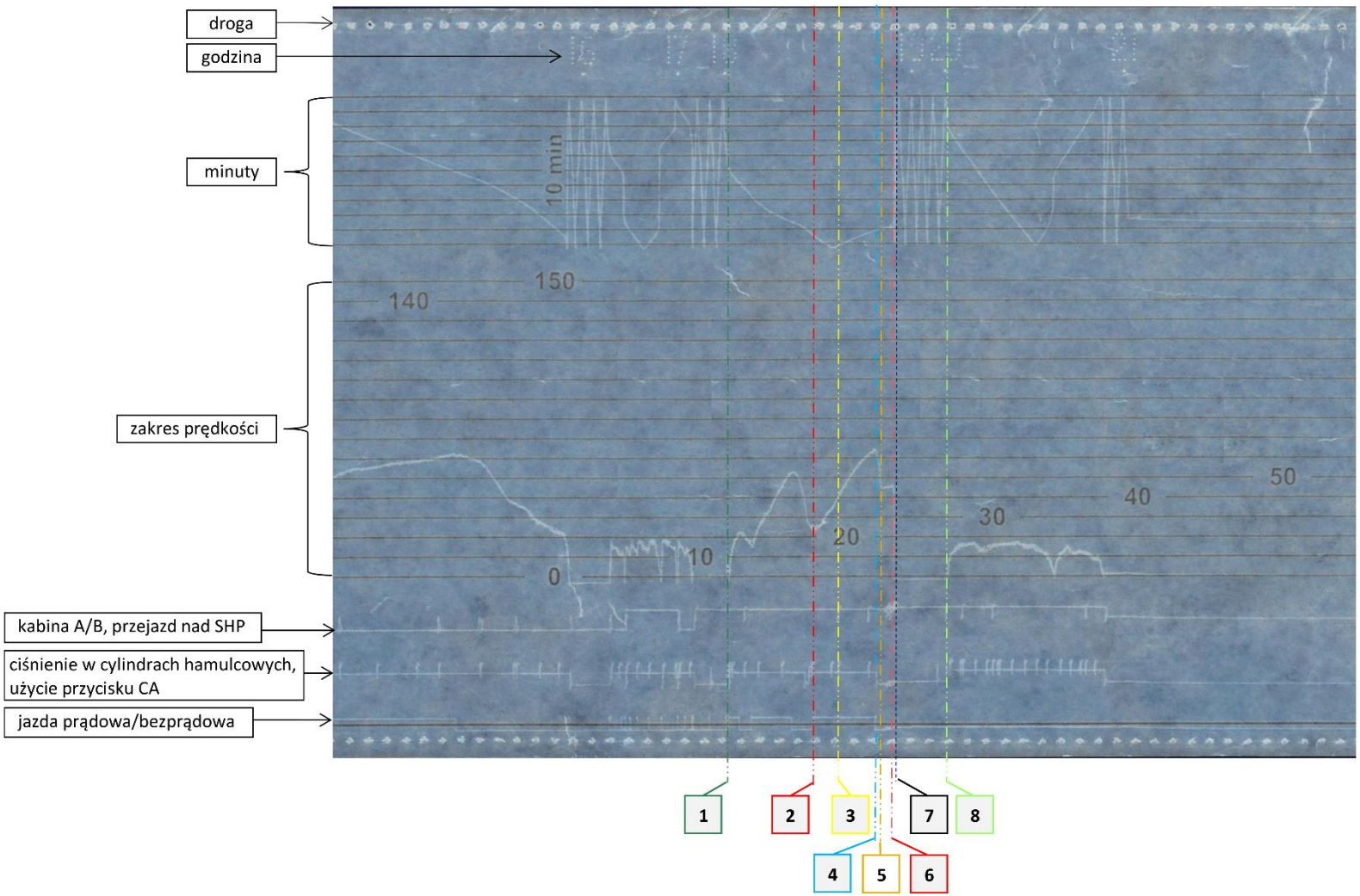


Figure 4 - A chart of driving parameters of the ET22-1062 locomotive (developed by PKBWK)

A description of the driving characteristics of train no. 441008 Bohumin Vrbice – Tychy Fiat on the route Chałupki – the occurrence site (key to Figure 4):

1 - 18:05 hrs, departure from the Chałupki station, drive control from cabin A, electric drive, until 18:09 hrs driving at the speed of 55 km/h over the distance of 2 km, use of the active vigilance button

2 - 18:09 hrs, speed reduction to 20 km/h, recorded reduction of pressure in the brake cylinders, non-electric drive, use of the active vigilance button

3 - 18:10 hrs passage over an ATS electromagnet at km 49.202, before a Top480 crossing warning signal, electric drive with the speed of 60 km/h, use of the active vigilance button

4 - 18:11 hrs, at the speed of 65 km/h the system recorded a pressure reduction in the brake cylinders, non-electric drive, speed reduction to 45 km/h over a distance of approximately 400 m

5 - the moment of collision of the locomotive and the road tractor at the speed of 45 km/h

6 - a sudden speed drop from 45 km/h to 0 km/h over a distance of 100 m

7 - starting at 18:11 hrs, the train stationary on the route

8 - 20:02 hrs, train brake released and non-electric drive (the train is towed to the Chałupki station)

Scania road tractor

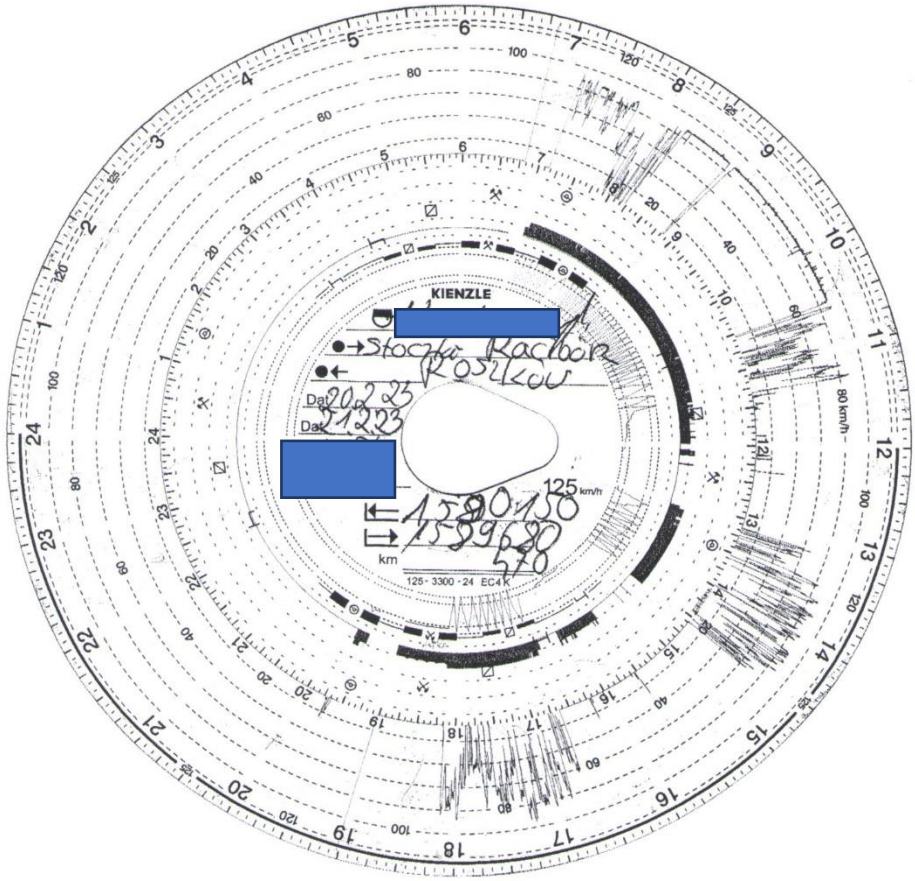


Figure 4 - A chart of driving parameters of the road tractor.

The driving parameters recorded show the following:

- at 07:00 hrs on 20 February 2023 - departure from the town of Stoczki,
- continuous driving until 11:20 hrs,
- from 11:20 hrs to 12:20 hrs - manoeuvring operations,
- a break in driving from 12:20 hrs to 13:10 hrs,
- continuous driving to the loading site from 13:10 hrs to 14:35 hrs,
- manoeuvres at the loading site from 15:30 hrs to 16:15 hrs,
- continuous driving from 16:35 hrs to 18:10 hrs,
- end of work at 19:45 hrs in the town of Roszków,
- the road tractor covered the distance of 470 km,
- the driver worked, with breaks, for 11 hours and 10 minutes.

Automatic Crossing System (SSP)

- Type of automatic crossing system devices – SPA-5.
- Equipment cabinet ERR-1.
- Roadside signals –EHZ-7 - 4 items.
- Level crossing warning signals – EHZ-5 – 4 items.
- Barrier drives – EEG-3 – 4 items.
  - Entrance barrier drives:
  - EEG-310102, self-dropping, lockable in both road barrier positions – 2 items, no. N1 and N2.
  Exit barrier drives:
  - EEG- 300002, non-self-dropping, lockable in both road barrier positions – 2 items, no. N3 and N4.
  All barrier drives have a crank circuit breaker which breaks the drive's electric circuit after the crank is inserted (after opening the drive cover plate, in this version), as well as connected circuits for barrier bar continuity.
- Sound devices – sound generator EDG-4 – 2 items.
- Remote control devices – ERP-7, installed at the Chałupki station.
- Wheel sensor – ELS95 – 8 sets.
- Devices installed for the speed of 120 km/h.
- Cat. B level crossing, max. speed en route 120 km/h.
- Warning time min 46 s.
- Bombardier TSSA-001 CCTV devices (the screen installed in the equipment cabinet).

Rekord	Data/czas	Przejazd	Typ	Status	Opis
00188	2023-02-20 19:34:26	1/A	Z	-	czujniki w torze 2
00189	2023-02-20 19:34:26	1/A	Z	-	usterka kategorii 2
00190	2023-02-20 19:34:24	1/B	Z	!	ostrzeganie zapamiętane
00191	2023-02-20 19:34:24	1/B	Z	-	czujniki w torze 2
00192	2023-02-20 19:34:24	ERP	Z	-	położenie kluczyka ERP-7
00193	2023-02-20 19:34:23	1/A	Z	!	ostrzeganie zapamiętane
00194	2023-02-20 19:34:22	1/B	Z	!	polecenie: potwierdzenie
00195	2023-02-20 19:34:21	1/A	Z	!	polecenie: potwierdzenie
00196	2023-02-20 19:34:20	1/B	Z	!	polecenie: wyłącz czujniki w torze 2
00197	2023-02-20 19:34:19	1/A	Z	!	polecenie: wyłącz czujniki w torze 2
00198	2023-02-20 19:34:19	ERP	Z	!	położenie kluczyka ERP-7
00199	2023-02-20 18:16:28	1/B	Z	!	usterka kategorii 2
00200	2023-02-20 18:16:28	1/A	Z	!	usterka kategorii 2
00201	2023-02-20 18:06:28	1/B	Z	!	ostrzeganie w torze 2
00202	2023-02-20 18:06:28	1/B	Z	!	ostrzeganie
00203	2023-02-20 18:06:28	1/A	Z	!	ostrzeganie w torze 2
00204	2023-02-20 18:06:28	1/A	Z	!	ostrzeganie
00205	2023-02-20 18:05:58	1/A	Z	-	ostrzeganie w torze 1
00206	2023-02-20 18:05:58	1/A	Z	-	ostrzeganie
00207	2023-02-20 18:05:56	1/B	Z	-	ostrzeganie w torze 1
00208	2023-02-20 18:05:56	1/B	Z	-	ostrzeganie
00209	2023-02-20 18:03:42	1/B	Z	!	ostrzeganie w torze 1
00210	2023-02-20 18:03:42	1/B	Z	!	ostrzeganie
00211	2023-02-20 18:03:42	1/A	Z	!	ostrzeganie w torze 1
00212	2023-02-20 18:03:42	1/A	Z	!	ostrzeganie

Figure 5 - Events recorded in ERP-7 on 20 February 2023

In order to analyse the functioning of the automatic crossing system devices at the level crossing, records were secured including the event history and trackside sensor defect history as recorded in the remote control device ERP-7 installed in the dispatching switch tower "CHiA" at the Chałupki station.
Based on a computer log analysis, the following was found:

- the devices at the level crossing operated correctly prior to the occurrence,
- entry of train no. 441008 to the switch-on zone took place at 18:06:28 hrs, after which warning was activated on channels A and B at 18:06:28 hrs,
- at 18:16:28 hrs, the system detected a category 2 defect ("zone occupation defect on track 1") caused by the stop of the train in the exit zone for longer than 10 minutes,
- no defects of the automatic crossing system devices were recorded during the passage of the train.

In accordance with the records in the rail traffic control device inspection books from the switch tower "CHiA" and the automatic crossing system container as of 20 February 2023, no defects were recorded until the time of the occurrence.
The said data shows that on 20 February 2023 the automatic crossing system devices operated faultlessly.

3. Human factors

3.1. Human and individual characteristics

The driver of the road vehicle held a medical certificate of no contraindications to perform his job. As it transpires from documents and interviews with the driver and his employer, the road vehicle was driven on the day of the occurrence as per schedule on a designated route with cargo. The driver of the road tractor entered the level crossing despite the start of the signal that prohibited driving beyond the signalling devices, which could not be seen from the where the driver of the road tractor was seated. The driver stopped the vehicle on the level crossing before a passenger car which had stopped at the pedestrian crossing to give way to pedestrians, and thus he was unable to continue driving. After the pedestrians left the pedestrian crossing, the car in front of the road tractor managed to exit the level crossing before the exit half-barrier was closed, while the road tractor was denied the possibility of collision-free exit. The driver could not exit the level crossing without damaging the vehicle and elements of the traffic safety infrastructure on the level crossing (the barrier bar). According to an analysis of the evidence material collected by the Investigation Team, the situation surprised the driver and caused some stress, which is why he did not take any actions to exit the level crossing by ramming the closed half-barrier with his vehicle. He got of the vehicle and, fully aware that a train was approaching, started to stop it by waving a high-visibility vest.
Furthermore, the investigation into the causes of the occurrence confirmed that the train driver behaved appropriately as he initiated emergency braking with the "Attention!" signal after he noticed the obstacle on the level crossing. A medical examination of the train driver and the trainee train driver did not show the presence of alcohol in their blood. The train crew's work time was consistent with applicable standards. The driver of train no. 441008 had had 72 hours of rest prior to starting work. The train driver had received training required for operating ET22 series traction vehicles and had completed other training courses related to his job. The trainee train driver held an authorisation and valid medical certificate to perform his job.
The workers held medical certificates showing no contraindications to perform their jobs.

3.2. Job factors

The Investigation Team does not raise any reservations concerning job factors.

3.3. Organisational factors and assignments

As it transpires from the evidence material collected by the Investigation Team, the railway and road carriers had ensured that their personnel involved in the occurrence had the legally required rest time. The said workers held all ratings and authorisations required by the applicable law and instructions for actions performed
on the job concerned. The employer provided them with all necessary instructions and regulations ensuring safe performance of their jobs. The Investigation Team does not raise any objections concerning the organisational assignments.

3.4. Environmental factors

The Category B level crossing with four half-barriers is located in an urban area in the town of Roszków. The level crossing is in vicinity of the passenger stop Roszków, whose tracks are located on both sides of the road. The level crossing includes route tracks no. 1 and 2 of the Chałupki –Krzyżanowice route, and it crosses national road DK 45 at the angle of 33°. The pedestrian traffic pathway in the area of the level crossing concerned was organised inappropriately. The pavement is located partially on one side of the road, and partially on the other (interchangeably), with the change of pedestrian traffic sides located in the level crossing's danger zone, as the pedestrian crossing was 2.5 m behind the half-barriers on the day of the occurrence. The Investigation Team considered such organisation of the traffic and location of the pedestrian crossing as one of the factors contributing to the occurrence.

At the same time, the Investigation Team found that the crossing angle, the length of the level crossing and the dark time of the day hindered observation and appropriate judgement of the situation, and thus could have contributed to the occurrence. The said conditions prevented the train driver and the driver of the road tractor with a semi-trailer from reacting more quickly.

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

None identified.

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

The relevant regulatory framework conditions:

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

Following the amendment to the Act of 20 June 1997 on the Road Traffic Law, the infrastructure manager did not carry out a risk assessment concerning the location of pedestrian crossings in the level crossing's danger zone, nor included that threat in the register of threats.

4.2. The safety management system of the involved railway undertaking(s) and infrastructure manager(s) including the basic elements stated in Article 9(3) of Directive (EU) 2016/798 and any EU legal implementing acts

The Investigation Team did not identify a causal relationship between the occurrence concerned and procedures adopted and applied by the infrastructure manager and railway carrier.

4.3. The management system of the entity/entities in charge of maintenance and maintenance workshops including the functions stated in the Article 14(3) and Annex III of Directive (EU) 2016/798 and any subsequent implementing acts

Not applicable.

4.4. The results of supervision performed by the national safety authorities in accordance with Article 17 of Directive (EU) 2016/798

With respect to the level crossing concerned, the President of the Rail Transport Office did not perform any inspections in 2021 – 2023.

4.5. The authorisations, certificates and assessment reports granted by the Agency, the National Safety Authorities or other conformity assessment bodies

The Investigation Team does not raise any reservations regarding certificates held by the infrastructure manager and railway carrier.

4.6. Other systemic factors

The Road Traffic Law, which is the primary regulation for public road users and is also referred to as "The Road Traffic Code", i.e. the provisions of the Act of 20 June 1997 on the Road Traffic Law (consolidated text: Journal of Laws of 2021, item 450, as amended).
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 of 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"
The amendment to the Act of 20 June 1997 on the Road Traffic Law (Journal of Laws of 2021, item 450, as amended) caused that, effective on 1 June 2021, in accordance with Article 13 *"when approaching a pedestrian crossing, the driver of a vehicle is obliged to exercise special caution, reduce the speed so as not to endanger a pedestrian who at the time is either on the crossing or entering the crossing, and to give way to a pedestrian who is either on the crossing or entering the crossing*".
While imposing the obligation to give way to a pedestrian, the legislation did not provide for a situation in which the driver of a vehicle must stop before a pedestrian crossing while still on a road crossing or level crossing. The legislator exempted only tramways from that obligation.

Where a pedestrian crossing is located in the immediate vicinity of a level crossing, a road vehicle, when giving way to a pedestrian, must stop on the level crossing, which is in conflict with Article 47(1)(1) of the Act that provides: *"A vehicle is forbidden to stop on a railway or tramway level crossing, or an intersection, or at a distance shorter than 10 m from the crossing or intersection".*
The conflict of the said rules exposes drivers of road vehicles at a pedestrian crossing in the vicinity of a level crossing to breaching either of the said articles. The Investigation Team considers the provisions of the aforementioned rules as imprecise and causing contradiction where a pedestrian crossing is located too close to level crossings, which in turn may lead to accidents. In simple terms, the said rules require giving way to a pedestrian on the one hand, while forbidding stopping at a level crossing, on the other. At a pedestrian crossing located as the one at the site of the occurrence, and in the circumstances concerned, it would b impossible to jointly meet both rules. The implementing provisions to the Construction Law do not specify the conditions for locating road crossings in the area of a level crossing.
That discrepancy, and the absence of provisions on locating pedestrian crossings in the area of a level crossing, are considered by the investigation team as systemic factors which in specific situations may pose a hazard to the safety of road and railway traffic.

The conduct of the train crew had no impact on the occurrence because the warning and traffic protection system at the level crossing operated correctly. The signals on the level crossing warning signal (Top) only inform the train driver that the devices are operational and ready to warn road users, i.e. that the road and sound signals and crossing barriers are operational.

5. Previous occurrences of a similar character

The Investigation Team analysed accidents which occurred under circumstances similar as on railway line no. 151.
A brief description of the events and their consequences.

1) An occurrence on 3 February 2022 at 06:14 hrs, at a Cat. B level crossing, track no. 2, located at the Warlubie – Laskowice Pomorskie route, railway line no. 131 Chorzów Batory– Tczew, km 437.386, which involved passenger train IC 5600/1 operated by railway carrier PKP Intercity S.A., consisting of a EU07A-002 locomotive and seven wagons, and a Mercedes INTEGRO bus operated by carrier PKS Grudziądz. The occurrence consisted in a collision of the train and the rear right-hand side of the bus which was on the level crossing between the closed half-barriers and was trying to exit the level crossing. Before the bus entered the level crossing, the automatic crossing system was in the warning mode because of the approaching freight train on track no. 1 in the direction of the Warlubie station. Due to the closed barriers and active light signalling, the bus stopped before the crossing. After the freight train passed the level crossing, the system started lifting the barriers. Before the barriers were fully lifted and road signals were switched off, passenger train IC 5600/1 approaching on track no. 2 from the Warlubie station reactivated the automatic crossing system in the warning mode. The lights on the road signals were continuously giving signals prohibiting any entry onto the level crossing, and the barriers starter closing again right after being lifted. The bus driver, ignoring the road signal that prohibited the entry (visible to him S1 and S3), entered the level crossing while the barriers were closing. The bus driver reached the barrier on the other side of the level crossing and stopped the bus. As the bus remained stationary, the driver told the minder of the children to get out of the bus and lift the barrier manually.
After several unsuccessful attempts to lift the barrier, the minder noticed a train approaching from the direction of the Warlubie station. He immediately ordered the bus driver to leave the level crossing. The bus driver slowly drove to leave the level crossing and evade the barrier without damaging it.
After passing the Warlubie station and coming out of the bend, the driver of train IC5600/1 noticed a bus stationary on the level crossing. The train driver initiated emergency braking and emitted the sound signal "Caution". The train hit the rear of the bus at the speed of around 90 km/h.
As a result of the collision, the bus turned 90 degrees and hit the locomotive with its side, and was subsequently thrown away to the right side of track no. 2 (looking in the train driving direction) to some 100 metres from the axis of the level crossing, and the bus driver was killed. As a result of the accident, the road vehicle (the bus) was destroyed and the EU07A-002 locomotive and passenger wagons were damaged.

2) An occurrence on 3 April 2019 at 15:44 hrs, on a Cat. B level crossing, with a correctly operating signalling with four half-barriers (two entrance and two exit barriers) at km 152.183 on track no. 1 of railway line no. 271 Wrocław Główny – Poznań Główny, during which train IC 45101 operated by carrier PKP Intercity S.A. drove into an ambulance stationary between closed barriers. The driver of the ambulance passed a passenger car stationary before the closed entrance barrier and entered the level crossing while the exit barrier was closing. While the ambulance was driving through the level crossing, the exit barrier dropped, preventing it from leaving the level crossing. The ambulance driver positioned the ambulance with its front towards the driving direction of the train. The approaching train drove into the ambulance (stationary on the level crossing). As a result of the occurrence, two persons were killed on the spot and the ambulance driver was taken to hospital. As a result of the accident, the road vehicle was destroyed and the locomotive and wagons were damaged.

3) An occurrence 19 April 2016 at 07:10 hrs, on a Category B level crossing, with a correctly operating signalling on track no. 1 at km 32.612 of railway line no. 356 Poznań Wschód – Bydgoszcz, during which train no. 79628 operated by carrier Koleje Wielkopolskie Sp. z o.o. drove into a Volvo SR6 lorry with a load of construction timber stationary on the level crossing. Exiting provincial road no. 196 onto a municipal road leading to the level crossing, the lorry driver ignored a B-5 road sign (no entry for

lorries) and entered the level crossing with lifted barrier bars while ignoring the light signals. While the lorry was driving through the level crossing, the barrier bar started dropping and the lorry driver stopped the vehicle. After a moment, the train drove into the rear of the lorry. One person was injured as a result of the occurrence. The car and the SA132 – 003 railbus were seriously damaged.

V. CONCLUSIONS

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

An analysis showed that the rolling stock involved in the accident, as well as the rail infrastructure elements, including the automatic crossing system installed at the level crossing, were in working order. Job factors and organisational assignments performed by entities involved in the occurrence did not contribute to the occurrence concerned.

The Investigation Team found that the causal factor for the occurrence was inability of a road tractor with a semi-trailer to exit a Cat. B level crossing due to a passenger car stopping in front of a pedestrian crossing, followed by the road tractor with a semi-trailer being enclosed by an exit barrier, as a result of which a train ran into the road tractor.

Inappropriate organisation of pedestrian traffic in the area of the level crossing caused by the location of the pedestrian crossing at a 2.5 m away from the barriers, hindering smooth passage of road vehicles through the level crossing, and the fact that a passenger car stopped before the pedestrian crossing to give way to pedestrians, which prevented the road tractor with a semi-trailer from continuing driving through the level crossing, and no possibility for third parties to manually lift the exit barrier (which was which had been installed as lockable). In addition, failure to implement recommendation no. 2) in Point 4.2 of the PKBWK's Annual Report 2018 concerning disassembly of exit barriers. All the above factors were considered by the Investigation Team as factors contributing to the occurrence.

The location of the pedestrian crossing in the immediate vicinity of the level crossing forces drivers of road vehicles to stop in the level crossing's danger zone to give way to pedestrians in accordance with the Act on the Road Traffic Law, and it forces them to breach the said Act as regards the prohibition of stopping on the level crossing.

The causes of the occurrence which the Investigation Team considered as the systemic factors are described in detail in Point IV.4.6.

2. Measures taken since the occurrence

The Chairman of PKBWK, having regard to the existing state of reduced safety in accordance with the provisions of Article 28l(1a) of the Act of 28 March 2003 on rail transport (consolidated text: Journal of Laws of 2021, item 1984), addressed a letter of 17 March 2023 to the Director of PKP PLK S.A. Railway Line Plant in Tarnowskie Góry, and a letter of 7 April 2023 to the Director of GDDKiA Katowice Branch, in which he issued the following recommendations aimed at improving rail transport safety at the level crossing concerned:

GDDKiA Katowice Branch shall:

1) change the organisation of pedestrian traffic in the area of the level crossing by removing the vertical and horizontal pedestrian crossing signage in the area of the level crossing concerned (the recommendation has been implemented; the pedestrian crossing vertical and horizontal signage has been removed),
2) install pavement fencing to protect pedestrians and channel pedestrian traffic at the drive of barrier N2 closing the entry to the level crossing and at the drive of barrier N3 closing the pedestrian pathway on the pavement in the direction of the tracks (the recommendation has not been implemented; it can be implemented after implementation of the recommendations imposed on PKP PLK S.A.),
3) take immediate actions to relocate the pedestrian crossing from the immediate vicinity of the level crossing to at least 22 metres away from the entrance barrier on the entry lane (the recommendation is under implementation).

PKP PLK S.A. Railway Line Plant in Tarnowskie Góry shall:

4) Remove the barrier and its drive (no. N4) closing the exit from the level crossing (the recommendation is under implementation).

5) Change the function of the barrier (no. N3) from a barrier closing the exit from the level crossing to a barrier closing the pedestrian pathway on the pavement in the direction of the tracks for the duration of train passage. Replace the bar of barrier N3 with a type that will secure only the pavement, and the barrier should operate in the entrance barrier sequence (the recommendation is under implementation).
6) Change the location of the drive of barrier N2 closing the entrance to the level crossing to meet the conditions laid down in the Regulation (the recommendation is under implementation).
7) Install lamps on the barrier bars to ensure their visibility in accordance with the provisions of the Regulation (the recommendation is under implementation).
8) Change the location of the signals to ensure their visibility in accordance with the provisions of the Regulation (the recommendation is under implementation).
9) Introduce a permanent 60 km/h speed limit for trains along the entire width of the Category B level crossing located on the Chałupki - Krzyżanowice route, km 47.973 of railway line no. 151 Kędzierzyn Koźle - Chałupki, until the barriers closing the road traffic in the direction of the exit from the level crossing (the recommendation has been implemented).

3. Additional comments

The Investigation Team identified other irregularities that did not contributed to the occurrence concerned:
- inappropriate positioning of the cameras on at the level crossing, preventing monitoring of the area of the entire level crossing together with the road signals,
- inappropriate (inconsistent with the system's DTR) functioning of the sound signal, which at present generates acoustic warning signals after rolling stock engages the switch-off sensor,
- installation of the drive of barrier N4 at the distance of less than 5 m from the outermost rail,

VI. SAFETY RECOMMENDATIONS

1) The Minister competent for transport shall lay down, among others, the conditions of positioning pedestrian crossings at level crossings in the implementing provisions to the Construction Law.
2) The Minister competent for transport shall take actions to amend the *Regulation of the Minister of Infrastructure and Development on the technical conditions to be met by crossings of railway lines and sidings with roads, and on their positioning* as regards activation of lights on all barrier bars simultaneously with the start of emitting signals on road signals.
3) Authorised rail infrastructure managers, users of railway 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 level crossings as regards the location of pedestrian crossings in their immediate vicinity. Shall any such pedestrian crossings be identified, they shall immediately act together with the relevant road manager to move those pedestrian crossings outside the level crossing's danger zone.
4) Rail infrastructure managers shall implement recommendation no. 2) from Point 4.2 issued by the Commission in the PKBWK's Annual Report 2018, i.e.
   "Infrastructure managers shall remove exit barriers in automatic crossing systems at Category B level crossings where solutions with four half-barriers are employed. Such a configuration is inconsistent with the provisions of Point 6.2 of Annex no. 4 to the Regulation of the Minister of Infrastructure of 3 July 2003 on the detailed technical conditions concerning road signs and signals and road traffic safety devices, and on the conditions of their installation on roads (consolidated text: Journal of Laws of 2019, item 2311), which provide that: "barriers U-13a and U-13b which close the entire width of the roadway shall be used at Category A level crossings, whereas half-barriers U-13c shall be used at Category B level crossings. Half-barriers shall be positioned so that they close the right half of the road on each side (also where half-barriers are installed on one-way roadways)".
   In addition to the recommendation of 2018, efforts should be made to separate traffic lanes on one-way roads by means of installing separators.
5) PKP PLK S.A. Railway Line Plant in Tarnowskie Góry shall:
   - change the position of the cameras at the level crossing to provide for monitoring of the area of the entire level crossing together with the road signals,
   - change the operation of the sound signal, which at present generates acoustic warning signals after rolling stock engages the switch-off sensor (as per the system's Technical and Operational Documentation, DTR).

STATE COMMISSION ON RAILWAY ACCIDENT INVESTIGATION
CHAIRMAN

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Tadeusz Ryś

List of entities and acronyms that appear in Report No. PKBWK 5/2023

#	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.	PKP PLK S.A.	Polskie Linie Kolejowe - infrastructure manager
5.	IZ	Railway Line Plant (Polish: *Zakład Linii Kolejowych*)
6.	PKP CARGO S.A.	Railway carrier
7.	GDDKiA	General Directorate for National Roads and Motorways (Polish: *Generalna Dyrekcja Dróg Krajowych i Autostrad*) - road manager
8.	DTR	Technical and Operational Documentation (Polish: *Dokumentacja Techniczno-Ruchowa*)