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

REPORT No. PKBWK 06/2024

on the investigation of a railway accident that occurred on 24 August 2023 at 12:05 hrs at Skierniewice station, at turnout no. 13, at km 64.282 of railway line no. 1 Warszawa Zachodnia - Katowice the area of the infrastructure manager PKP Polskie Linie Kolejowe S. A. Railway Line Plant in Łódź

WARSAW, 1 August 2024

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 followed for railway accident and incident investigation reports (OJ L 132 of 27 April 2020)*

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I. SUMMARY

Type of occurrence Accident.

Description: Freight train no. 524009 of the railway carrier PKP CARGO S.A. travelling from Nidzica to Sitkówka Nowiny, led by locomotive ET41-121, was had been moving on main station track two of Skierniewice station, which is an extension of plain line track no. 2 (left) of the Radziwiłłów Mazowiecki - Skierniewice route. The route for that train had been prepared and locked onto track three, and the permissive aspect S13 was shown on the signal $J2^{1/2/3/4/m}$. When the head of that train, moving from track two onto track one via turnout no. 11, reached the fouling point of turnout no. 13 at km 64.282, a lateral collision occurred with passenger train no. 93965 led by EMU ER160-22 of the railway carrier "Koleje Mazowieckie - KM" Sp. z o.o. travelling from Warszawa Wschodnia to Skierniewice. The passenger train had been moving on track one, which is an extension of plain line track no. 1 (right) of the Radziwiłłów Mazowiecki - Skierniewice route, and disregarded the signal $J1^{1/2/3/m}$ which was showing aspect S1 "Stop". The passenger train overtook the freight train by entering turnout no. 13 directly from the obtuse crossing side onto the route of the freight train, and ran through that turnout. The head of the ET41-121 locomotive at turnout no. 13 ran into the left side of the first unit of the passing passenger train. The head of train no. 524009 stopped at km 64.306, and the head of train No. 93965 stopped at km 64.374.

Date of the occurrence: 24 August 2023, 12:05 hrs

Location of the occurrence: Skierniewice station, railway line no. 1, turnout no. 13, km 64.282, geographical coordinates 51º58’23,8”N, 20º10’17,8”E.

Consequences of the occurrence: As a result of the occurrence, all bogies of the first section and one bogie of the second section of the ET41-121 derailed, and section B and the gangway between the locomotive sections were damaged. Elements of the structure and body skin of electric multiple unit (EMU) ER160-22 were damaged. In addition, the drive of turnout no. 13 and the turnout bearers were damaged.

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)

Train no. 93965 disregarding the signal $J1^{1/2/3/m}$ with the aspect S1 "*Stop*" positioned at track 1, as a result of which the said train entered turnout no. 13 lying in the route of train no. 524009, which lead to a lateral collision of the two trains.

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) The fact that the driver of train no. 93965 did not communicate with the signaller to explain the reason why the permissive aspect had not been displayed on the intermediate signal $J1^{1/2/3/m}$ when he was starting from the home signal $B^{1/4}$ (the last one showing the aspect S5 "*The next signal is showing the aspect Stop").* Furthermore, the fact that the said train driver did not establish communication when approaching a ToJ1 warning disc showing the aspect Os1 *"The signal to which this disc refers is showing the aspect Stop".*
2) The driver of the passenger train was under stress caused by fixing door faults in the electric multiple unit at two consecutive passenger stops.
3) Time pressure on the driver due to the requirement to meet the passenger train timetable.

4) Lack of visibility of the aspects displayed by the intermediate signal $J1^{1/2/3/m}$ from the required distance of 375 m (the signal aspects are obscured by catenary poles positioned at track two as well as by trains running on that track).
5) The fact that the driver of train no. 93965 took a telephone call from continued the conversation with the dispatcher of the Rolling Stock Repair and Operation Section Warszawa Grochów while approaching, on track one, the intermediate signal $J1^{1/2/3/m}$ showing the aspect S1 *"Stop"*, in contravention of the internal regulations of the railway carrier.

Systemic factors: None found.

Recommendations and their addressees:

1) Certified railway carriers shall incorporate a train driver improvement programme in their safety management systems. Addressed to train drivers who have less than 5 years of work experience, the programme shall include at least:
   a. obligatory supervised instruction rides with all employee who are starting their careers as train drivers, at a rate of at least one ride per month for a period of one year, applicable to each train driver from the moment they obtain their train driver's certificate,
   b. ad hoc training, including an increased number of hours of simulator training,
   c. special assistance to that group of employees in terms of behavioural processes such as maintaining concentration, selecting stimuli, dividing attention, and the ability to work under pressure and under stress.
2) Licensed railway carriers shall include in their preparatory courses, training and periodic instruction for train drivers topics related to the rules on the use of mobile phones and other mobile devices while driving and shunting, as recommended by the Chairman of PKBWK (Report no. PKBWK/1/2012 Recommendation No. 3).
3) Certified railway carriers and entities in charge of maintenance shall identify within their management systems the hazard of recurrence of the causes of failure for a given vehicle type, and shall carry out a risk assessment for that risk. If the hazard is identified, they will continue to:
   a. apply corrective measures to eliminate the safety hazard,
   b. report recurrent failures of vehicles of a given type to the rolling stock manufacturer so that the latter could verify the failure rate in relation to other vehicles of the type, monitor the performance of potentially defective components and take actions to ensure the safe operation of these vehicles, e.g. by repairing/replacing the defective component in all vehicles of the type.
4) PKP PLK S.A. IZ Łódź shall install repeater signals ahead of the intermediate signal $J1^{1/2/3/m}$ to provide clear and uninterrupted visibility of the aspects shown by that signal.
5) PKP PLK S.A. shall cover the following topics in their periodic and ad hoc instructions for personnel directly involved in the operation of railway traffic:
   a. a good practice for their signal box personnel to send an additional notification by radio to the drivers of railway vehicles concerning changes in the traffic organisation applicable to a given train within a station, in particular concerning an unscheduled stop at a station or en route to let other trains pass as recommended by the Chairman of PKBWK in relevant Reports (No. PKBWK/03/2018 and No. PKBWK/02/2022).
   b. formulation of radiotelegrams in accordance with Instruction Ir-5 (R-12).

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Photograph 1 - The site of the occurrence (source: documentation of the railway commission)

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II. THE INVESTIGATION AND ITS CONTEXT

1. The decision to establish an investigation

The Chairman of the State Commission on Railway Accident Investigation (hereinafter referred to as "PKBWK" or "the Commission") Mr Tadeusz Ryś issued decision no. PKBWK.590.9.2023 of 1 September 2023 to establish an investigation of the railway accident that occurred on 24 August 2023 at 12:05 hrs at Skierniewice station. Pursuant to the provisions of Article 28e(4) of the Act of 28 March 2003 on rail transport (consolidated text: Journal of Laws of 2023, item 602, as amended), hereinafter referred to as the "Rail Transport Act", the occurrence was reported to the European Union Railway Agency within the prescribed time limit and registered in its database under number PL-10444.

2. The motivation to the decision to establish an investigation

Based on an analysis of the circumstances, considering the nature of the occurrence, which under slightly different conditions would have been a serious accident, and further considering that it forms a series of accidents concerning the system as a whole, the Chairman of PKBWK decided to establish an investigation to be conducted by the Commission's Investigation Team pursuant to Article 28e(3)(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 circumstances 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 a four-person Investigation Team from among the standing members of the Commission 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

Pursuant to Article 28h(2)(5) of the Railway Transport Act, the Chairman of PKBWK obliged specific members of the railway commission representing the infrastructure manager and the carriers concerned to cooperate with the Investigation Team (letter no. PKBWK. 590.9.1.2023 of 1 September 2023).
Pursuant to the aforementioned letter, the chairman of the railway commission transferred formally the accumulated documentation to the head of the Investigation Team at the registered office of PKP Polskie Linie Kolejowe S.A. IZ Łódź on 8 September 2023.

The Chairman of PKBWK requested the infrastructure manager and the two railway carriers in writing to submit the documents necessary for the investigation carried out by the Commission's Investigation Team. The aforementioned entities provided all the materials necessary for 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, i.e. the infrastructure manager and both railway carriers, which took place during the investigation into the causes and circumstances of the occurrence did not give rise to any objections on the part 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 railway carriers, and the technical documentation. Furthermore, the Investigation Team relied on their own knowledge and experience, as well as on the documentation gathered by the Investigation Team and the railway commission.

Within the investigation, the Investigation Team prepared/carried out inter alia the following activities:

- a visual inspection of the site of the occurrence and the railway vehicles following the occurrence,
- photo and video documentation,
- an analysis of the documentation provided by the railway carriers and the infrastructure manager,
- an analysis of the data from the event data recorder and forward looking video recorder (from the electric multiple unit ER160-22 and the locomotive ET 41-121),
- an on-site verification involving a ride in the cab of an ER160-type EMU,
- an analysis of the list of the entrance door failures made available by the manufacturer of the ER160 EMUs operated by "Koleje Mazowieckie - KM" Sp. z o.o.

Below is a list of selected legal acts, rules and internal instructions used in the course of 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 EU L119, 04.05.2016, p.1, as amended).
2) 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 EU L 132, 27.04.2020).
3) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety (OJ EU 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 10 May 2018 on the protection of personal data (Journal of Laws, item 1000).
3) Regulation of the Minister of Infrastructure of 11 January 2021 on personnel employed on positions related directly to the operation and safety of rail traffic and to driving of specific types of rail vehicles (Journal of Laws of 2021, item 101, as amended).
4) Regulation of the Minister of Infrastructure of 18 July 2005 on general conditions for rail traffic operation and signalling (consolidated text: Journalof Laws of 2015, item 360, as amended).
5) Regulation of the Minister of Infrastructure of 24 November 2022 on the train driver's licence (Journal of Laws 2022, item 2574).

6) Regulation of the Minister of Infrastructure of 1 November 2022 on the train driver's certificate (Journal of Laws 2022, item 2680).
7) Regulation of the Minister of Infrastructure of 29 November 2022 on examinations for the train driver's licence and certificate (Journal of Laws of 2022, item 2557).
8) Regulation of the Minister of Infrastructure of 3 November 2022 on training centres for train drivers and candidates for train drivers (Journal of Laws 2022, item 2355).

Internal instructions of the infrastructure manager PKP PLK S.A. (selected)

1) Ir-1 Instruction on operating rail traffic.
2) Ir-5 (R-12) Instruction for using railway radio communication devices.
3) Ir-8 Instruction on the handling of serious accidents, accidents and incidents in rail transport.
4) Ie-1 Instruction on signalling operations.
5) Ie-4 (WTB-E10) Technical guidelines on the construction of rail traffic control devices.
6) Id-1 Technical conditions on the maintenance of the surface of railway lines.
7) Ik-2 Instruction on inspections concerning the safety of railway traffic.

Internal instructions of the railway carrier PKP CARGO S.A. (selected)

1) Ct-1 Instruction for traction unit crews,

Internal instructions of the railway carrier Koleje Mazowieckie - KM sp. z o. o. (selected)

1) KMt-1 Instruction for drivers of traction vehicles.
2) KMh-21 Instruction for conductor teams.
3) KMh-22 Instruction for a train manager, conductor and controller.
4) KMt-4 Instruction on the maintenance of rail vehicles.
5) KMr-12 Instruction on train formation.
6) KMw-56 Instruction on the operation and maintenance of brakes in rail vehicles.

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

The Investigation Team did not encounter any other difficulties or problems that could affect the course, timeliness or conclusions of the investigation.

9. Any interaction with the judicial authorities

There was no need to interact with the judicial authorities.

10. Other information relevant in the context of the investigation

Not stated.

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III. DESCRIPTION OF THE OCCURRENCE

1. The occurrence and background information

1.1. The description of the occurrence type

Accident - a collision of a freight train and a passenger train.
Freight train no. 524009 of the railway carrier PKP CARGO S.A. travelling from Nidzica to Sitkówka Nowiny, led by locomotive ET41-121, had been moving on main station track two of Skierniewice station, which is an extension of the Radziwiłłów Mazowiecki - Skierniewice route, towards track three on a prepared and locked route on the permissive aspect S13 on the signal $J2^{1/2/3/4/m}$. When the head of the train was at turnout no. 13 at km 64.282, a lateral collision occurred with train no. 93965 led by EMU ER160-22 of the railway carrier "Koleje Mazowieckie - KM" Sp. z o.o. travelling from Warszawa Wschodnia to Skierniewice, which was heading in the same direction. Train no. 93965, moving on track one, ignored the signal $J1^{1/2/3/m}$ showing the aspect S1 "*Stop*", which resulted in the collision with the freight train.
The head of train no. 524009 stopped at km 64.306, and the head of train No. 93965 stopped at km 64.374.

1.2 The date, exact time and location of the occurrence

The occurrence took place on 24 August 2023 at 12:05 hrs at turnout no. 13 at Skierniewice station, km 64.282 of railway line no. 1. Geographical coordinates 51º58’23.8”N, 20º10’17.8”E.

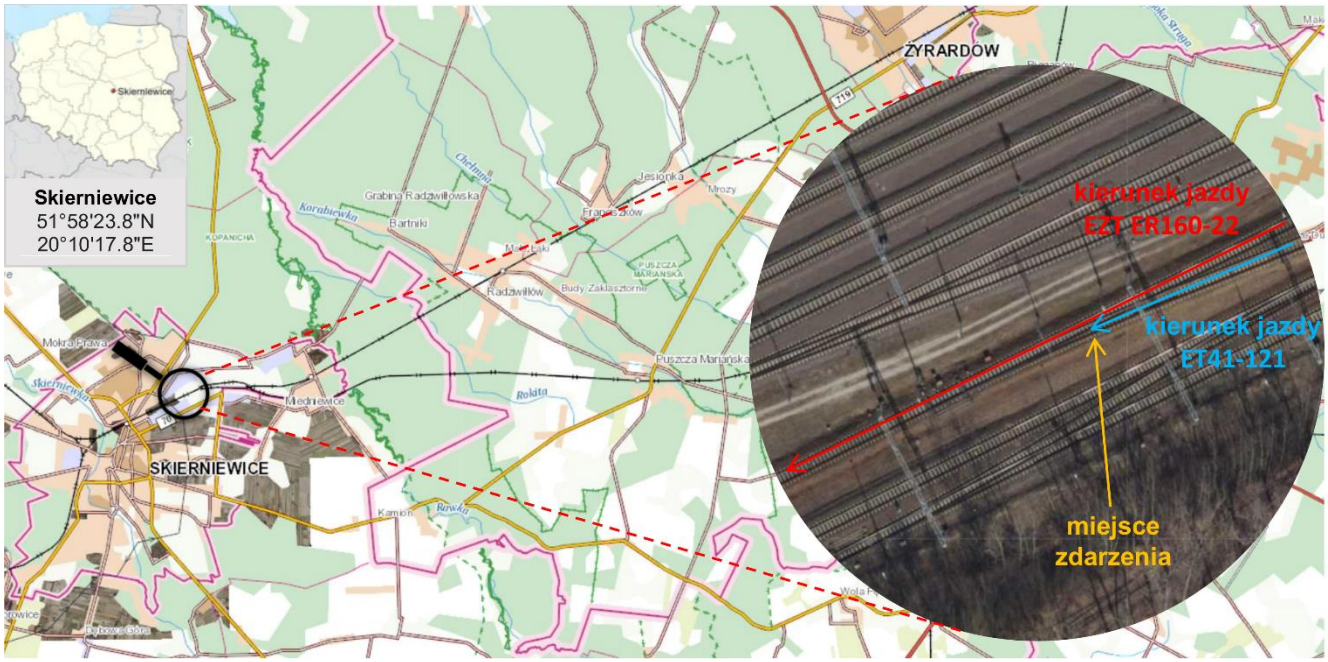


Figure 1 - The site of the occurrence (source: Geoportal)

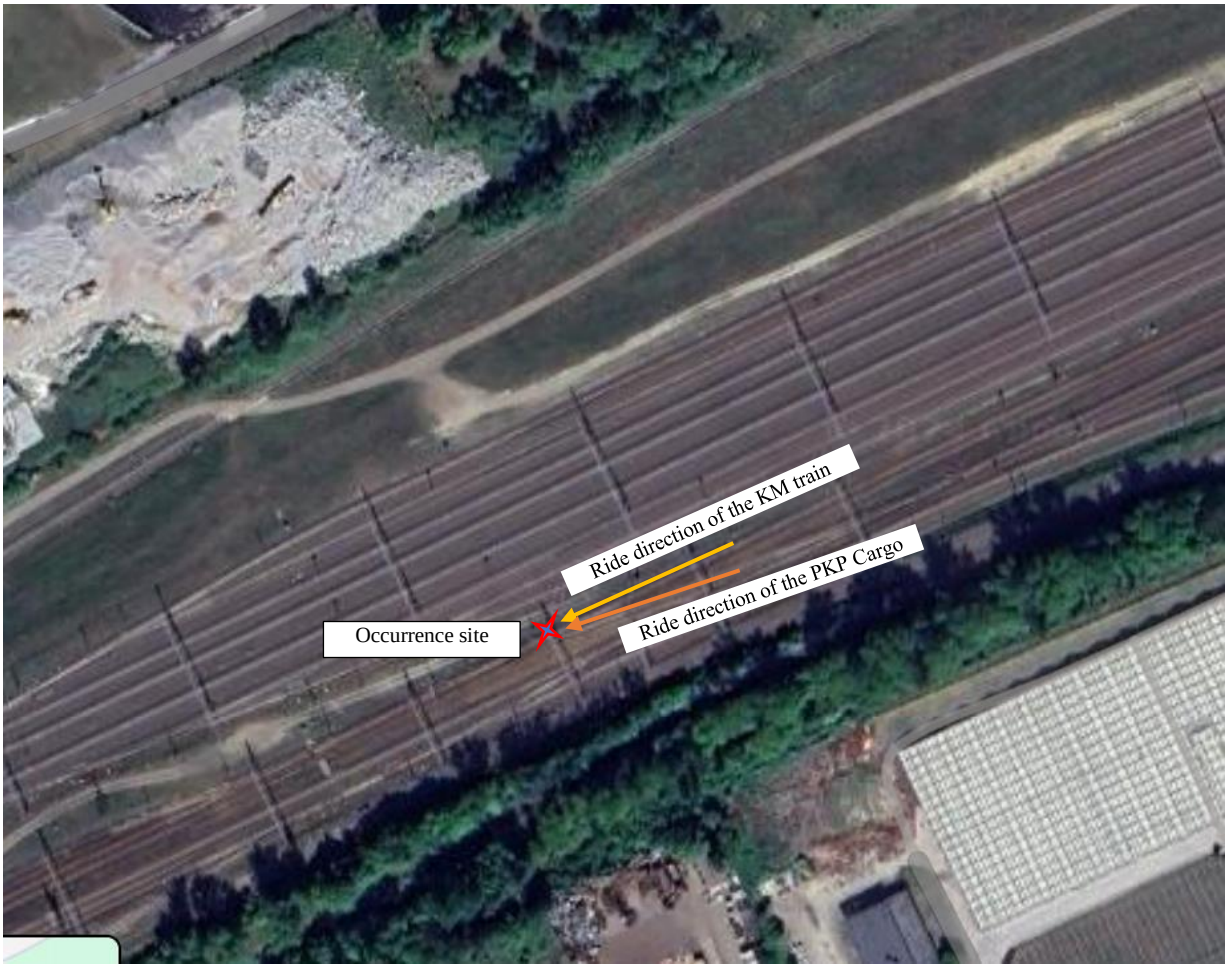
Miejsce zdarzenia	Occurrence site
Kierunek jazdy pociągu KM	Ride direction of the KM train
Kierunek jazdy pociągu PKP Cargo	Ride direction of the PKP Cargo train

Photograph 2 - A view from the front view camera of train no. 93965 at the time of the collision

Photograph 3 - A view from the front view camera of train no. 524009 at the time of the collision

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

Skierniewice station is a junction station where the following three lines converge:
no. 1 Warszawa Zachodnia – Katowice,
no. 11 Skierniewice – Łowicz Główny,
no. 12 Skierniewice – Łuków.
The axis of the station is located at km 65.926 of line no. 1. At the station, there is a section signal box of the Local Control Centre (LCS) Skierniewice "Skeo" with two section signaller positions: the eastern position and the western position. Using the a computer control panel of the Command 900 master system, the signallers control train traffic and shunting operations in the assigned sections. The occurrence took place in the area controlled by the section signaller on the eastern position.
The occurrence took place in day time, cloud cover - moderate, precipitation - none, temperature + 29°C, visibility - good, audibility - good, other phenomena - none.
No works had been carried out at the occurrence site that day or immediately before.



Photograph 4- A general view of the occurrence site (source: Google Earth)

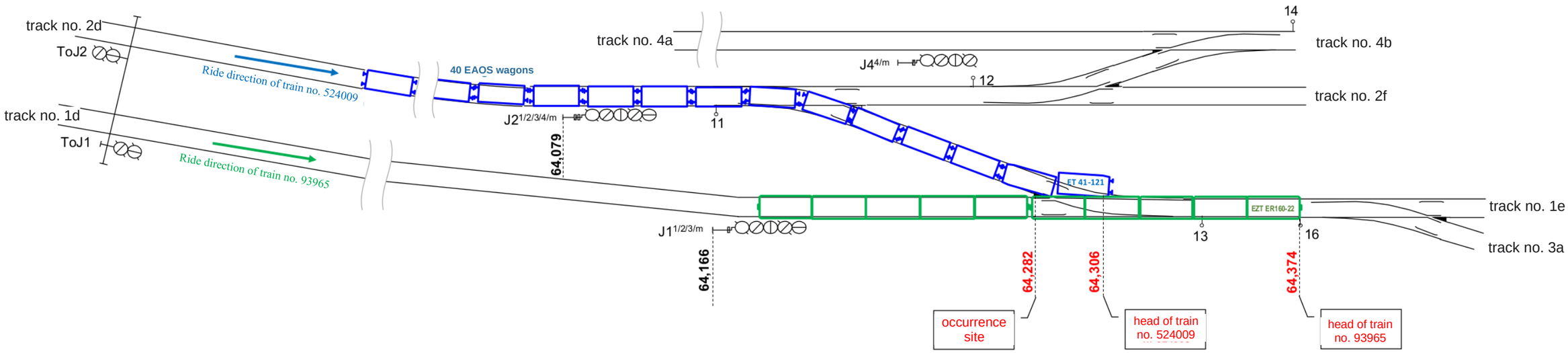


Figure 2 - Sketch of the accident (prepared by PKBWK)

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

No train crews or any of the passengers were injured as a result of the accident.

b) cargo, luggage and other property

The luggage of the passengers on the train was not damaged.

c) rolling stock, infrastructure and the environment

Rolling stock

The occurrence resulted in the derailment of the first B section of the ET41-121 locomotive with all bogies and the second A section of the locomotive with one bogie. The derailed section B was tilted by an angle of approx. 30˚ from the vertical to the left, looking in the ride direction. Sections A and B of the locomotive were partially uncoupled. Section A of the locomotive was coupled by a screw coupling and air hoses to the train set. Damage was sustained by:

- locomotive body: damaged section B skin, steps, handrails, battery box, gangway between sections, outer floor skin under cab B;
- bogie frames: torn off fender on bogie 4 - right hand side, damaged front fenders on section B, side supports on bogies II, III and IV, brake cables and sand tubes on bogies III and IV;
- wheelsets: structure bonding brushes on bogies II, III and IV, structure bonding cables, installation from the Mirel system transmitter to the connection box;
- braking equipment: brake cylinders on bogies II, III and IV - right-hand side, pneumatic piping of brake cylinders;
- current collectors and WS: II and III current collector - bent DSA-150 heads.

There was no other damage to the railway vehicles in the train.

As a result of the occurrence, the following damage was sustained by the EMU ER160-22 to the skin of the left side of the carriages in the ride direction:

- L-4423 22C: skin scratches on the yaw damper support, C-E side;
- L-4423 22E: damaged skin along the entire length of the carriage, deformed door D6P, door D5P - damage to the left panel and both platforms; perforation of the skin in the area between the support points of the carriage and entrance 6P (lower beam), deformation of the skin (more than 10mm) of the carriage from the support point to the 3rd window (counting from the rating plate);
- L-4423 22D: damage to the skin along the entire length of the carriage; damage to 4 door panels and both platforms; damaged window seals - 3 pieces; damaged (dented) skin at the vehicle's waste disposal point - to be replaced;
- L-4423 22A: damage to the skin (scratches along the length of the entire carriage); damaged D2P door panel; perforation of the skin at the front of the carriage above the body-body absorber support; damaged yaw damper - 1 piece, and inter-carriage dampers CE, ED, AD - 3 pieces.

The second EMU ER160-23 type EMU in the train set was not damaged.

Photograph 5 - A view of the damage to the railway vehicle after the accident (source: documentation prepared by the railway commission)

Infrastructure

The occurrence resulted in the run-through of turnout no. 13 and damage to the L826H switch drive, damage to 6 concrete turnout bearers and 60E1 rails in the crossover along the total length of 12m.

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 occurrence entailed the necessity to suspend train traffic on both tracks of railway line no. 1 on the Radziwiłłów Mazowiecki - Skierniewice route.

Tracks 1 and 2 at Skierniewice station were closed 24 August 2023 at 12:07 hrs due to the rescue and recovery operation. Passengers of train no. 93965 were evacuated, assisted by the Police and Fire Brigade, to the station square in Skierniewice at 13:15 hrs.

Track 1 at Skierniewice station was opened at 11:20 hrs and track 2 at 08:25 hrs on 25 August 2023. Turnout no. 13 on was opened on 25 August 2023 at 07:00 hrs for traffic in the main direction at the speed 40 km/h, and at 18:00 hrs in both directions - at the schedule speed. Train traffic to and from Radziwiłłów Maz. junction were routed through Skierniewice station on track 104 of line no. 529. Due to the closure of station tracks 1 and 2, only one platform edge situated at track 104 was available. For this reason, passenger traffic was conducted on a shuttle basis.

PKP Intercity S.A. trains on the Skierniewice - Żyrardów section operated with a stop at all passenger stops. Five PKP Intercity S.A. trains were detoured on line no. 3 via Sochaczew.

The cancelled trains of "Koleje Mazowieckie - KM" Sp. z o.o. on the Żyrardów - Skierniewice section were replaced by a temporary bus service.

Delays		Primary	Secondary	TOTAL			Primary	Secondary	TOTAL			Primary	Secondary	TOTAL
Pass. tr.	quantity	101	265	366	Fr. tr.	quantity	26	8	34	Other tr.	quantity	6	2	8
	min.	1,847	3,046	4,893		min.	13 776	224	14,000		min.	2,068	34	2,102

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 passenger train no. 93965 of the railway carrier "Koleje Mazowieckie - KM" Sp. z o. o.
- the driver of freight train no. 524009 of the railway carrier PKP CARGO S.A.
- the manager of train no. 93965
- the section signaller on the eastern position of LCS Skierniewice.

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

Freight train (PKP CARGO S.A.) no. 524009 was set up of an ET41-121 locomotive with EVN 915131160007-3, 91513160008-1 and 40 empty Ea wagons.

- length of the train 593.85 m,
- total mass of the train 1007 t,
- actual braked mass percentage 97%,
- required braked mass percentage 49%,
- the speed of the train at the time of the collision was 25 km/h.

Passenger train ("Koleje Mazowieckie - KM" Sp. z o.o.) no. 93965 was set up of two EMUs ER160-22 with EVNs 94512141318-7, 94512141319-5, 94512141320-3, 94512141321-1, 94512141322-9, and EMU ER160-23 with EVNs 94512141323-7, 94512141324-5, 94512141325-2, 94512141326-0, 94512141327-8.

- length of the train 198 m,
- total mass of the train 343 t,
- actual braking mass percentage 324%,
- required braking mass percentage 131%,
- the speed of the train at the time of the occurrence was approximately 53 km/h.

All of the railway vehicles involved in the occurrence had valid railworthiness certificates and rail vehicle type authorisation certificates.

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

Track and turnout at the site of the occurrence

Rail type…….. – 60E1

Sleepers……..– pre-stressed concrete PS94 type

Attachment type…… – flexible, type Sb3,

Ballast type…….. – crushed stone

Right-hand regular turnout R-500 1:12, 60E1 rail on pre-stressed concrete turnout bearers

Highest permitted speed for trains: – 150 km/h

passenger .....
freight ..... - 100 km/h.

The passenger train had been moving on track one, from the ToJ1 disc to the intermediate signal $J1^{1/2/3/m}$, on a slight slope gradient of maximum 5‰ and a left curve with the radius R=2010 starting at km 63.431 and ending at km 63.722; further ahead, at km 63.752, there is another left curve with the radius of R=1200 staring at KM 63.752 and ending at km 64.020 where the track changes to a straight line.
On the right side of track one, the one which passenger train no. 93965 had been travelling from Radziwiłłów Maz. junction to Skierniewice station, the following aspects were showed by successive light signals: home signal $B^{1/4}$ at km 60.998 S5 *"The next signal is showing the aspect Stop"*. Then, at km 62.441, a warning disc ToJ1 showed the aspect Os1 *"The signal to which this disc refers is showing the aspect Stop"* and referred to the intermediate signal $J1^{1/2/3/m}$ at km 64.166 showing the aspect S1 *"Stop"*. The warning disc was positioned ahead of the intermediate signal in accordance with the rules laid down in Instruction Ie-4 (WTB-10), because the distance between the consecutive signals is greater than twice the braking distance.
Along track one there is track two, on which freight train no. 524009 had been travelling from the Radziwiłłów Maz. junction to Skierniewice station, for which the following aspects were showed on successive light signals: the home signal $A^{1/4}$ at km 60.998 showing the aspect S4 *"The next signal is showing the aspect permitting travel at a speed reduced to 40 or 60 km/h"*. Then, at km 62.486, a warning disc ToJ2 showed the aspect Os4 *"The signal to which this disc refers is showing the aspect permitting travel at a speed reduced to 40 or 60 km/h"* and referred to the intermediate signal $J2^{1/2/3/4/m}$ at km 64.079 showing the aspect S13 *"Proceed at a speed not exceeding 40 km/h, and Stop at the next signal"*. The aforementioned tracks are electrified.

The following sequence of events was established on the basis of an analysis of entries recorded in the system:
11:34:05.181658 hrs the signaller issues a POC command (in the computer system) to set up a train route from signal B to signal J1 for passenger train no. 93964/5,
11:34:07.328473 hrs the signaller issues a POC command to set up a train route from signal J1 to signal M1, extending the train route for passenger train no. 93964/5,
11:34:14.704719 hrs the EC module sends information to the IM module that the upper amber light (aspect S5) is displayed on signal B,
11:34:15.721752 hrs the EC module sends information to the IM module that the upper amber light, lower amber light and green strip (aspect S9) are is displayed on signal J1,
11:34:17.656644 hrs the EC module sends information to the IM module that the flashing green light (aspect S3) is displayed on signal B,
11:37:39.617355 hrs the signaller issues a ZCZ command to temporarily release a train route for signal J1,
11:37:40.847265 hrs the EC module sends information to the IM module that the upper amber light (aspect S5) is displayed on signal B (the last record reporting a change of aspects displayed by signal B before the incident),
11:37:41.356255 hrs the EC module sends information to the IM module that the red light (aspect S1) is displayed on signal J1 (the last record reporting a change of aspects displayed by signal J1 before the incident),
11:39:38.788878 hrs the IM module sends information to the C900 system that the temporary train route release operation for signal J1 is complete,
11:55:52.286035 hrs the signaller issues a POC command to set up a train route from signal A to signal J2 for freight train no. 524009,
11:55:53.569095 hrs the EC module sends information to the IM module that the upper amber light (aspect S5) is displayed on signal A,
11:57:17.325000 hrs the signaller issues a POC command to set up a train route from signal J2 to signal M3, extending the train route for freight train no. 524009,
11:57:23.306827 hrs the signaller issues a POC command to set up a train route from signal R1 to signal V1,
11:57:25.506672 hrs the IM module sends information to the C900 system that the right-hand position of turnout no. 13 is locked for the train route from signal J2 to signal M3,

11:57:26.426518 hrs the EC module sends information to the IM module that the upper amber light and lower amber light (aspect S13) are displayed on signal J2,
11:57:28.038352 hrs the EC module sends information to the IM module that the flashing upper amber light (aspect S4) is displayed on signal A,
11:57:46.846862 hrs the EC module sends information to the IM module that the upper amber light (aspect S5) is displayed on signal R1,
11:57:48.702693 hrs the EC module sends information to the IM module that the green light (aspect S2) is displayed on signal R1 - the consequence of setting up the train route from semaphore V1 to block 1P by the signaller,
12:00:59.380279 hrs freight train no. 524009 commences execution of its train route by occupying section JtA,
12:01:19.078645 hrs freight train no. 524009 occupies section Jt2a,
12:01:22.212274 hrs freight train no. 524009 occupies section Jz1,
12:01:28.064946 hrs freight train no. 524009 occupies section Jt2b,
12:01:58.188490 hrs freight train no. 524009 releases section JtA,
12:02:01.234203 hrs freight train no. 524009 releases section Jt2a,
12:02:07.009673 hrs freight train no. 524009 releases section Jz1,
12:02:23.576381 hrs freight train no. 524009 occupies section Jz6,
12:02:29.227009 hrs freight train no. 524009 occupies section Jt2c,
12:02:38.125238 hrs freight train no. 524009 occupies section Jt2d1,
12:02:51.856116 hrs passenger train no. ROJ93964/5 commenced execution of its train route by occupying section JtB,
12:03:02.413239 hrs freight train no. 524009 releases section Jt2b,
12:03:05.840014 hrs freight train no. 524009 occupies section Jt2d2,
12:03:07.446952 hrs freight train no. 524009 releases section Jz6,
12:03:07.649869 hrs freight train no. 524009 occupies section Jt2d3,
12:03:10.694597 hrs passenger train no. 93964/5 occupies section Jt1a,
12:03:14.200356 hrs passenger train no. 93964/5 occupies section Jz2,
12:03:15.405235 hrs freight train no. 524009 releases section Jt2c,
12:03:17.428110 hrs passenger train no. 93964/5 occupies section Jt1b,
12:03:18.532991 hrs passenger train no. 93964/5 releases section JtB,
12:03:21.571757 hrs passenger train no. 93964/5 releases section Jt1a,
12:03:24.519523 hrs passenger train no. 93964/5 releases section Jz2,
12:03:33.518789 hrs passenger train no. 93964/5 occupies section Jz3,
12:03:36.458572 hrs passenger train no. 93964/5 occupies section Jz5,
12:03:40.290270 hrs passenger train no. 93964/5 releases section Jt1b,
12:03:43.132988 hrs passenger train no. 93964/5 releases section Jz3,
12:03:44.568952 hrs freight train no. 524009 releases section Jt2d1,
12:03:46.275793 hrs freight train no. 524009 releases section Jt2d2,
12:03:47.109102 hrs passenger train no. 93964/5 occupies section Jt1c,
12:03:52.349211 hrs passenger train no. 93964/5 occupies section Jt1d1,
12:03:54.278062 hrs passenger train no. 93964/5 occupies section Jz5,
12:03:59.011687 hrs passenger train no. 93964/5 occupies section Jt1c,
12:04:07.154566 hrs passenger train no. 93964/5 occupies section Jt1d2,
12:04:08.065894 hrs passenger train no. 93964/5 occupies section Jt1d3,
12:04:13.556441 hrs passenger train no. 93964/5 releases section Jt1d1,
12:04:14.393409 hrs passenger train no. 93964/5 releases section Jt1d2,
12:04:42.593138 hrs freight train no. 524009 occupies section Jz11 commencing execution of its train route (from signal J2 to signal M3),
12:04:52.789312 hrs the ACE module sends information to the IM module that section Jz13 is occupied,
12:04:57.954876 hrs the EC module sends information to the IM module that switch no. 13 has been run through.

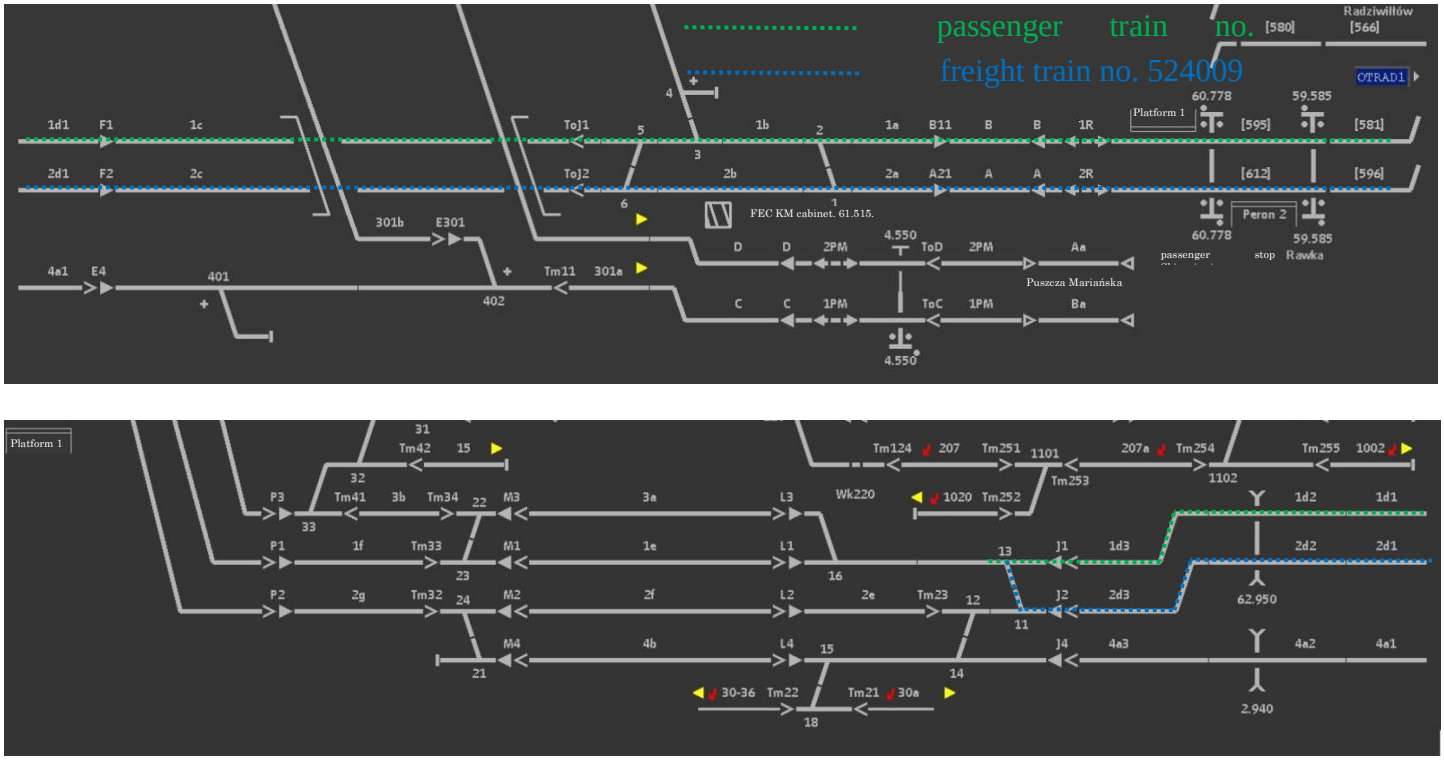


Figure 3 - A computer system screenshot with the train routes marked

Based on an analysis of the system records, it was established that the system operation was correct. At the time of the occurrence, switch no. 13 was locked in the right-hand position for the route set up for train no. 524009 from signal J2[1/2/3/4/m] to track three.

On 24 August 2023 at 14:15 hrs, the railway commission described the following state of the rail traffic control equipment:
The state of the equipment as shown on the Command 900 computerised control panel of the ESTWL905 interlocking system of Skierniewice station (the eastern section position of the LCS) in connection with the collision of freight train no. 524009 with passenger train no. 93965 at crossover no. 11/13 of line no. 1:
-signals J1 and L1 indicate side protection for the route from track 2d to track 3a, signal M3 (red on the panel) - the end of the train route,
-signals J2, J4, L3, L4, L2, M1, M2, M4, F1, F2, E4, ToJ1, ToJ2, B, A (grey on the panel).
-Switch positions: switch no. 16 in the minus (-) position directs to track no. 3a, switch no. 13 signals a run-through and no control of the position of the blades, switches nos. 12 and 14 in the plus (+) position, switch no. 11 in the minus (-) position directs to turnout no. 13, switches nos. 5 and 6 in the plus (+) position - grey, switches nos. 3 and 4 in the plus (+) position - grey, switches nos. 1 and 2 in the plus (+) position - grey.
-the state of the track and turnout occupancy control circuits is based on AzLM-type axle counters.
On the computerised control panel, track section it2d3 (occupied by train no. 524009 - red), it1d3 (occupied by train no. 93965 - red), it2f (occupied by train no. 10136 - red), switch sections iz11, iz13, iz16 show the state "occupied" - red colour. Track section it3a locked (green) - cleared of rolling stock for train no. 524009. Other track and switch sections from signal A to signal J2 and from signal B to signal J1 - cleared of rolling stock (grey).
The state of the equipment on the ground - as shown on the Command 900 computerised control panel.
Computer room locked and sealed - seals legible. No works were carried out on the internal rail traffic control devices at the time of the occurrence.

1.9. Any 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 24 August 2023 at 07:00 hrs, a train driver of PKP CARGO S.A. started his working shift at Warszawa Praga Towarowa station, where he received train no. 524009 bound from Nidzica to Sitkówka Nowiny. After a detailed test of the combined brake, the train departed on its scheduled route at 10:10 hrs, with a scheduled replacement of the train crew at Piotrków Trybunalski station. The freight train set up of 40 empty Ea wagons and lead by section B of the ET41-121 locomotive. The ride was uneventful until the occurrence.
On the same day, at 08:00 hrs, at the Rolling Stock Repair Section Warszawa Grochów, a train driver of "Koleje Mazowieckie - KM" Sp. z o. o. accepted rolling stock ER-160 set up of two electric multiple units no. 22 and no. 23, to operate train no. 996066 bound from Warszawa Grochów to Warszawa Wschodnia. A detailed brake test was carried out before the departure. Beginning from Warszawa Wschodnia, the train was travelling as train no. 93964/5 bound from Warszawa Wschodnia to Skierniewice. The ride was as per timetable and uneventful until the passenger stop in Radziwiłłów Maz. When the passenger train stopped at the passenger stop at 11:33 hrs, the signaller of the LCS Skierniewice - eastern position (hereinafter referred to as "the signaller") proceeded to set up the train from the home signal $B^{1/4}$ to the intermediate signal $J1^{1/2/3/m}$ and on to the next intermediate signal $M1^{1/4/m}$ at Skierniewice station. After the train stopped at the passenger stop in Radziwiłłów Maz., the third door (in the ride direction) on the right-hand side of the first unit malfunctioned. The train driver reported the malfunction to the signaller by radio, after which he and the train manager proceeded to repairing it. As a result of the malfunction report, the signaller decided to route traffic from Radziwiłłów Maz. junction to Skierniewice on track 2 (left) in the direction opposite to the primary direction. To this end, at 11:37:39 hrs he used the ZCZ command to temporarily release a train route for the intermediate signal $J1^{1/2/3/m}$, which resulted in displaying the aspect S1 "*Stop*" on that signal and a change of the aspect of the home signal $B^{1/4}$ from S3 "*Proceed at the highest permitted speed - there are two block sections free ahead - or at the maximum speed of 100 km/h at the next signal*" to S5 "*The next semaphore (indicates) gives the signal Standstill*".
Passenger train no. 1905 departed on plain line track no. 2 (left) from Radziwiłłów Maz. junction to Skierniewice station and passed the passenger train standing at the passenger stop in Radziwiłłów Maz. at 11:46 hrs.
Due to the door malfunction and repair, the passenger train at the Radziwiłłów Maz. passenger stop was delayed by 10 minutes. After reporting to the signaller that the malfunction had been fixed, it departed at 11:43 hrs. At the next scheduled stop at the Skierniewice Rawka, the head of the train stopped at 11:46 hrs at the home signal $B^{1/4}$ showing the aspect S5 *"The signal is showing the aspect Stop"*.. After the train manager signalled clear to depart, the train driver found that the outer doors had malfunctioned and that the ride could not be continued. Having commenced the repair, the train driver found a malfunction of another door situated as third from the end of the train set. The door malfunctions took place at two successive stops before the site of the occurrence, i.e. Radziwiłłów Maz. and Skierniewice Rawka. Time required for locating and repairing the malfunctions increased the delay of the passenger to 27 minutes.
In that situation, the signaller dispatched passenger train no. 5425 on plain line track no. 2 (left) from Radziwiłłów Maz. junction at 11:49 hrs. It passed the passenger train standing at the Skierniewice Rawka passenger stop at 11:53 hrs.
After that, the signaller, having no knowledge of how long the passenger train had been stationary at the stop, prepared the entry from track 2 (left) to Skierniewice station for freight train no. 524009 onto track 3, and at 11:57:28 hrs set the home signal $A^{1/4}$ to display the aspect S4 "*The next signal is showing the aspect*

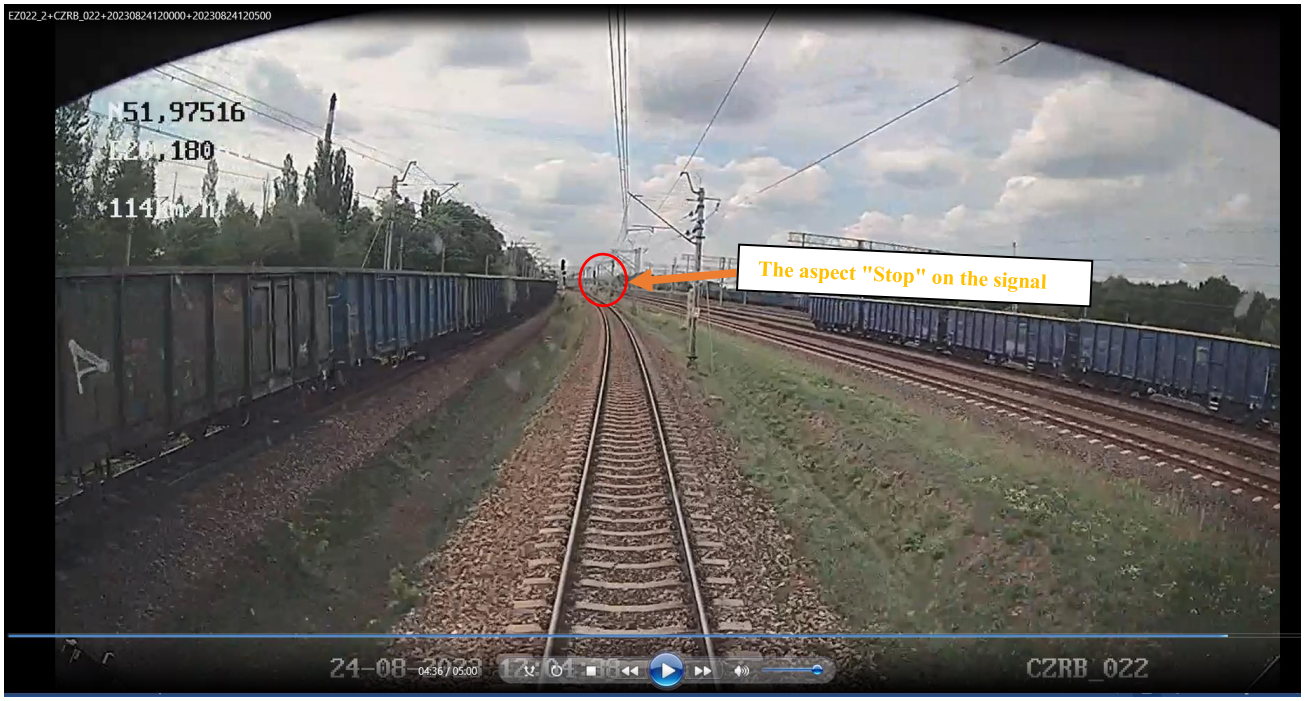
permitting travel at a speed reduced to 40 or 60 km/h". The freight train, proceeding at a speed below 60 km/h, overtook the passenger train standing on plain line track no. 1 and passed the signal $A^{1/4}$ at 12:01:00 hrs. At the same time, the driver of the passenger train had finished repairing the door malfunction and, at 12:02:42 hrs, reported to the signaller by radio that he was ready to continue the ride, quote: "*The malfunction fixed, we're going*." The signaller acknowledged it and replied, quote: *"Roger, go ahead"*. The train departed the Skierniewice Rawka passenger stop from under the home signal $B^{1/4}$ showing the aspect S5 *"The next signal is showing the aspect Stop*" and proceeded towards Skierniewice station at a speed below 116 km/h. At 12:03:51 hrs, the passenger train the warning disk ToJ1 showing the aspect Os1 *"The signal to which this disc refers is showing the aspect Stop"* at the speed of 101 km/h.

Photograph 6 - Driving foreground - a view of the ToJ1 warning disc from the camera of the EMU ER160-22

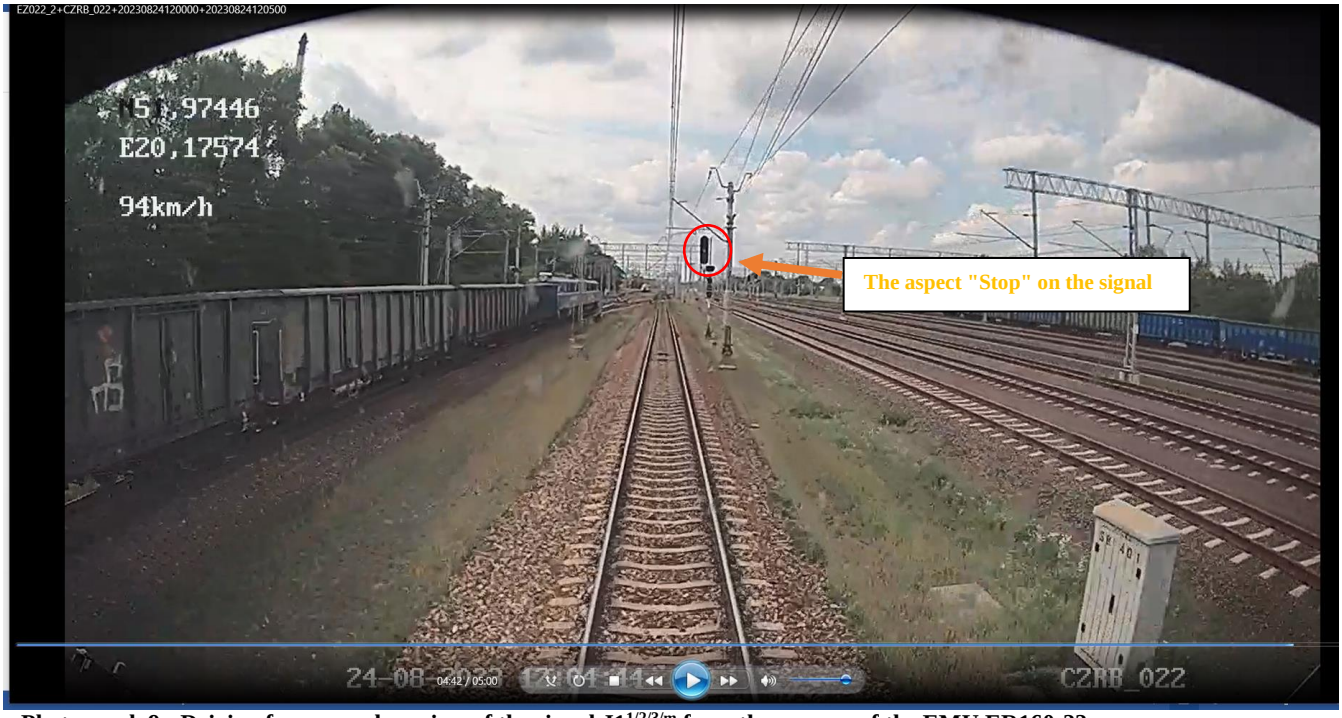
When the passenger train was at km 63.200, i.e. approximately one kilometre ahead of the intermediate signal $J1^{1/2/3/m}$ showing the aspect S1 "*Stop*", the train driver took a mobile phone call at 12:04:13 hrs and was in conversation with the dispatcher of the Rolling Stock Repair and Operation Section Warszawa Grochów of "Koleje Mazowieckie - KM" Sp. z o.o. discussing the door malfunctions. At that time, travelling on track one at 114 km/h, he caught up with the freight train travelling on track two, and started overtaking it. The head of the freight passed the intermediate signal $J2^{1/2/3/4/m}$ showing the aspect S13 *"Proceed at a speed not exceeding 40 km/h, and Stop at the next signal"* at the speed of 32 km/h at 12:04:28 hrs. At that moment, the train driver did not see the approaching passenger train.

Photograph 7 - Driving foreground - the moment when the pasenger train was approaching train no. 524009, a view from the camera of the EMU ER160-22

Driving at the speed of 111 km/h, the driver of the passenger train terminated the call at 12:04:39 hrs when the head of the train was 166 m ahead of the signal $J1^{1/2/3/m}$ showing the aspect S1 "*Stop*", and implemented braking.



Photograph 8 - Driving foreground - a view of the intermediate signal $J1^{1/2/3/m}$ from the camera of the EMU ER160-22



Photograph 9 - Driving foreground - a view of the signal J1$^{1/2/3/m}$ from the camera of the EMU ER160-22

The driver of the passenger train applied the air brake reducing the speed to 78 km/h, and it was at that speed that he passed, at 12:04:46 hrs, the intermediate signal J1$^{1/2/3/m}$ showing the aspect S1 "*Stop*" while at the same time pushing the Rp1 signal button "*Attention*". Despite applying the brake, the passenger train overtook the head of the freight train, entered turnout no. 13, "ran through" the switch, and found itself on route that had been correctly set up for the moving freight train. What happened at turnout no. 13 at km 64.282 as a result, was that the head of the ET41-121 locomotive drove into the left side of the first unit of the passing passenger train. The driver of the freight train transmitted the Rp1 signal "*Attention*" and after a while used the radio emergency signal "Radio-stop". The collision resulted in the derailment of the ET41-121 locomotive (the consequences of the occurrence are covered in Clause III.1.4 of the Report). The head of the freight train stopped at km 64.306, and the head of the passenger train at km 64.374.

Photograph 10 - Driving foreground - a view of the passenger train entering the route of the freight train - a view from the camera of the ET41-121

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 rescue operation lasted from 12:07 hrs on 24 August 2023 until 02:30 hrs on 25 August 2023, and involved the following units:

- emergency medical team. The ambulance crew arrived at 12:25 hrs,
- technical rescue service. Dispatched to the occurrence site were: a Uniroller technical rescue vehicle from Łódź Widzew station (arrived on site at 14:40 hrs), a rescue train with a 750 t crane from Łódź Widzew station (arrived on site at 17:40 hrs), and a rescue train with a 750 t crane from Warszawa Wschodnia station (arrived on site at 19:50 hrs). In addition, locomotive SM42-819 (PKP Cargo S.A.) was dispatched from Łódź Olechów station (arrived on site at 15:01 hrs),
- technical emergency service. Rapid recovery team from ISE Koluszki - from 15:50 hrs on 24 August 2023 to 07:00 hrs on 25 August 2023,
- power emergency from 20:26 hrs on 24 August 2023 to 06:31 hrs on 25 August 2023,
- fire guard units. The fire guard arrived at 12:25 hrs.

Passengers of train no. 93965 were evacuated, assisted by the Police and Fire Brigade, to the station square in Skierniewice at 13:15 hrs. At 16:25 hrs, the 40 wagons of train no. 524009 were uncoupled and shunted onto track four. The EMU ER160-22 was shunted onto track three at 19:50 hrs. At 22:05 hrs, the second section of the ET41-121 locomotive was re-railed, and the services commenced re-railing the first section of the locomotive.

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 Łódź

The primary task of a railway infrastructure manager is, in particular, safe operation of railway traffic.
The obligations of the manager with regard to safe operation of railway traffic are specified in *Ir-1 - Instruction on operating rail traffic, Ie-1(E-1) - Instruction on signalling operations* and *Technical Regulations for Section Signal Box / LCS SKIERNIEWICE "Skeo"*.
Among other things, the railway infrastructure manager is responsible for the proper maintenance of the railway lines. The responsibilities of the railway infrastructure manager are laid down in inter alia Article 62 of the Act of 7 July 1994 on the Construction Law. This provision obliges managers to carry out annual and five-year inspections of building structures. Internal Instruction Ie-7, requires the infrastructure to carry out a diagnostic examination of building structures at least once a year. Building maintenance inspections involving checks of the technical condition of the "station railway traffic control devices" at Skierniewice station were carried out in accordance with the regulations.
Between 2020 and 2023, tests were carried out at the station concerning the visibility of signals and operation of train guidance control devices during daytime and nighttime. No defects were found during the inspections.
The rules for the layout and positioning of trackside signals are set out in the Technical Guidance for the Construction of Railway Traffic Control Equipment Ie-4 (WTB-E10).
In accordance with §9. *Visibility of signal aspects*
1. Trackside signals shall be positioned so that their aspects are clearly visible and legible from the minimum distances specified in paragraph 2.
Where train signals relating to different tracks are grouped together, they shall be arranged so that the driver of an approaching train, starting from the limit of the required visibility, can see them in the same sequence as they are actually positioned.
2. The visibility of the signals (W) in metres at the highest permitted approach speed of the railway vehicle to the signal (V) in km/h (not more than 160 km/h) shall be:
1) for home signals $\frac{10xV}{3}$ *m, but not less than:*
a) on trunk and primary lines - 400 m,
b) on secondary lines - 300 m,
c) on lines of local significance - 100 m;
2) for exit (grouped exit) and intermediate signals at the main line and on the secondary line tracks where non-stop routes take place, and for manned and automatic block signals $\frac{10xV}{4}$ *m, but not less than 200 m;*
3) for exit signals at tracks where no non-stop routes take place, and for all signals at lines of local significance, not less than 50 m;
4) for warning discs and crossing warning discs $\frac{10xV}{4}$ *m, but not less than 200 m;*
5) for light strips, displayable indicators installed on signals $\frac{10xV}{5}$ *m, but not less than 200 m;*
6) for a shunting disc, not less than 50 m;
7) the visibility of the aspects shown by humping disc indications, it shall be not less than 500 m. The aspects on the humping disc shall be visible along the entire route of pushing the train set by means of using a sufficient number of humping discs.

3. Where, due to terrain obstacles (excavations, track curve, buildings or other obstructions), the required visibility of the signal aspect cannot be achieved, one of the following solutions shall be used:

1) set up repeaters for manned signals, except for home signals on routes with multi-output (automatic) line blocking.
The number of repeaters relating to a single signal shall not exceed three, and their arrangement shall ensure the required visibility.

The manner of setting up intermediate signals is specified in § 11 and § 12 of the Guidelines:
§12. Intermediate signals
2. Intermediate signals must be positioned according to the rules applicable to exit signals laid down in § 11.
§11.
8. Exit signals shall be positioned so that:
1) the maximum useful length of the track can be achieved (preferably the values specified in [Technical Standards]);
2) the greatest number of simultaneous routes can be ensured;
3) the aspects shown on a signal are visible from where the head of the passenger train stops at the platform.
Where possible, exit signals should be positioned perpendicularly or obliquely to the track axis.
In the case of a group of signals positioned perpendicularly to the track axis, the same height of signal masts shall be used for all the signals in the group. The height shall be determined taking into account [technical requirements for signals].
The Investigation Team identified the following as one of the factors contributing to the incident: "Lack of visibility of aspects on the intermediate signal $J1^{1/2/3/m}$ from the required distance of 375 m (the signal aspects are obscured by catenary poles and trains running on track two, which necessitates the use of repeaters.

Railway carrier PKP CARGO S.A.
For carrying out a transport task, the railway carrier is obliged to allocate railway vehicles with a type authorisation certificate and a railworthiness certificate. The railway carrier carries out its activities under a valid licence to carry rail transport of freight, and a safety certificate.
The Investigation Team established that the rail vehicle involved in the occurrence met the requirements concerning authorisation to operation and had the required documents.
The responsibilities of a railway carrier concerning safe driving of a rail vehicle are specified in the internal rules of the infrastructure manager and railway carrier.
The designated train crew that operated the train held all ratings and qualifications required by law. The train was driven on the basis of an internal timetable.
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.

Railway carrier "Koleje Mazowieckie - KM" Sp. z o. o.
For carrying out a transport task, the railway carrier is obliged to allocate railway vehicles with a type authorisation certificate and a railworthiness certificate. The railway carrier carries out its activities under a valid licence to carry rail transport of passengers, and a safety certificate.
The Investigation Team established that the rail vehicle involved in the occurrence met the requirements concerning authorisation to operation and had the required documents.
The responsibilities of a railway carrier concerning safe driving of a rail vehicle are specified in the internal rules of the infrastructure manager and railway carrier. Based on an analysis of the material gathered in the case, the Investigation Team found irregularities in the conduct of the train driver when driving the train, which are described in detail in Chapter IV Clause 3.
The designated train crew that operated the train held all ratings and qualifications required by law. Train no. 93965 was operated on the basis of the annual timetable according to which it was to arrive at Skierniewice station at 11:39 hrs. Subsequently, the train set, now as train no. 93812, was due to depart on a return service to Warszawa Zachodnia station at 12:01 hrs, operated by the same train crew. The door malfunctions in the train set caused the train to be delayed. This situation exerted time pressure and was the reason for changing the train sequence.

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

Railway carrier PKP CARGO S.A., which provides the rolling stock, is responsible for its serviceability, technical condition and compliance with the vehicle maintenance process. The powered rail vehicle ET41-121 leading the train had a railway vehicle type certificate and a valid reailworthiness certificate. The carrier submitted documentation concerning the latest technical inspections of its rail vehicles. The Investigation Team did not find any irregularities as regards rolling stock maintenance and operation. The technical condition of the rail vehicle had no impact on the occurrence concerned.

The entity in charge of maintenance of ER160 vehicles is Stadler Polska Sp. z o.o. The entity is listed in the European Vehicle Register (EVR) and subcontracts the maintenance function to Stadler Service Polska Sp. z o.o.
The task of the entity in charge of maintenance is to ensure that the vehicles for the maintenance of which it is responsible are able to move safely on the railway network. The entity in charge of maintenance also manages withdrawal/return of a vehicle from/to service.
The railway carrier "Koleje Mazowieckie - KM" Sp. z o.o. submitted documentation of the latest technical inspections of railway vehicles. The Investigation Team did not find any irregularities as regards rolling stock maintenance. The technical condition of the EMU had no impact on the occurrence concerned. However, the Investigation Team concludes that the occurrence of the external door malfunctions in the above-mentioned units during the ride of train no. 93965 on the day of the occurrence did affect the driver's conduct.

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 that would be affected by manufacturers of rolling stock and suppliers of rail products. Under a contract signed earlier, the manufacturer STADLER Polska sp. z o. o. provided the railway carrier "Koleje Mazowieckie - KM" Sp. z o.o. 61 five-unit FLIRT 3 ER160 EMUs. Based on the documentation gathered, the Investigation Team established that between 7 January 2022 and 23 November 2023 there had been 210 external door malfunctions in the vehicles of the type owned. The carrier and the manufacturer are taking preventive measures together to minimise the malfunctions and their incidence by conducting in-house training in the mechanical adjustment of the doors and by replacing defective components.

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

The President of the Office of Rail Transport (UTK) supervises railway traffic safety. 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 material gathered, the Investigation Team did not identify any factors that could be affected by notified bodies.

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

Based on the investigation material gathered, the Investigation Team did not identify any factors that could be affected by certification bodies of the rail carrier.

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

The powered rail vehicle ER160 - 022 of "Koleje Mazowieckie - KM" Sp. z o. o. was equipped by the manufacturer with an electronic event data recording system:

- data recorder type: Deuta-Werke (Redbox),
- speed measurement range: 160 km/h
- recorded data: distance, speed, time, driving from cab A or cab B, activation automatic train stop, cancelling of vigilance devices, braking, activation of driving controller, use of siren,
- memory card no. 945121413187KM_20230824_133722_SLU.usar.

The Investigation Team used ADS4 software to analyse selected driving parameters recorded by the recorder immediately prior to the occurrence.

From departing from Radziwiłłów Maz. passenger stop until stopping at Skierniewice Rawka passenger stop:

Time:

11:42:42 hrs - traction is activated and the train departs the Radziwiłłów Maz. passenger stop, increasing its speed to 129 km/h along a distance of approximately 1,536 m

11:43:51 hrs - ride with cruise control without changing the speed along a distance of approximately 2,321 m

11:44:56 hrs - traction is deactivated, coasting without changing the speed along a distance of approximately 216 m

11:45:02 hrs - service braking is applied, the speed decreases to 0 km/h along a distance of approximately 1,305 m

11:46:12 hrs - stop at the platform edge of the passenger stop Skierniewice Rawka.

From departing from Skierniewice Rawka passenger stop until stopping at the site of the occurrence:

12:02:37 hrs - traction is activated and the train departs from the Skierniewice Rawka passenger stop, increasing its speed to 108 km/h along a distance of approximately 735 m

12:03:24 hrs - traction is deactivated, coasting with an increase in speed to 110 km/h along a distance of approximately 41 m

12:03:26 hrs - service braking is applied, the speed decreases to 108 km/h along a distance of approximately 73 m

12:03:28 hrs - releasing is applied, coasting with a drop in speed to 106 km/h along a distance of about 20 m

12:03:29 hrs - traction is activated and the speed increases to 108 km/h along a distance of approximately 285 m

12:03:39 hrs - traction is deactivated, coasting without changing the speed along a distance of approximately 9 m

12:03:39 hrs - service braking is applied, the speed decreases to 103 km/h along a distance of approximately 119 m

12:03:43 hrs - releasing is applied, coasting with a drop in speed to 99 km/h along a distance of about 55 m

12:03:45 hrs - traction is activated and the speed increases to 115 km/h along a distance of approximately 683 m

12:03:51 hrs - traversing over a train auto-stop resonator at the speed of 101 km/h (1,890 m before stopping at the site of the occurrence)

12:03:51 hrs - the Rp1 signal "*Attention*" is given (1,876 m before stopping at the site of the occurrence)

12:04:08 hrs - traction is deactivated, coasting with an increase in speed to 116 km/h along a distance of approximately 25 m

12:04:09 hrs - traction is activated with no increase in speed along a distance of approximately 33 m

12:04:10 hrs - traction is deactivated, coasting with an increase in speed to 115 km/h along a distance of approximately 111 m

12:04:13 hrs - traction is activated with no increase in speed along a distance of approximately 226 m

12:04:20 hrs - traction is deactivated, coasting with an increase in speed to 112 km/h along a distance of approximately 448 m.

A detailed description of braking:

12:04:34 hrs - service braking is applied (electrodynamic brake) at the speed of 112 km/h and long a distance of approximately 101 m (electrodynamic braking applied 528 m before the stopping point)

12:04:38 hrs - in addition (simultaneously with ED braking), air braking is applied at the speed of 109 km/h with a pressure drop in the main line to 3.8 bar, further braking along a distance of approximately 126 m (simultaneous ED and air braking 427 m before the stopping point)

12:04:42 hrs - end of pressure drop in the main line at the speed of 94 km/h and further braking along a distance of approximately 93 m (simultaneous electrodynamic and air braking 301 m before the stopping point)

12:04:46 hrs - pressure in the main line drops again at the speed of 78 km/h to 3.2 bar along a distance of approximately 54 m (simultaneous electrodynamic and air braking 228 m before the stopping point)
12:04:46 hrs - traversing over a train auto-stop resonator at the speed of 78 km/h (205 m before stopping)
12:04:49 hrs - end of pressure drop (at 3.2 bar) at the speed of 68 km/h and further braking without the level position changed along a distance of approximately 114 m (simultaneous electrodynamic and air braking 154 m before stopping)
12:04:57 hrs - the ED brake lever is moved to neutral at the speed of 37 km/h and further braking with the air brake along a distance of 24 m (air braking 40 m before stopping)
12:05:00 hrs - radio-stop signal is received - at the speed of 24 km/h and the main line pressure drops to 0 bar, the train stops along a distance of approximately 16 m (emergency braking 16 m before stopping)
12:05:05 hrs - the train stops at the site of the occurrence.

Notes:

1) the time shown in the description is the recorded by the tachograph,
2) the train was driven from cab B,
3) the use of the vigilance button was recorded 7 times on the distance described.

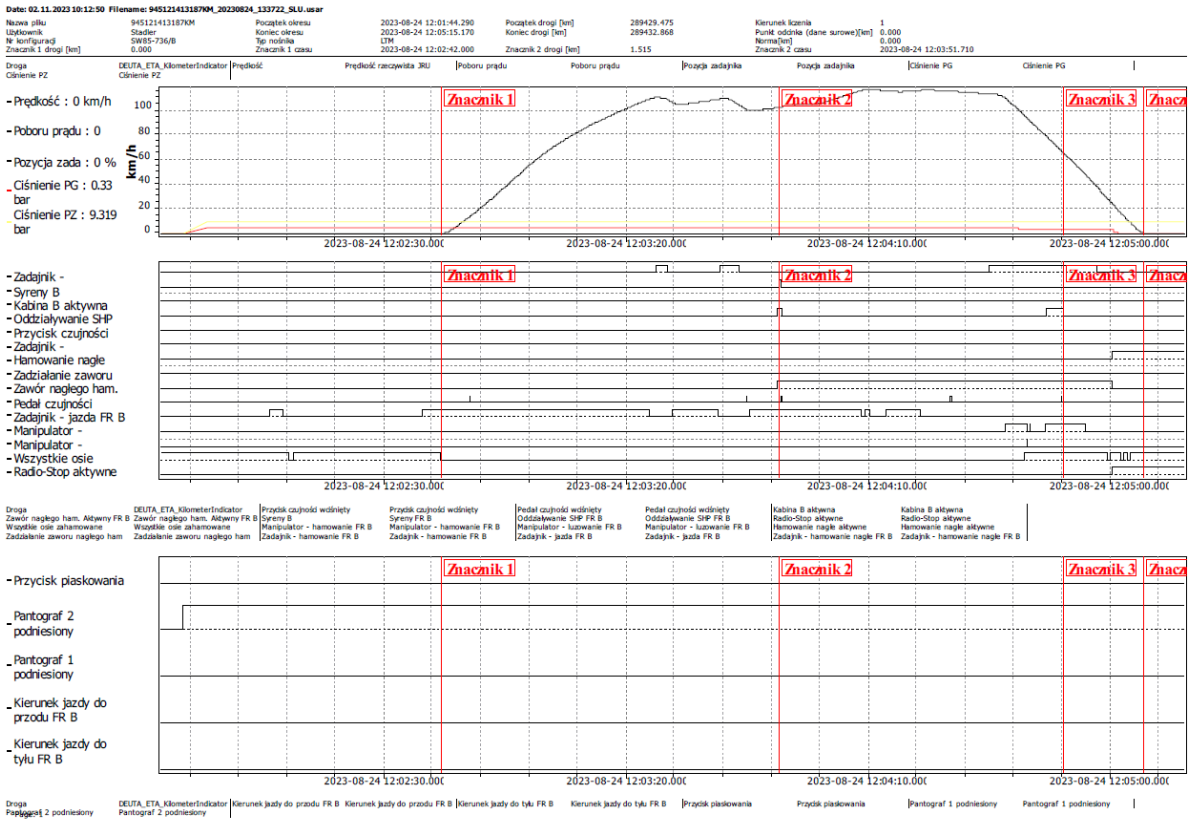


Figure 4 - A graph of driving parameters of train no. 93965 "Koleje Mazowieckie - KM" Sp. z o. o. (prepared by PKBWK)

The powered rail vehicle ET41-121 PKP CARGO S.A. was equipped by the manufacturer with an electronic event data recording system:

- tachograph type: Hasler TELOC 1500,
- speed measurement range: 150 km/h
- parameters recorded by the tachograph: distance, speed, time, driving from cab A or cab B, use of the vigilance button, use of Rs, air braking, use of Rp1 "*Attention*" signal.

The Investigation Team used EVA software to analyse selected driving parameters recorded by the recorder immediately prior to the occurrence.

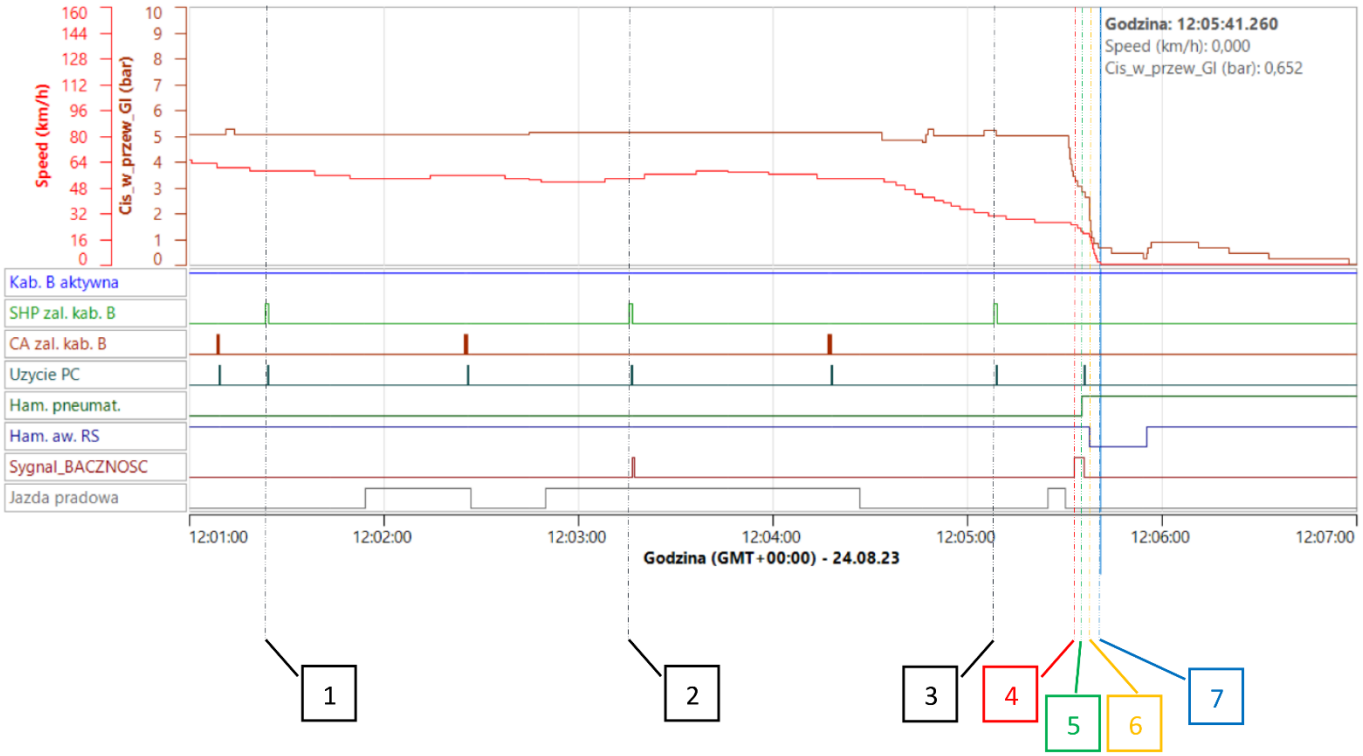


Figure 5 - A chart of driving of train PKP CARGO S.A. no. 524009 (prepared by PKBWK)

1- 12:01:23 hrs traversing over automatic train stop (SHP) of signal A, V=58.4 km/h
2- 12:03:15 hrs traversing over SHP of the warning disc ToJ2, V=53.99 km/h
3- 12:05:08 hrs traversing over SHP of the signal J2, V=30.55 km/h
4- 12:05:33 hrs the "Attention" signal is given, V=24.83 km/h
5- 12:05:35 hrs air braking is applied, V=21.07 km/h
6- 12:05:37 hrs Radiostop emergency braking starts, V=17.38 km/h
7- 12:05:41 hrs the train stops.

The Investigation Team found that between the time points recorded by the Deuta Werke REDBOX recorder installed in the ER160-022 rail vehicle of the carrier "Koleje Mazowieckie - KM" Sp. z o. o. and the time points recorded by the Hasler Teloc 1500 recorder of the rail vehicle ET41-121 of the railway carrier PKP Cargo S.A. there was a time lag of 37 s. The Hasler Teloc 1500 recorder recorded time periods later than the Deuta Werke REDBOX recorder, e.g. the time when the "Alarm" signal was used with the use of "Radio-stop" is:
- in the Deuta Werke REDBOX recorder - 12:05:00 hrs, ("Koleje Mazowieckie - KM" Sp. z o.o. assumed is as the actual time)
- in the Hasler Teloc 1500 recorder - 12:05:37.hrs (PKP CARGO S.A. time difference of 37 s).
Although the above difference did not affect the occurrence, it is recommended that both carriers check the way the time is synchronised by the recorders and, if any irregularities are found in this respect, take appropriate corrective actions. The Investigation Team assumed the time recorded by the Deuta Werke recorder as the actual time.

3. Human factors

3.1. Human and individual characteristics

The driver of passenger train no. 93965 was employed by "Koleje Mazowieckie - KM" Sp. z o. o. and was rated to drive the following types of vehicles: EN57, EN57AKM, EN57AL effective on 9 February 2023, and ER160 effective on 30 June 2023 r. The driver, aged 25, had short work experience. On the day of the

occurrence, the train's entrance doors kept malfunctioning, which caused him stress. At the same time, the increasing time pressure due to the train's delay distracted the driver and might have contributed to ignoring the intermediate sign $J1^{1/2/3/m}$ showing the aspect "Stop". An additional reason for the distraction and loss of concentration was the fact that the driver was having a telephone conversation with the dispatcher of the Rolling Stock Repair and Operation Section Warszawa Grochów, which the Investigation Team considered to be one of the factors contributing to the occurrence.
The driver's failure to pay attention to the aspect of the home signal $B^{1/4}$ and, subsequently, the ToJ1 warning disc, might also have been influenced by the voice message from the signaller of Skierniewice station - eastern position, namely: *"Roger, go ahead"*. With these words, the signaller acknowledged the driver's report that the entrance door malfunction had been fixed and that the journey would continue, without providing any further information. The form of the message given by the signaller might have contributed to reducing the alertness and attention of the driver operating the passenger train. This situation did not exempt the driver from observing the aspects of the signals or responding to them accordingly.

3.2. Job factors

Not applicable.

3.3. Organisational factors and assignments

The material collected by the Investigation Team shows that the railway carriers provided the drivers of the rail vehicles involved in the occurrence with the statutorily required rest time. The said employees held all ratings and authorisations required by the applicable law and instructions for actions performed on the job concerned. The employers provided the said workers with all necessary instructions and regulations ensuring safe performance of his job.

When starting the train from the home signal $B^{1/4}$ (the last one indicating the aspect S5 "*The next signal is showing the aspect Stop")*, the train driver established communication with the signaller to inform him that the malfunction had been fixed and that the journey could continue, but he did not ask the signaller why the intermediate signal $J1^{1/2/3/m}$ was not showing the permissive aspect, which he was obliged to do under by the Ir-1 instruction. Neither did he establish communication when approaching the ToJ1 warning disc showing the aspect Os1 *"The signal to which this disc refers is showing the aspect Stop"*.

3.4. Environmental factors

The catenary poles positioned in the curve of the railway line make it difficult for train drivers to see, the aspects shown on the intermediate signal $J1^{1/2/3/m}$ from the required distance (375 m), which the Investigation Team finds to be a a contributing factor.

Photograph 11 - A view of the signal J1$^{1/2/3/m}$ 340 m (own material of PKBWK)

Photograph 12 - A view of the signal J1$^{1/2/3/m}$ from 340m on the day of the occurrence, with another train running on the adjacent track at the same time.

Other trains travelling on track 2 (the other one) are an additional reason why the visibility of the signal J1$^{1/2/3/m}$ is hindered.

Photograph 13 - Visibility of the intermediate signal J1$^{1/2/3/m}$ from 375 m on the day of the occurrence

Photograph 14 - A view of the intermediate signal J1$^{1/2/3/m}$ from 300 m on the day of the occurrence.

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

In the course of the investigation, the Investigation Team did not identify any other factors linked to the accident.

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 were found across the railway system that could play an active role in similar occurrences taking place.

5. Previous occurrences of a similar character

The PKBWK Investigation Team analysed similar occurrences already investigated by the Commission:

1. Investigation of a serious accident that took place on 30 August 2017 at 21:40 hrs at Smętowo station, track no. 2, km 457.485 of railway line no. 131 Chorzów Batory - Tczew (Report No. PKBWK 03/2018)

Type of occurrence: Serious accident.

Description: Collision of two trains

On 30 August 2017 at 21:40 hrs, freight TMS 564024 of the railway carrier STK S.A. Wrocław departed from Morzeszczyn station towards Smętowo station. The train was driven by a driver of diesel traction vehicles. The train was set up of an S200-303 diesel locomotive type and 6 wagons. At 21:48 hrs, from Morzeszczyn station also in the direction of Smętowo station, on the same track, as the second train, departed passenger train MPE 54170 "POGORIA" of the railway carrier PKP Intercity S.A., which was scheduled to pass Smętowo station on station track no. 2 without stopping. The train was driven by a driver of electric traction vehicles. The train was set up of a locomotive and 11 carriages. Locomotive EP07-395 with EVN PL-PKPIC 91511140088-2. Both trains were on the Morzeszczyn - Smętowo route and were moving on the basis of aspects shown by signals of an Eac automatic multi-block system (hereinafter referred to as "SBL"). At that time, freight train TDE 752009 of the railway carrier PKP CARGO S.A. was approaching from the opposite direction from Twarda Góra station on track no. 1 to the Smętowo station; that train was scheduled to pass Smętowo station on station track no. 1 without stopping. Acting in accordance with the Technical Regulations of the Traffic Post and the applicable instructions of the infrastructure manager PKP PLK S.A., the signaller and point operators at Smętowo station prepared the train route by displaying permissive aspects on the following signals:

- A1/2 - the aspect (single continuous green light), X - the aspect S2 (single continuous green light) for train TDE 752009 to proceed on track no. 1 without stopping;

- Z1/2 - the aspect S13 (two continuous amber lights) for train TMS 564024 to enter auxiliary main track no. 32. Train TMS 564024 entered Smętowo station on track no. 32 at 21:51 hrs and proceeded on that track throughout its route at a steady speed of approximately 17 km/h. At that time, passenger train MPE 54170 was approaching Smętowo station. That train, after the route had been prepared for it (proceed without stopping), received the aspect S2 (single continuous green light) on the home signal Z1/2 and the aspect S2 (single continuous green light) on the exit signal C. When the aspects were being displayed, passenger train MPE 54170 was on the penultimate sbl block section (the fact established on the video recorder footage from locomotive EP07-395). Train TMS 564024 did not stop at the intermediate signal L2 situated at track no. 32 and showing the aspect S1 "Stop" (single red light). When the head of his train was at the L2 signal, the driver of train no. TMS 564024 realised that the aspect S1 "Stop" was being displayed on that signal and mover the drive control to reverse to immediately reverse the train, and subsequently applied emergency braking, as a result of which the train continued towards turnout no. 24 and the head of the train stopped 38 m beyond the L2 intermediate signal.

At the same time, train MPE 54170 was moving on station track no. 2. Having realised that train no. TMS 564024 was within the gauge of track no. 2, the driver of train MPE 54170 applied emergency braking. Thus, beyond the fouling point of turnout No. 24,

at the speed of 110 km/h, the right side of locomotive EP07 collided wit the left side of locomotive S200 - 303 of train no. TMS 564024 which was beyond the fouling point (indicator W17) at turnout No. 24. The head of train MPE 54170 stopped at km 457.270 at the distance of 184 metres from the collision site.

Date of the occurrence: 30 August 2017, 21:40 hrs

Location of the occurrence: Smętowo station, track no. 2, km 457.485 of railway line no. 131 Chorzów Batory - Tczew

Consequences of the occurrence: As a result of the collision, the locomotive and seven passenger carriages of train MPE 54170 derailed to the left side in the inter-track area of tracks no. 1 and no. 2. The derailment of train MPE 54170 caused damage to track no. 1 and its occupancy control equipment, which in turn caused an automatic change of the aspect on the home signal A1/2 from S2 (continuous green) to S1 (continuous red) for freight train TDE 752009, which stopped at that signal. As a result of the accident, 28 passengers on train MPE 54170 were injured, 10 of them seriously. Fire, Police and Ambulance units arrived at the site.

Direct cause: Failure of freight train TMS 564024 to stop at the intermediate signal L2 showing the aspect S1 "Stop" and entry onto turnout no. 24 in the route of train MPE 54170

Root cause: Insufficient observation by the train driver of the route of train TMS 564024 while proceeding on auxiliary main track no. 32 at Smętowo station, which resulted in him failing to react to the aspect "Stop" shown on the L2 signal, which led to entry within the gauge of track no. 2 at turnout no. 24

Indirect cause: Disabling the automatic train stop (SHP) and vigilance (CA) devices on the S200-303 locomotive by closing the pneumatic valves of those devices in the locomotive's pneumatic cabinet, which significantly contributed to the reduction of the driver's vigilance while driving the train.

Systemic cause: Failure to assess and evaluate the hazard in the Safety Management System as regards the use of protective routes used after the increase of the speed limit at the station to 120km/h on the main tracks in a situation where switches no. 24 and no. 25 are involved in train routes z231 and z232 and are located within in the protective routes but are not interlocked for these train routes. The internal regulations of the infrastructure manager do not provide for such situations, in particular when an automatic multi-block system is used on the adjacent routes.

2. Investigation of an accident that took place on 26 February 2021 at 05:32 hrs at Grodzisko Dolne station, track no. 2, railway line no. 68 Lublin - Przeworsk, km 163.654 of railway line no. 68 Lublin - Przeworsk (Report no. PKBWK 02/2022)

Type of occurrence: Accident.

Description: Collision of two trains

As train MPE38100 of the railway carrier PKP Intercity S.A., led by locomotive EU160-010, was proceeding to Leżajsk station on the organized non-stop route K^1-C from the signal K^1 to the signal C on the second main primary track at Grodzisko Dolne station, train LSS335064 (locomotive 6Dg-140 of the railway carrier Lotos Kolej Sp. z o.o. moving alone) proceeded onto the second from the main additional fourth track, without a prepared route or clearance, and with the home signal D^2 showing the aspect "Stop". Locomotive 6Dg-140 ran through the switch of turnout no. 6 and entered onto track two directly in front of passenger train MPE38100 without automatically changing the aspect on the signal C from "Proceed" to "Stop" due to the type of

equipment. Having noticed the locomotive ahead of him, the driver of train MPE38100 applied emergency braking. Despite that, a collision occurred, i.e. the passenger train ran into the freight train travelling on the same track in the same direction.

Date of the occurrence: 26 February 2021, 05:32 hrs.

Location of the occurrence: Railway line no. 68 Lublin - Przeworsk, Grodzisko Dolne station, second track, km 163.654, geographical coordinates 50°10'24.7"N 22°30'21.1"E.

Consequences of the occurrence: As a result of the occurrence, four people were injured, i.e. the driver of the lone locomotive and three passengers on the passenger train. There were also material losses, i.e. severe damage to locomotives EU160-010 and 6Dg-140 and passenger carriages.

Causal factor: Disregard of the semaphore signal ^{D2} showing the aspect Sr1 "Stop", running through the switch of turnout no. 6 and entry of locomotive 6Dg-140 onto main track two immediately in front of train MPE38100 travelling on that track.

Contributing factors:

1. Hindered observation of aspects of the home signal D from track four due to the head of train LSS335064 stopping in a place which hindered observation of the aspect shown on the signal D. *In accordance with § 64(8) of the Ir-1 Instruction, the head of the train should stop as close as possible to the "Stop" aspect, and in case of light signals not closer than it is necessary to recognise the aspect beyond any doubt.*
2) The driver of train LSS335064 starting from track four after misidentifying the aspect of the exit signal C from track two showing Sr2 for train MPE38100 as the aspect "Proceed" for his train no. LSS335064.
3) Hindered visibility of the aspects shown by the semaphore signals in the area of illuminated turnout heads in the dark (early morning hours).

Systemic factors: None found.

3. Investigation of a serious accident that took place on 9 March 2020 at 04:15 hrs at Szymankowo station, track no. 2, km 287.360 of railway line no. 9 Warszawa Wschodnia Osobowa - Gdańsk Główny (Report no. PKBWK 01/2021).

Type of occurrence: Serious accident.

Description: Collision of two trains

On 9 March 2020 at 04:15 hrs, at Szymankowo station, a WMB10-182 railway motor car (work train 1) travelling from closed plain track no. 2 to Szymankowo station ignored the home signal "P" showing the aspect S1 "Stop". At the same time, train LTE 555122 (locomotive E186-261 of the railway carrier HSL Polska Sp. z o. o.) travelling from Gdynia Port GPA to Malbork was moving on plain track no. 1 Tczew – Szymankowo in the same direction; that train's route was set up from that plain route to track no. 2 at Szymankowo station. The route of that train included, among others, turnout no. 26. After train LTE 555122 passed the home signal "O" showing the aspect S6 - *Proceed at a speed not exceeding 100 km/h..."*, while it was proceeding on the track connecting track no. 1 with track no. 2, the train ran into the WMB10-182 railway motor car at the speed of 76.7 km/h which had stopped at turnout no. 26 which was in the route of the train (a WMB10-182 railway motor car of PKP PLK S.A. Railway Line Plant in Gdynia). Two persons were killed as a result of the collision: the driver

	of the motor bogie and a surface fitter travelling with him, and the WMB10-182 motor bogie was destroyed; the E186-261 electric locomotive and rail infrastructure elements were also damaged.
Date of the occurrence:	9 March 2020, 04:15 hrs
Location of the occurrence:	Szymankowo station at km 287.360, track no. 2, railway line no. 9 Warszawa Wschodnia Osobowa - Gdańsk Główny
Implications of the event:	Two persons were killed as a result of the collision: the driver of the motor bogie and a surface fitter travelling with him, and the WMB10-182 railway motor car was destroyed; the E186-261 electric locomotive and rail infrastructure elements were also damaged.
Direct cause:	Train LTE 555122 (lone locomotive) running into work train 1 standing in its route (WMB10 - 182 railway motor car).
Root cause:	Non-compliance with applicable regulations concerning operation of train traffic by the signaller at Szymankowo station, and the trackmaster and the driver of the WMB10-182 railway motor car, which created favourable circumstances for the driver of that railway motor car (work train 1) to disregard the home signal "P" showing the aspect S1 "Stop".
Indirect causes:	1) The signaller at Szymankowo station giving the trackmaster, i.e. a person not in the vehicle cab, a wrong clearance for work train 1 to enter Szymankowo station. 2) The trackmaster forwarding the said clearance by telephone to the driver of the WMB10-182 railway motor car informing him that he may disregard the home signal "P". 3) The driver of the WMB10-182 railway motor car (work train 1) disregarding the entry signal "P" without the required clearance as prescribed by the Ir-1 instruction. 4) Inappropriate organisation of work train routes during the works.
Systemic cause:	None found.

V. CONCLUSIONS

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

Having analysed the documentation and materials gathered in the case, and having carried out a site inspection and test rides on passenger trains, the Investigation Team concluded what follows:

- When starting the train from the home signal $B^{1/4}$ (the last one indicating the aspect S5 "*The next signal is showing the aspect Stop"),* the train driver established communication with the signaller to inform him that the malfunction had been fixed and that the journey could continue, but he did not ask the signaller why the intermediate signal $J1^{1/2/3/m}$ was not showing the permissive aspect, which he was obliged to do under by the Ir-1 instruction. Neither did he establish communication when approaching the ToJ1 warning disc showing the aspect Os1 *"The signal to which this disc refers is showing the aspect Stop"*;
- The form of the message given by the signaller involved acknowledgement of the train driver's report that the front door malfunction had been fixed and that he was able to continue the journey could continue, which might have played a role in the train driver ignoring the aspect of the home signal $B^{1/4}$ and, subsequently, the ToJ1 warning disc. This situation did not exempt the driver from observing the aspects of the signals or responding to them accordingly;
- The door malfunctions in the train set caused the train to be delayed. This situation caused stress to the driver of the passenger train and put time pressure on him and the signaller, which was the reason for changing the sequence of the trains;
- Another reason for the distraction and loss of concentration was the fact that the driver was having a telephone conversation with the dispatcher of the Rolling Stock Repair and Operation Section Warszawa Grochów in contravention of the carrier's internal regulations prohibiting any telephone conversations when driving a train;
- the aspect shown by the intermediate signal $J1^{1/2/3/m}$ was obscured by catenary poles and by a train running in parallel on the adjacent track.

The Investigation Team established that the causal factor of the occurrence was train no. 93965 disregarding the signal $J1^{1/2/3/m}$ with the aspect S1 "*Stop*" positioned at track 1, as a result of which the said train entered turnout no. 13 lying in the route of train no. 524009, which lead to a lateral collision of the two trains.

Factors contributing to the occurrence were:

1) The fact that the driver of train no. 93965 did not communicate with the signaller to explain the reason why the permissive aspect had not been displayed on the signal $J1^{1/2/3/m}$ when he was starting from the home signal $B^{1/4}$ (the last one showing the aspect S5 "*The next signal is showing the aspect Stop").* Furthermore, the fact that the said train driver did not establish communication when approaching a ToJ1 warning disc showing the aspect Os1 *"The signal to which this disc refers is showing the aspect Stop".*
2) The driver of the passenger train was under stress caused by fixing door faults in the electric multiple unit at two consecutive passenger stops.
3) Time pressure on the driver due to the requirement to meet the passenger train timetable.
4) Lack of visibility of the aspects displayed by the intermediate signal $J1^{1/2/3/m}$ from the required distance of 375 m (the signal aspects are obscured by catenary poles positioned at track two as well as by trains running on that track).
5) The fact that the driver of train no. 93965 took a telephone call from continued the conversation with the dispatcher of the Rolling Stock Repair and Operation Section Warszawa Grochów while approaching, on track one, the intermediate signal $J1^{1/2/3/m}$ showing the aspect S1 *"Stop"*, in contravention of the internal regulations of the carrier.

No systemic factor were found.

2. Measures taken since the occurrence

Not applicable

3. Additional comments

1. The schematic plan of Skierniewice station shows wrong locations of the warning discs ToJ1 and ToJ2.
2. In the traffic logbook (R-146) kept by the signaller of LCS Skierniewice, eastern position, there are corrections made in conflict with the Ir-1 instruction.
3. Radio communication between the train driver and the signaller was conducted incorrectly, in conflict with the Ir-5 (R-12) instruction.

VI. SAFETY RECOMMENDATIONS

1) Certified railway carriers shall incorporate a train driver improvement programme in their safety management systems. Addressed to train drivers who have less than 5 years of work experience, the programme shall include at least:
   a. obligatory supervised instruction rides with all employee who are starting their careers as train drivers, at a rate of at least one ride per month for a period of one year, applicable to each train driver from the moment they obtain their train driver's certificate,
   b. ad hoc training, including an increased number of hours of simulator training,
   c. special assistance to that group of employees in terms of behavioural processes such as maintaining concentration, selecting stimuli, dividing attention, and the ability to work under pressure and under stress.
2) Licensed railway carriers shall include in their preparatory courses, training and periodic instruction for train drivers topics related to the rules on the use of mobile phones and other mobile devices while driving and shunting, as recommended by the Chairman of PKBWK (Report no. PKBWK/1/2012 Recommendation No. 3).
3) Certified railway carriers and entities in charge of maintenance shall identify within their management systems the hazard of recurrence of the causes of failure for a given vehicle type, and shall carry out a risk assessment for that risk. If the hazard is identified, they will continue to:
   a. apply corrective measures to eliminate the safety hazard,
   b. report recurrent failures of vehicles of a given type to the rolling stock manufacturer so that the latter could verify the failure rate in relation to other vehicles of the type, monitor the performance of potentially defective components and take actions to ensure the safe operation of these vehicles, e.g. by repairing/replacing the defective component in all vehicles of the type.
6) PKP PLK S.A. IZ Łódź shall install repeater signals ahead of the intermediate signal $J1^{1/2/3/m}$ to provide clear and uninterrupted visibility of the aspects shown by that signal.
7) PKP PLK S.A. shall cover the following topics in their periodic and ad hoc instructions for personnel directly involved in the operation of railway traffic:
   a. a good practice for their signal box personnel to send an additional notification by radio to the drivers of railway vehicles concerning changes in the traffic organisation applicable to a given train within a station, in particular concerning an unscheduled stop at a station or en route to let other trains pass as recommended by the Chairman of PKBWK in relevant Reports (No. PKBWK/03/2018 and No. PKBWK/02/2022).
   b. formulation of radiotelegrams in accordance with Instruction Ir-5 (R-12).

STATE COMMISSION ON RAILWAY ACCIDENT INVESTIGATION
CHAIRMAN

.....
Tadeusz Ryś

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List of entities and acronyms which appear in Report **No. PKBWK 06/2024**

No.	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.	Infrastructure manager
5.	PKP PLK S.A. IZ Łódź	Railway Line Plant in Łódź
6.	PKP CARGO S.A.	Railway carrier
7.	"Mazovia Railways - KM" Sp. z o. o.	Railway carrier
8.	EMU	Electric Multiple Unit
9.	LCS	Local Control Centre (Polish: Lokalne Centrum Sterowania)