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

REPORT No. PKBWK 06/2022

on the procedure on a railway incident that occurred on 05 February 2021 at 09:37 in Gogolin station track no. 6, 22.400 km of railway line no. 136 Kędzierzyn Koźle – Opole Groszowice

PKP PLK S.A. infrastructure manager area Zakład Linii Kolejowych [Railway Facility] in Opole

WARSAW, 21 July 2022

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

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

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I. ABSTRACT

Type of event:
Railway incident.

Event description: Train no. 844000 riding on the route between Szczecin Port Centralny – Chałupki operated by the railway undertaking PKP Cargo S.A. entered Gogolin station at the permissive signal on semaphore $Z^{1/2}$ on the hardened track of the route, travelling from $^{2}_{6}$. This train moved on an incorrectly prepared route. The incorrectly set switch of turnout no. 42 (not dependent in the journey) was set in the direction of turnout no. 39ab, and later towards non-electrified side track no. 8. instead of towards main auxiliary track no. 6. Having noticed the improperly prepared route, the train driver started immediate stop and lowered the pantographs. The front end of train no. 844000 came to a stop behind the points of turnout no. 39ab on track no. 8 at 22.455 km.

Event date: 05.02.2021, 09:37 a.m.

Event location: Railway line no. 136 Kędzierzyn Koźle – Opole Groszowice track no. 6 Gogolin station, 22,400 km (50.497464N, 18.014500E).

Consequences of the event: None.

Causal factor: Entry of a freight train operated by electric traction onto non-electrified side track no. 8 of Gogolin station instead of track 6 due to an incorrectly set switch of turnout no. 42.

Contributing factors:

- Failure to observe the train movement restrictions at the station during telephone instructions and notification of route preparation.
- Points of turnout no. 42 switched towards track no. 8 instead of towards track no. 6.
- No interdependence of the switch of turnout no. 42 on the mechanical and electric track in the train path from $^{2}_{6}$ from Górażdże to track 6 and in the path for the entrances to track 4 of switches 39ab and 39cd, which allowed to feed the permitting to the entrance semaphore $Z^{1/2}$.
- The lack of the "active key control board" at the signal box Gg2 at Gogolin station for switch locks built on non-independent switches on the routes.
- Placing the active keys for the switch locks built into switches 39ab and 42 in a "spare key cabinet," which was situated in a place not visible to the operating personnel, thus resulting in inappropriate ergonomics of the point operator's workstation.
- The operation of switches 42 and 39ab and 39cd during the entry of an auxiliary vehicle (handcar) on track 28 by unauthorised persons (handcar operation) in an improper manner, i.e.:
  - failure of the 42 turnout point to return to default setting
    carried out unorganised manoeuvre run,
  – failure to return the keys to turnouts 42 and 39ab by the handcar personnel, however the point operator decided to manage train traffic.
- Improper check of the setting of the route from $^{2}_{6}$ by the point operator, consisting in, among others, no confirmation regarding locking the point no. 42 to the return position.
- The housing of the pin locks positioned for the duration of the works allowed them to be operated freely, as specified by the designer of the control and command and signalling equipment (unsealed keys, accessible to the contractor of the construction works, placed

on the key board in an unsealed manner with a recommendation of accessibility to the contractor, without designing the active key board as a component of the train path).

- The lock of up-to-date documentation of the signalling equipment (schematic plans and locking sheet) at the command box on the day of the incident.
- Discrepancy between the facts and the documentation for phase no. 27 of the Regulations on Temporary Traffic Management during works on railroad tracks – the locking sheet and schematic plan for this phase required the dependency of turnout no. 42 on the key road, while factually there was no dependency of it for the route from $^{2}_{4,}$ from$^{2}_{6}$, which was not disclosed during the acceptance of this phase of works and the plot no. 9 of the Technical Regulations of the Station during phase 27 of the Regulations on Temporary Traffic Management during works on railroad tracks with the facts.
- Inappropriate internal acceptance of signalling equipment as part of the completion of stage 27 of the control and command and signalling equipment at Gogolin station and inappropriate supervision by the infrastructure manager over the investment works at Gogolin station.
- The train dispatcher on duty ordered the employees of the motor trolley to hand over the keys of the locks of switches 39ab and 42, however the employees did not hold authorisations to set the route for train no. 669234.
- Inappropriate implementation of the contractual provisions for the author's supervision consisting in, inter alia, in the designer updating the design of the built facility after it is put into use.

Systemic factors:

None.

Recommendations:

Temporary recommendation:

Pursuant to Article 281 section 1a of the Act of 28 March 2003 on Railway Transport (i.e., Journal of Laws of 2020, item 1043, as amended). The Chairman of the Commission issued an interim recommendation for the Railway Department in Opole to implement the following measures aiming to improve safety in rail transport with respect to Gogolin station:

- making an active key board on the Gg2 dependent box of the Gogolin station and placing it in a place visible to the operating personnel,
- Preparation of the consolidated text of the Regulations on Temporary Traffic Management during works on railroad tracks no. 12/2018 on the premises of PKP PLK S.A. Zakład Linii Kolejowych [Railway Facility] in Opole.

Recommendations arising from the performance of the conducted procedure:

1) The railway infrastructure manager PKP PLK S.A. shall take measures intended to:

a. increase the supervision of the Investment Performance Centre of the construction work contractors as part of ongoing investments.
b. improve the quality and depth of technical acceptance of individual stages of works in terms of inspecting the conformity of the design documentation with the condition on the ground.
c. update the trainings for employees with issues related to the operation of trains in the station and adjacent routes during restrictions, telephonic announcement of trains on the routes, telephonic recommendation and notification of the preparation of routes in the station.

2) Railway infrastructure manager PKP PLK S.A., within the framework of supervision of executed investments, shall extend the scope of control in the scope of compliance of executed phases with the documentation, in particular during changes between successive transitional phases of investment works related to railway traffic operation and safety.
3) After completion of each stage of an investment project containing phases, new temporary train traffic regulations should be drawn up during execution of works on the premises of PKP PLK S.A. Zakład Linii Kolejowych, which will constitute a continuation of the specific investment task.

Photograph 1 – View of the site (source: PKBWK)

II. THE PROCEDURE AND ITS CONTEXT

1. Decision to initiate the Procedure

Pursuant to the provisions of Article 28e section 2a of the Railway Transport Act of 28 March 2003 (Journal of Laws of 2020, item 1043, as amended), hereinafter referred to as the "Railway Transport Act," on 16 February 2021, the Chairman of the State Commission on Railway Accident Investigation (hereinafter referred to as "PKBWK" or the "Commission"), Mr. Tadeusz Ryś, issued the decision no. PKBWK.4631.2.2021 to undertake proceedings regarding the incident that occurred on 05 February 2021 at Gogolin station.
The incident was reported to the European Union Agency for Railways on 19 February 2021 and was registered in the Agency's database under number PL-10022.

2. Statement of reasons for the decision to initiate the procedure

The Chairman of PKBWK decided to initiate proceedings on the grounds that the incident represents a series of safety risks in rail transport relating to the organisation of traffic and maintenance of the infrastructure during the modernisation of railway lines.

3. The scope and limitations of the procedure including their justification, and an explanation of any delays considered a risk or otherwise affecting the conduct of the proceedings or the conclusions of the proceedings

The procedure aimed at determining the root causes of the incident were conducted pursuant to Article 28h section 1 of the Railway Transport Act of 28 March 2003. Pursuant to the provision of Article 28f section 3 of the aforementioned Act, the proceedings shall not determine guilt or liability.
There were no constraints during the course of the proceedings that would adversely affect the procedure.

4. Aggregated description of the technical capabilities of the functions in the team conducting the procedure

The Chairperson of the Commission has appointed an Investigation Team (hereinafter referred to as the "Investigation Team") from the group of the permanent members with relevant competence and experience in the proceedings.
There was no need to appoint ad hoc members and experts, nor to commission external expertise.

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

In accordance with Article 28h section 2 item 5 of the Railway Transport Act, the Chairman of the PKBWK obliged the designated members of the Railway Commission to cooperate with the Investigation Team on an ongoing basis pursuant to the written of a written undertaking addressed to their employers by letter no. PKBWK 4631.2.1.2021 dated 16.02.2021 and to hand over the documents collected during the procedure.

On 18.02.2021, at the headquarters of PKP PLK S.A., Zakład Linii Kolejowych in Opole, the Investigation Team received the documentation collected by the Railway Commission.

As part of the investigation, the Investigation Team applied the entities associated with the investigated incident to cooperate, i.e.:

- the railway infrastructure manager – PKP Polskie Linie Kolejowe S.A., including the company's Investment Performance Centre,
- the rail carrier – PKP Cargo S.A.,
- the contractor for the works at Gogolin station – PORR S.A.

In addition, selected information was also requested from the works contractor, PORR, regarding the works being carried out at Gogolin station in connection with the upgrade of the Gogolin station, which was being carried out on the day of the incident.

In accordance with the provisions of Article 28k of the Act on Railway Transport, the PKBWK permitted the entities related to the occurred incident to investigate the course of the procedure and enabled to read the draft report in order to raise potential remarks. The obtained opinions of the interested entities were analysed at the Commission's meeting on the 20th and 21.07.2022 and in the case of acknowledging the legitimacy of the submitted comments – appropriate amendments were made to the contents of the draft report.

6. Description of the level of cooperation proposed by the units involved in the procedure

The level of cooperation with the involved entities was correct. These entities provided the evidence and documents expected by the Investigation Team.

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

In the course of investigating the causes and circumstances of the incident, the Investigation Team relied on the secured evidence, procedures and experience, as well as photographic documentation, documents received from the railway operator, railway infrastructure manager, contractor and subcontractors.
As part of the investigation of the incident, the Investigation Team used the following methods to determine the facts:

- visual inspection of the site of the incident – command box Gg, and the executive box Gg2 at Gogolin station,
- investigation of the employees involved in the incident,
- inspections carried out at the offices of entities involved in the incident, including the offices of PKP PLK S.A Managing Authority Opole and the Investment Performance Centre of PKP PLK S.A. in Wrocław,
- analysis of the data recorded by the rolling stock vehicle trip data recorder,
- analysis of documentation obtained from the infrastructure manager, the carrier and the contractor for the works at Gogolin station,
- analysis of the information obtained during the hearings of persons involved in the incident.

The investigation carried out by the Investigation Team was based in particular on the provisions of the Railway Transport Act, its specific implementing acts and selected internal regulations of the railway infrastructure manager and the railway undertaking.

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

European Union regulations:

1) Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 On railway safety (OJ L 253, 11.10.2002, p. 102).

2) Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation (OJ EU L119 of 04.05.2016. p.1. as amended)) and the related Act of 10 May 2018 on Personal Data Processing (Journal of Laws, item 1000).
3) Commission Regulation (EU) No 1158/2010 of 9 December 2010 on a common safety method for assessing conformity with the requirements for obtaining railway safety certificates.
4) Commission Regulation (EU) No 1169/2010 of 10 December 2010 on a common safety method for assessing conformity with the requirements for obtaining a railway safety authorisation.
5) Commission Implementing Regulation (EU) 2020/572 of 24 April 2020 concerning the reporting structure to be followed for rail accident and incident investigation reports (Official Journal of the European Union No. 132 of 27 April 2020)

National legislation:

1) Act of 28 March 2003 Construction Law (i.e., Journal of Laws of 2020, item 1043, as amended and Journal of Laws of 2021, item 1984, as amended).
2) Regulation of the Minister of Infrastructure of 11 January 2021 on workers employed in positions related to the operation and safety of railway traffic and to the operation of certain types of railway vehicles (Journal of Laws of 2021, item 101).
3) Regulation of the Minister of Infrastructure of 18 July 2005 on general conditions for railway traffic and signalling (i.e., Journal of Laws of 2015, item 360, as amended).
4) Act of 7 July 1994 Construction Law (i.e., Journal of Laws of 2020, item 1333, as amended).

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

Due to the need to complete and verify the source documentation, and to conduct additional interviews of the designer of the designer of the signalling equipment, the train driver and the train dispatcher, as well as due to the organisational change in the general contractor's subcontracting company, it was not possible to publish the Report on the Procedure within 12 months after the date of the incident, the Commission announced the Interim Report mo. PKBWK 01/T1/2022 of 12.01.2022 (pursuant to Article 28l section 5a of the Act of 28 March 2003 on Rail Transport (i.e. Journal of Laws Journal of Laws 2021 item 1984 as amended). An additional factor contributing to extending the procedure included the prevailing COVID-19 pandemic situation and related restrictions.

9. All interactions with the judicial authorities

Due to the fact that there were no victims and no losses as a result of the incident, cooperation with the Public Prosecutor'' Office in Opole concerned only the exchange of information regarding the incident.

10. Other information relevant to the proceedings

During the course of the investigation, the employees related to the incident were investigated.
The contents of the investigation lead to the following conclusions, among others:
The personnel of the Gg2 executive signal box consisted of a point operator and an apprentice point operator.
Their works continued without disruptions between 07:00 and 09:30 a.m. Between 09:30 and 09:35, an auxiliary vehicle (motor trolley) was shunted from track no. 2 to tracks no. 6 and 8 and further to track no.

28 to unload coal to fuel station Gg2. Prior to entering the track at the signal box, a service employee of the motor trolley received keys to the turnout keys and a crank to manually adjust the switch by the point operator, which was not returned until after the incident. After 09:30, the point operator received information from the train dispatcher on duty at Gogolin station that a runway had been prepared for a freight train from the direction of Górażdże on track 6.

The point operator prepared the runway for the freight train on track 6 and checked that he had prepared the runway correctly by moving the runway rod to the end position. Having serviced the gate devices at the level crossing category A, he displayed the enabling signal at the entrance semaphore. Afterwards, the point operator and his apprentice proceeded to observe the approaching train.

The point operator, noticed that the train started to brake and stopped on track no. 8. The locomotive and two wagons remained off the overhead line. Before entering side track 8, the driver lowered the pantograph. The point operator informed the train dispatcher that the train had entered track 8 instead of track 6. After the train had entered track 8, the point operator realised that the key for point 42 was missing and that its position is unknown. The point operator was very surprised that it was possible to display the permit signal on the semaphore and the equipment allowed this. He stated that point 42 should be dependent in accordance with the dependency table.

A week after the incident, the turnout 42 was conditioned from the route.

The designer of the equipment learned about the incident from the contractor, i.e., PORR company. After reviewing the matter, he concluded that the incident did not occur due to a design error. In accordance with the documentation for phase 27 of the Temporary Regulation no. 12/2018, an electric drive giving control in the equipment at the Gg2 signal box should have been built in at turnout no. 42. In such case, the dependencies would not have allowed entry onto track no. 8. The mechanical and electrical dependencies would have worked and prevented entry onto track no. 8. The design company Sabel had only a contract for the design work of the signalling equipment on the section Opole Groszowice – Zdzieszowice. The designer was not a member of the acceptance committee and had no knowledge of the condition nor the situation on the facility on the day of the incident. The designer worked on materials and diagrams received directly from ISE Opole.

The driver of train no. 844000 noticed an incorrect position of the turnout switch while entering the station. The switch of the turnout was set for running in the direction to non-electrified track no. 8 instead of track no. 6. He immediately applied emergency braking and at the same time emergency lowered the pantograph before the overhead contact line terminated. The train stopped behind a junction on track no. 8. After the train had stopped, the driver contacted the dispatcher at the Gogolin station as well as his dispatcher about the incident over the radio. He remained in the locomotive while waiting for the arrival of the commission. After the incident, he secured the train, including the locomotive against running away by manually applying the brakes to two carriages and the locomotive due to a power failure. The internal train schedule did not provide for a stop at Gogolin station.

III. DESCRIPTION OF THE EVENT

1. Event and background information

1.1. Description of the event type

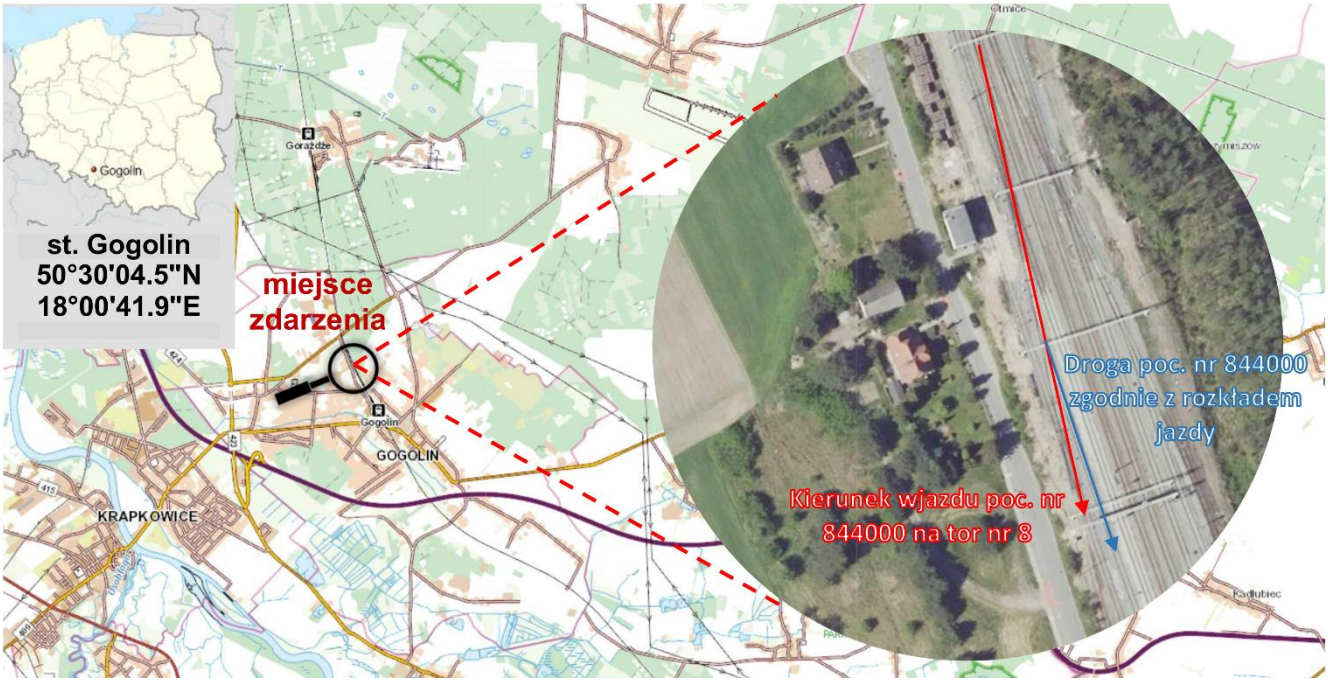
Railway incident consisting in the entry of a train no. 844000, route Szczecin Port Centralny – Chałupki of the carrier PKP Cargo S.A., served by electric traction on the enabling signal on the semaphore $Z^{1/2}$ on the non-electrified side track no. 8 of the Gogolin station, instead of on the main additional track no. 6 due to an incorrectly set switch of the turnout switch no. 42 on the route from $^{2}_{6}$ (the switch was put in the straight position towards track 8, and not in the default position in the direction back to track 6).

1.2. Date, exact time and place of event

The incident occurred on 05.02.2021 at 09:37 at Gogolin station on track no. 6, at 22.40 km of railway line no. 136 Kędzierzyn Koźle – Opole Groszowice, area of executive signal box Gg2.

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

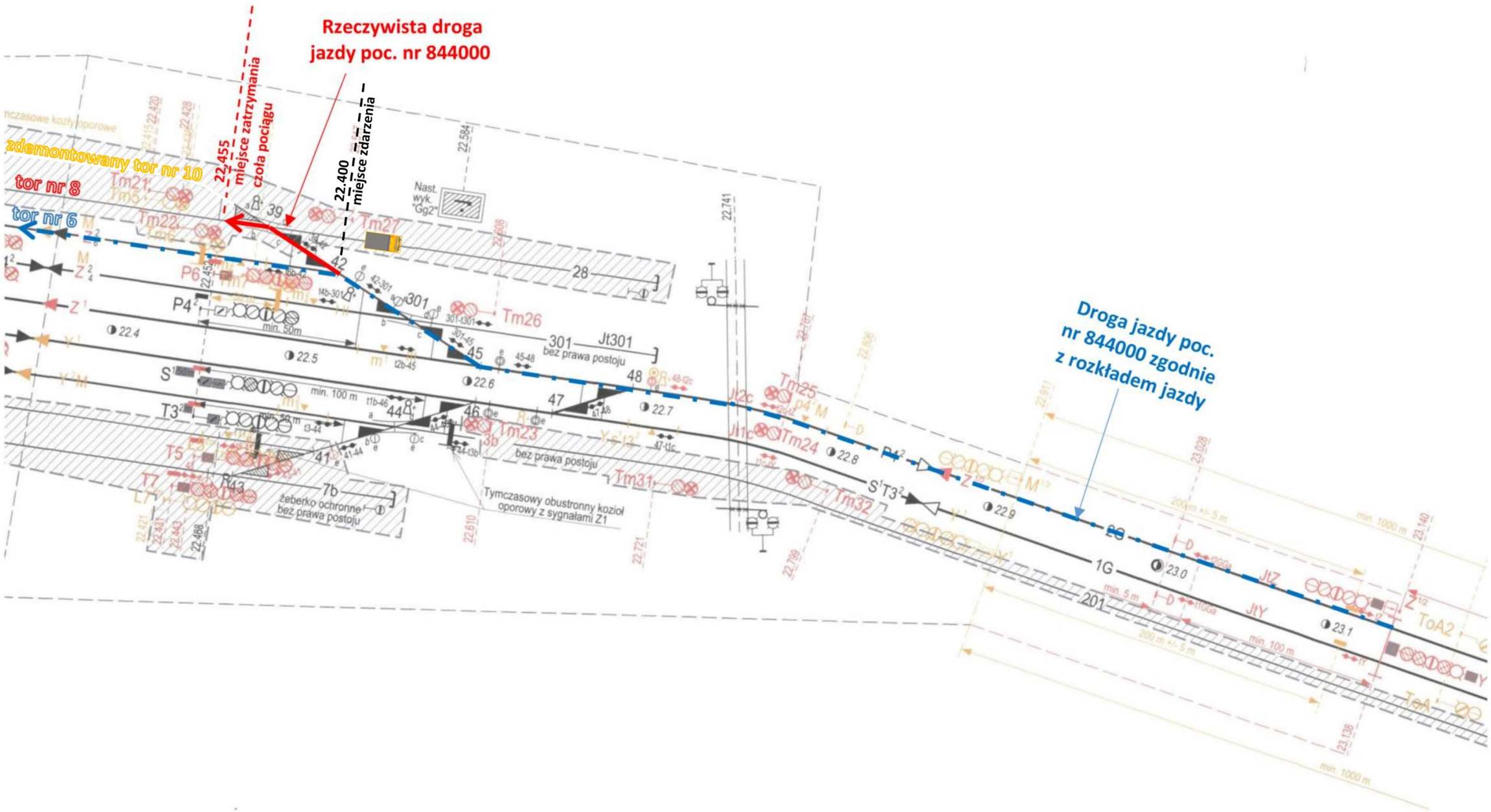
Figure 1 – General overview of the site (source: Geoportal).



The incident occurred in the district operated from executive control station Gg-2 at Gogolin station.

The weather conditions at the time of the incident did not limit visibility or affect the occurrence of the incident. Geographical, topographical conditions did not affect the occurrence of the incident.

Figure 2 – Sketch of the site (developed by PKBWK)



1.4. Deaths, injuries and damage to property

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

No persons were injured in result of the incident.
The freight carried by the train was not damaged.

b) rolling stock, infrastructure and environment

The incident did not cause damage to rolling stock, infrastructure or the environment.

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

Train traffic on track 2 of the Górażdże - Gogolin route was suspended from 09:55 to 11:30 due to the incident. 9 trains were delayed for a total of 444 minutes. Replacement service was not introduced.

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

The Investigation Team identified persons directly linked to the event:
- the point operator of the point Gg2 at Gogolin station – an employee of PKP PLK S.A. Zakład Linii Kolejowych w Opolu, Sekcja Eksploatacji Opole Główne,
- train dispatcher of the command box Gg at Gogolin station – an employee of PKP PLK S.A. Zakład Linii Kolejowych w Opolu, Sekcja Eksploatacji Opole Główne,
- train driver of the WMB-10 handcar - an employee of PKP PLK S.A. Zakład Linii Kolejowych w Opolu, Sekcja Eksploatacji w Opolu,
- senior craftsman - an employee of PKP PLK S.A. Zakład Linii Kolejowych w Opolu, Sekcja Eksploatacji w Opolu,
- train driver of the locomotive ET22-932 – an employee of PKP Cargo S.A. Śląski Zakład Spółki in Tarnowskie Góry, Sekcja Przewozów i Eksploatacji Opole,
- manager of the traffic control system – an employee of PORR S.A.,
- traffic control equipment designer – an employee of SABEL Biuro Wdrożeniowo – Projektowe,
- members of the acceptance committee:
  - chairman – an employee of PKP PLK S.A. Zakład Linii Kolejowych w Opolu, Sekcja Eksploatacji Opole Główne,
  - a representative of the Orderer, the traffic control supervisor – an employee of Ekocentrum Wrocław,
  - a representative of the contractor, traffic control works manager - PORR S.A. employee,
  - representative of PKP PLK S.A., Diagnostic Inspector - employee of PKP PLK S.A., Zakład Linii Kolejowych w Opolu, Section Eksploatacji Opole Główne.

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

Train no. 844000 on the route of Szczecin Port Centralny - Chałupki of the carrier PKP Cargo S.A. consisted of an electric locomotive, series ET22-932 and 22 loaded, covered Habbiins, H, U type wagons.

Information regarding train no. 844000:
- train length ..... 531.6 m
- total weight of the train ..... 1683.23 t
- required brake mass percentage..... 49 %
- effective brake mass percentage..... 82 %
- required brake mass..... 824.8 t

– actual brake mass..... 1382.5 t

Train locomotive number in accordance with EVN register 91 51 3 150 265-9 series ET22-932, rail vehicle certificate of roadworthiness no. COT055/06/2019 issued on 08.04.2019 in Gliwice, valid until 07.04.2027 for a mileage of 500,000 km calculated from 149 km, current mileage 105,808 km. Last P1 inspection performed on 24.01.2021 CT Wschodni, last P2 inspection - 11.01.2021 CT Centralny.

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

1. Tracks, turnouts:
turnout no. 48 – directs to the switch of turnout 45 (plus position),
turnout no. 45 – directs to switch 301ab (minus position),
turnout no. 301ab – directs to switch 45 (minus position),
turnout no. 301cd – directs to switch 42 (minus position),
turnout no. 42 – directs to switch 39 (minus position),
turnout 39ab – directs to track no. 8 (minus position).

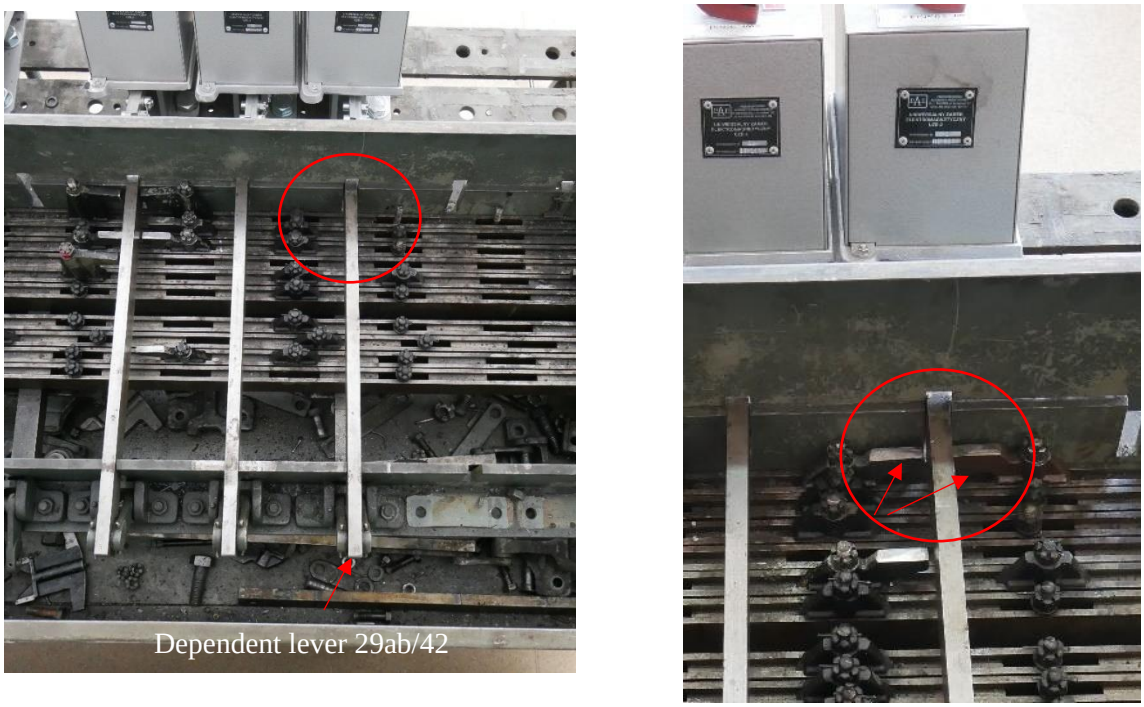
2. Control and command and signalling equipment and their indications:

a) at the traffic station
Mechanical interlocking system:
- position of the levers of the universal electromagnetic lock (UZE-2 locks):
39ab/42 - plus position; 39cd - plus position; 301 ab/45 - minus position; 301cd - minus position;
41/43 - plus position; 44ab/46 - plus position; 44cd - plus position; 47/48 - plus position,
- route lever from $^{2}_{6}$ – repositioned; other levers in default positions,
- semaphore repeater $Z^{I/2}$ - illuminates red, other semaphore repeaters - preventing signal,
- signal box – closed, sealed,
- command receiving instrument On Z^{2}_{6} unlocked, dial colour white,
- route confirming box Pu Z^{1} from Górażdże on tracks 2, 4, 6 – blocked, dial colour white.

b) on the ground:
The light semaphore $Z^{I/2}$ displays the signal S1 “stop,” the other semaphores display the signal S1 “stop”.

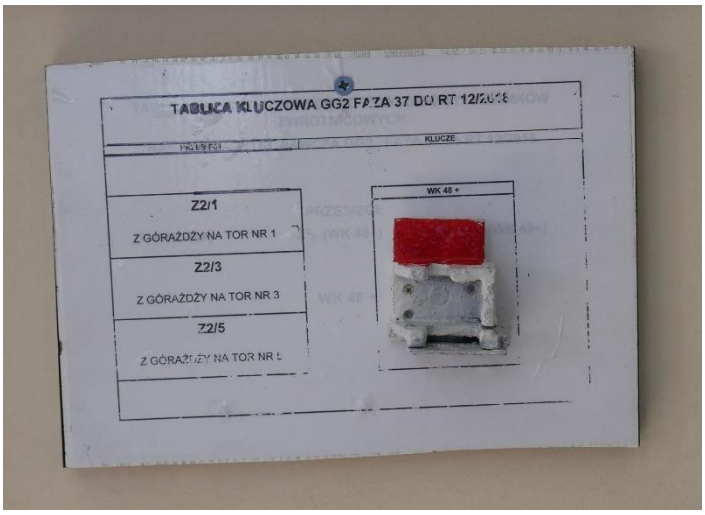
c) indoor equipment:
Premises closed and sealed.

Photograph 2 – View of the combiner with UZE-02 electromagnetic locks on the dependent box Gg2



Photograph 3 – View of the combiner without locking dogs (left side – condition after the incident) and with the caps installed after the incident – condition as at 21.04.2021.

Photograph 4 – Board of spare keys and keys for the locks temporarily installed on the Gg2 signal box



Photograph 5 – Key board of active Gg2 control station made after the incident (during the subsequent stage of works)

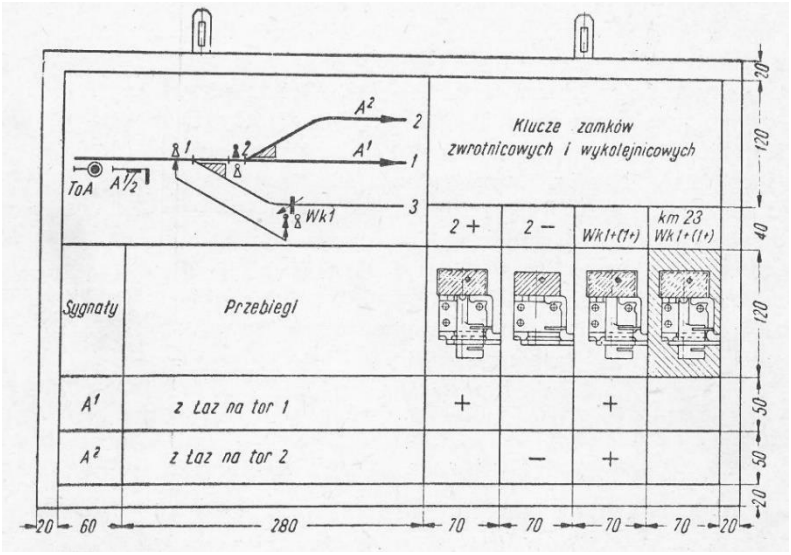


Figure 3 – Example of an active key control board

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

Pursuant to the records of the Control Book of the signalling equipment E-1758 of the Gg and Gg2 control stations, the Investigation Team discovered broken seals for the manual movement of the lever of turnout no. 42 and the keys for turnout 39ab, 42. The description in part one was made by the point operator at station Gg2 and the description in part one at station Gg by the signaller. Pursuant to the station communication calls, the traffic point operator instructed the point operator to issue the keys and the lever to the service personnel of the motor trolley. The order and its implementation violated the Regulations, as the operation of the switches should be performed by the point operator.

The R-142 Mileage Book at the Gg-2 executive dependent box contains an entry stating that the book must be maintained in in full due to investment works being carried out at Gogolin station and adjacent routes. On the day of the incident, telephone instructions and reporting on the preparation of route routes were in force at Gogolin station. The conditions were not observed by the train dispatcher and the point operator. The Investigation Team found the above as one of the contributing factors to the incident.

2. A factual description of the events

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

On 05.02.2021 at 09:20 a.m., a WMB-10 motor trolley No. 175 entered track No. 2 of Gogolin station as train no. 669234. After the motor trolley entered track no. 2, the signaller instructed the point operator to carry out shunting from track no. 2 to track no. 6 and later to track no. 8, and to issue the keys of turnouts no. 39 and 42 and the lever for manual adjustment of switch drives to the personnel of the motor trolley.
During the shunting operations, the employee of the motor trolley turned the point of turnout no. 42 into the position pointing towards turnout no. 39 and the turnout lever no. 39cd to the position pointing towards track no. 8 using a crank, and later manually shifted turnout switch no. 39ab into the position pointing towards track no. 8 using a steel crowbar. After performing these operations, he gave the hand shunting

signal "com hither," and later the motor-powered trolley drove onto track no. 8. After stopping on track no. 8, the employee repositioned the switch of turnout no. 39ab back into position towards track no. 28 terminated by a protective rib and gave the hand shunting signal "come hither". After entering on the track, the workers proceeded to unload the coal. After shunting was complete, the switch of turnout no. 42 remained in the position pointing towards track no. 8, while the switch of turnout no. 39ab remained in the position pointing towards track no. 28. The keys and the valve remained on the motor trolley throughout the entire time.

At 09:33, the point operator received the order to prepare the route for train no. 844000 from semaphore $Z^{1/2}$ on track no. 6. After preparing the runway, he moved the route lever from $^{2}_{6}$ to the end position and blocked the runway restraining block PuZ^{1}. At 09:36 he received an order from the train dispatcher to give the enabling signal on the home signal $Z^{1/2}$. The driver of train no. 844000, was observing the route while entering Gogolin station and when he noticed that the route was pointing to the non-electrified track, he implemented sudden braking and lowered the pantograph.

The front of the train stopped on track 8 at 22.455 km.

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

After stopping and securing the train, the engine driver notified the Gogolin station train dispatcher and the PKP Cargo S.A. dispatcher about the incident. The police were informed immediately after the incident. The officers carried out a sobriety test on the point operator and the train driver. Due to the fact that no injuries or damage occurred, there was no need for the ambulance and fire brigade to arrive.

IV. ANALYSIS OF THE INCIDENT

1. Roles and responsibilities

1.1. Railway undertakings or infrastructure managers

PKP PLK S.A. infrastructure manager Zakład Linii Kolejowych [Railway Facility] in Opole

The infrastructure manager is responsible for the proper maintenance of the railway line and level crossings.

Procedure SMS-PW-11: Cooperation with the contractors of investment works

The Infrastructure Manager's Safety Management System (SMS) includes a procedure no. SMS-PW-11 titled "Cooperation with contractors of investment works and designers". The procedure aims to establish the principles of cooperation with contractors of investment works during the execution of works and to regulate the principles of acceptance of these works. The scope of application of the procedure covers all organisational units of the Company, in particular the Investment Performance Centre ("IPC"), IPC Branches and Railway Facilities whose scope of activity includes the tasks of preparation, execution and commissioning the investment project.

The technical acceptance is carried out, among others, pursuant to the "Guidelines for technical acceptance and commissioning of signalling equipment" Ie-6 and the "Conditions and principles for acceptance of construction works on railway lines" – Appendix to Resolution no. 268/2020 of 20.04.2020 of the Management Board of PKP Polskie Linie Kolejowe S.A., hereinafter referred to as "Acceptance Conditions".

The internal instructions "Acceptance Conditions" provide, among others, carrying out of acceptance of individual parts of the executed works, the so-called partial acceptance (including vanishing or covering works). These acceptances are carried out, among others, in the event that:

- the contractor seeks payment for partial completion of the works and the contract provides for such a method of settlement,
- the contractor proceeds to the next stage of the work and there is a need to determine the quality and quantity of the work that is either vanishing or in the process of being covered,
- there is a need to assess the quality of the assembled component or equipment,
- there is a need for acceptance before handing over a specific stage of the works to another Contractor.

The engineer/supervisor is responsible for organising and carrying out the partial acceptance. In the case of vanishing works or works in the process of being covered, the participation of the person designated by the Railway Company (specialist in the sector concerned) is mandatory.

The contractor is obliged in particular to inspect the quality of the in-built elements, materials and equipment, as well as to carry out ongoing inspections of the correctness of the works carried out.

The Engineer/Supervisor is obliged in particular to:

- carry out an inspection of the works carried out by the contractor;
- inspect and verify the quality of the installed components, materials and equipment;
- carry out tests in accordance with its own quality control system;
- participate in technical trials and verify the results of these trials;
- verify and approve the as-built documentation;
- verify and check the terminal inspection report;
- declaration regarding the confirmation of the work;
- participate in all acceptances.

The basic condition for acceptance of executed works includes the confirmation of the application of selected materials, elements, devices and technologies provided for in the design, introduced into the market in an appropriate manner for and approved for use in the tracks of PKP Polskie Linie Kolejowe S.A. by means of:

- test results obtained by the Engineer as part of his own quality control system;
- the results of inspections and tests carried out during the works;
- the results of visual inspections and randomised tests carried out during acceptance.

The SMS-PW-11 procedure provides that, in case the commission does not accept the works submitted by the contractor, the acceptance report fort the works should specify the reasons for not accepting the scope of works submitted for acceptance, the time limit for the removal of the defects along with the reasons, and a possible new date for acceptance.

The internal acceptance of signalling equipment as part of the completion of phase 27 of the Temporary Regulation no. 12/2018 for managing train traffic during the performance of the works (hereinafter referred to as the Temporary Regulation no. 12/2018) were carried out in November and December 2020, while that equipment, in accordance with reports no.: 02/11/SRK/OP/2020 of 20.11.2020 and 01/12/SRK/OP/2020 of 01-02.12.2020, the equipment was accepted and handed over to operation.
The acceptance was carried out by a committee including representatives of the client, contractors, subcontractor and the user. The acceptance committee considered the scope of construction works on the facility to be completed without defects and carried out in accordance with the design. The equipment was checked for correct operation, and were handed over for use.
The Investigation Team believes that partial acceptance of stage 27 of Temporary Regulation no. 12/2018 was carried out in an insufficiently thorough manner. In particular, the conformity of the project documentation with the actual condition of the signalling equipment at Gogolin station was not adequately inspected, as documented by:

- The lack of interdependence of the switch of turnout no. 42 on the mechanical and electrical path in the train route from $^{2}_{6}$ from Górażdże to track 6 and in the route for entrances to track 4 of points 39ab and 39cd, which allowed to communicate the enabling signal on the home signal $Z^{1/2}$.
- The lack of the "active key control board" at the signal box Gg2 at Gogolin station for switch locks built on non-independent switches on the routes.
- Placing the active keys for the switch locks built into switches 39ab and 42 in the "spare key cabinet," which was positioned in an area not visible to the operating personnel, resulting in improper ergonomics of the point operator's workstation.
- The installation of the pin locks put in place for the duration of the works allowed them to be operated freely, as specified by the designer of the signalling equipment (unsealed keys, accessible to the contractor of the works, placed on the key board in an unsealed manner with a recommendation of accessibility to the contractor, without designing the active key board as a component of the train path).
- Discrepancy between the facts and the documentation for phase no. 27 of the Regulations on Temporary Traffic Management during works on railroad tracks – the locking sheet and schematic plan for this phase required the dependency of turnout no. 42 on the key road, while factually there was no dependency of it for the route from $^{2}_{4,}$ from$^{2}_{6}$, which was not disclosed during the acceptance of this phase of works and the plot no. 9 of the Technical Regulations of the Station during phase 27 of the Regulations on Temporary Traffic Management during works on railroad tracks with the facts.
- Discrepancy between the facts and the documentation for phase no. 27 of the Regulations on Temporary Traffic Management during works on railroad tracks – the locking sheet and schematic plan for this phase required the dependency of turnout no. 42 on the key road, while factually there was no dependency of it for the route from $^{2}_{4,}$ from$^{2}_{6}$, which was not disclosed during the acceptance of this phase of works and the plot no. 9 of the Technical Regulations of the Station during phase 27 of the Regulations on Temporary Traffic Management during works on railroad tracks with the facts.

The components listed above are assessed by the Investigation Team as factors which had contributed to the incident.

Railway carrier PKP Cargo S.A.
The carrier selected a railway vehicle for the transport task, holding a permission to operate of a type of railway vehicle and a certificate of technical fitness of the vehicle. The train driver operating the train had all the qualifications and qualifications required by law. The train operated in accordance with the schedule.

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

In accordance with the collected investigation material, the Investigation Team did not discover a link between the maintenance operators, maintenance workshops or any other maintenance providers and the investigated event.

1.3. Rolling stock manufacturers or other suppliers of railway products

In accordance with the collected investigation material, the Investigation Team did not find a link between the rolling stock manufacturers or other suppliers of railway products and the incident under investigation.

1.4. The national safety authorities or the European Union Agency for Railways

In accordance with the collected investigation material, the Investigation Team did not find a link between the national safety authority Office of Rail Transport (*Urząd Transportu Kolejowego* – UTK) or the European Union Railway Agency and the incident under investigation.

1.5. Notified bodies, designated bodies or risk assessment bodies

In accordance with the collected investigation material, the Investigation Team did not conclude on the relationship between the notified and designated risk assessment bodies and the investigated event.

1.6. Certification bodies of entities in charge of maintenance listed in item 1.2

In accordance with the collected investigation material, the Investigation Team did not discover a link between the certification bodies of the entities responsible for maintenance and the investigated event.

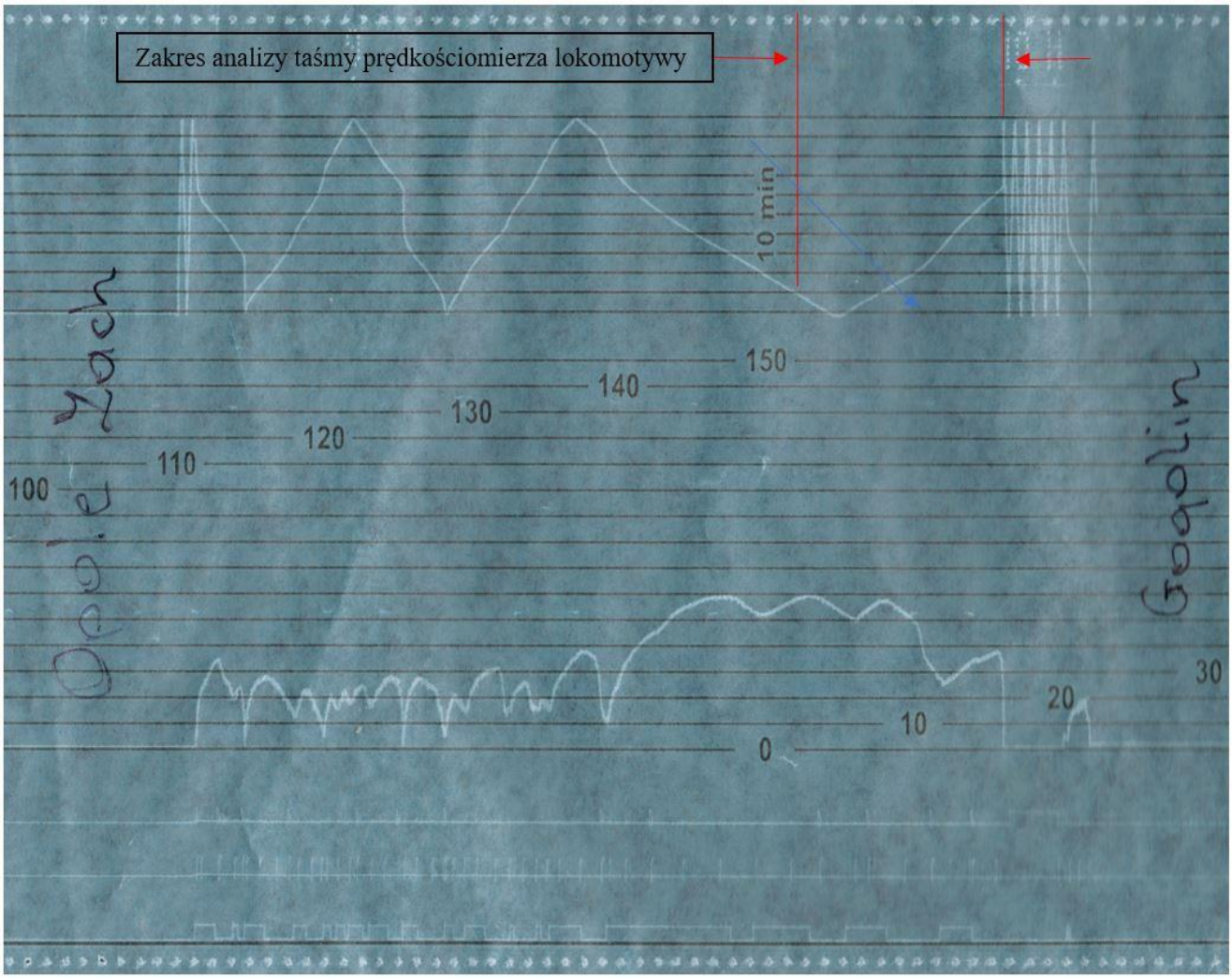
1.7. Any other person or entity involved in the incident, as may be documented in one of the relevant safety management systems, or as referred to in the register or relevant legal framework

Not applicable.

2. Rolling stock and technical installations

Rolling stock.
The ET22-932 electric locomotive is equipped by the manufacturer with a HASLER Rt9-type electromechanical driving recorder no. M 04.072 with a measuring range of 150 km/h. During the P4 level inspection (carried out in November of 2019), the locomotive was not equipped with a foreground image recording system, in violation of the order issued by the President of the Office of Rail Transport no. DBK-550/R03/KB/12 of 30.05.2012 addressed to railway carriers.
The Investigation Team analysed the driving parameters recorded on the speedometer to study the driving characteristics of the train immediately before and after the incident. The driving parameters of the train between 09:30 and 09:40 on the route between Górażdże – Gogolin are shown in the graph below with a description.

Figure 4 – Diagram of the ET22-932 locomotive running parameters



The diagram above presents the following driving parameters:

- speed,
- time,
- route,
- current / current-free driving,
- recording of the use of the SHP/CA vigilance device button,
- brake cylinder pressure,
- active cabin (A or B).

Speedometer tape recordings recorded while the driver was working between 09:29 and 09:40 were analysed:

- 09:29 driving from "B" cab at approximately 60 km/h, no recording of increase in pressure in locomotive brake cylinders, recording of driving with the drive off, recording of use of SHP and CA vigilance button;
- 09:29 – 09:30 speed drop to approximately 52 km/h, no recording of increase in pressure in locomotive brake cylinders, recording of travel with the drive off;
- 09:30 – 09:31 increase in speed to approximately 57 km/h, recording of running with the drive engaged, no recording of increase in pressure in locomotive brake cylinders, recording of use of SHP and CA vigilance button, recording of passing over track SHP solenoid from "B" cab;
- 09:31 – 09:32 speed reduction to approximately 26 km/h, recording of travel with the drive off, no recording of increase in pressure in locomotive brake cylinders, recording of the use of SHP and CA vigilance button, recording of passing over track SHP solenoid from "B" cab;

- 09:32 – 09:34 speed increase to approximately 30 km/h, recording of driving with the drive engaged, no recording of increase in pressure in the locomotive brake cylinders, recording of the use of SHP and CA vigilance button, distance travelled from 09:29, approximately 3,400 metres;
- 09:34 – 09:36 speed increase to approximately 37 km/h, no recording of increase in pressure in locomotive brake cylinders, recording of travel with drive off, recording of use of SHP and CA vigilance button, 09:34 recording of passing over track SHP solenoid from "B" cab;
- 09:36 – 09:36'30 sudden drop in speed to zero, no recording of increase in pressure in locomotive brake cylinders, recording of drive off, recording of use of SHP and CA vigilance buttons, distance travelled approximately 400 metres;
- 09:36'30 – 09:40 locomotive stops at Gogolin station.

The distance travelled during the recorded time, approximately 3,800 m.

Technical installations – control and command and signalling equipment.
On the day of the incident, works were carried out on Gogolin station in connection with the task: "Works on the E30 railway line on the section Kędzierzyn Koźle – Opole Zachodnie in the scope of railway line no. 136 from -0.206 km to 37.511 km and line no. 132 from 94.281 km to 97.210 km" in accordance with the agreement no. 90/106/088/17/Z/I of 21.09.2017.
The control and command and signalling equipment was rebuilt in accordance with the detailed design for phase 27 of Temporary Regulation no. 12/2018 regarding the execution of works, as laid down in § 3 of the Temporary Regulation no. 12/2018 of the operation of train traffic during the execution of works on the premises of PKP PLK S.A. Zakład Linii Kolejowych [Railway Facility] in Opole.
In accordance with the detailed design for the completion of stage 27 of the Temporary Regulation no. 12/2018, the switch of turnout no. 42 must be dependent in the train route from $^{2}_{6}$ "from Górażdże to track 6" and closed with a pin lock in the default position (directing to track no. 6).

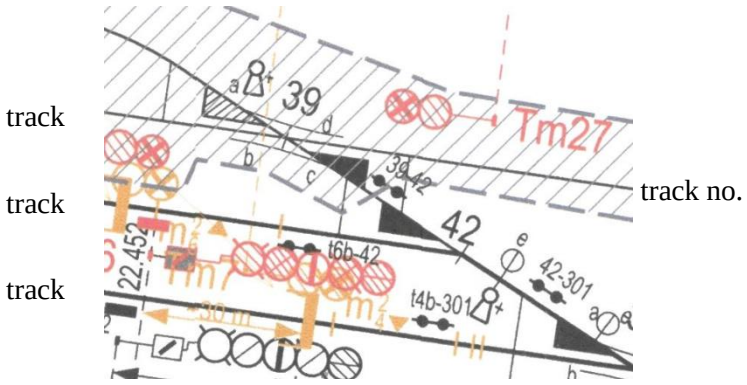


Figure 5 – A section of the schematic plan of Gogolin station

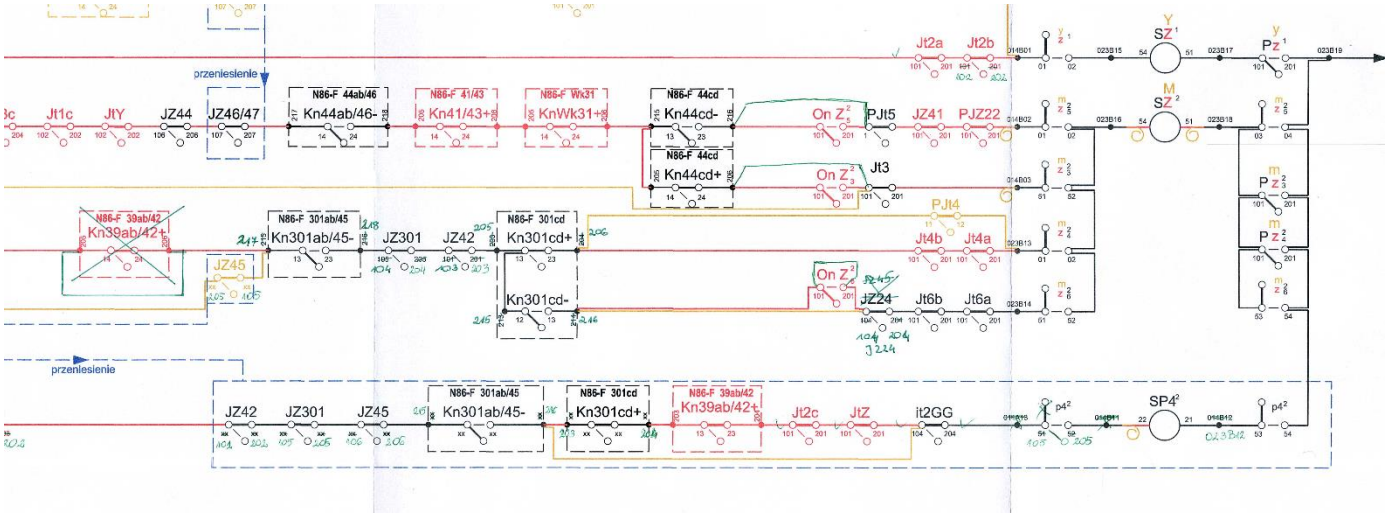


Figure 6 – A fragment of the signal relay circuit of main signal Z

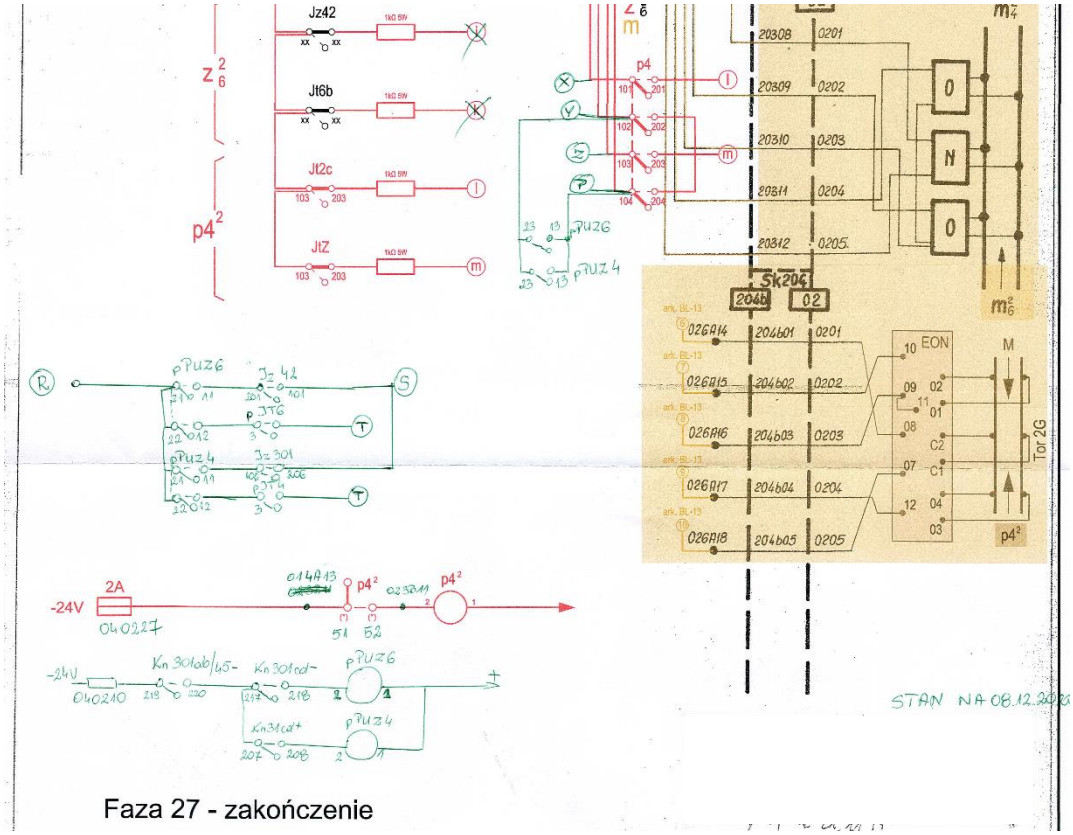


Figure 7 — A fragment of Pu block release circuits and valve over the end block

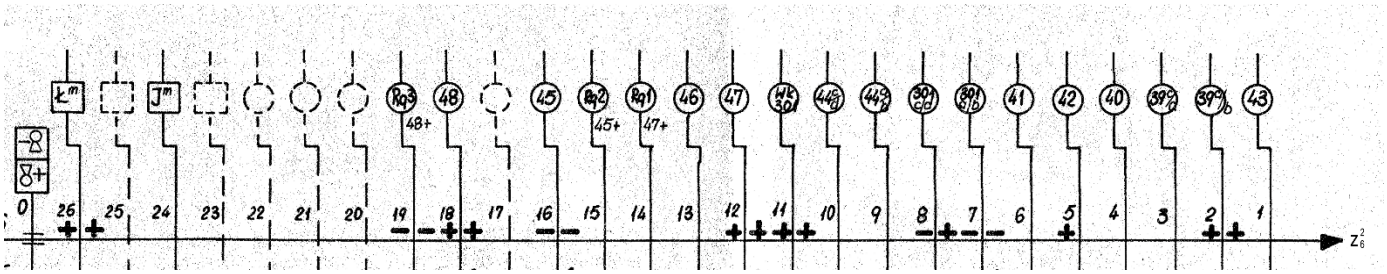


Figure 8 – A fragment of a sketch of the Gg2 signal box sliders

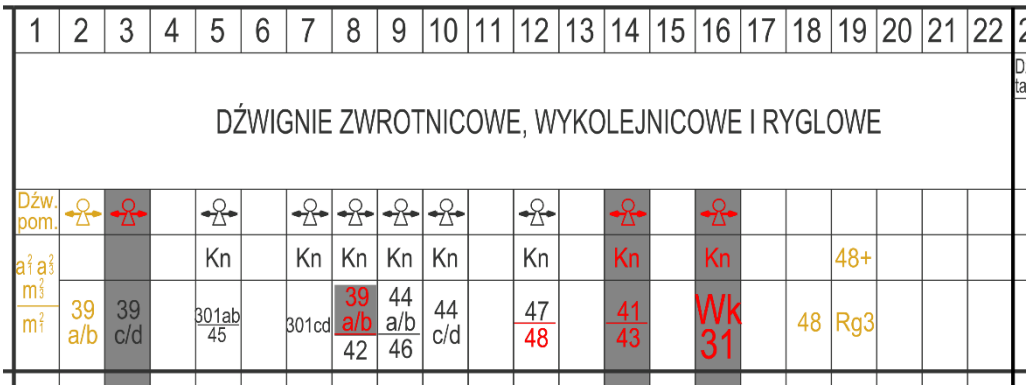


Figure 9 – An extract from the locking sheet of signal box Gg2

During the course of the investigation, the Investigation Team identified the following anomalies in relation to the design and construction of the reconstruction of the traffic control equipment for stage 27 of Temporary Regulation No. 12/2018:

- In accordance with to the designed locking sheet for the routes from $^{2}_{4}$ and from $^{2}_{6}$ in the combiner (on the mechanical route), plus dependency caps should be installed on the sliders, which was not taken into account in the build-up during the implementation of stage 27.
- electromagnetic locks were built in on the Gg2 signal box instead of switch levers, which were not provided for in the "draft sliders" (sheet no. 7 of the documentation for the completion of stage 27).
- The as-built documentation in the signal relay circuits and the Pu block release circuits for the routes from $^{2}_{4}$ and from $^{2}_{6}$ crossover relation no. 42 has been plotted.
- The changes made to the execution documentation were not approved by the designer.
- The commencement of the installation and assembly of the control and command and signalling equipment for stage 27 in accordance with the to the dependency table, which provided for the dependency of the coupling of turnouts no. 39ab and 42 despite the lack of designed setting and control circuits of the above-mentioned switch drives – locking sheet drafted on 09.11.2020 and remained in force after the completion of stage 27, while the setting and control circuits of turnout no. 42 were designed on 17.02.2021 (after the event), while at the same time the switch no. 42 with coupling 39ab was not included, despite it being planned in the design of the signal box (electromagnetic lock 39ab/42). This design was carried out as a supplementary design, and it did not take into account the cooperation of these switches (signalling and control circuit terminated at switch 42 – sheet numbers N111 and N111a).
- A key control board for active keys has not been designed in the detailed design of the control and command and signalling equipment with sockets for the keys, a device controlling the lists of these keys – for all switches and derailleurs entering the individual runways and not having dependencies in the routes.
- The diagram of the control and command and signalling equipment does not show any drawing with the status of the equipment or the arrangement of the signalling equipment control elements on the signal boxes in signal boxes Gg and Gg2.

- Discrepancy between the diagram of the station and the actual status in the area – track 10 is not present in the area.

3. Human factors

3.1. Human and individual characteristics

The investigation, including the interviews revealed the following individual human factors of service personnel:
- the lack of theoretical as well as practical knowledge on the proper behaviour while the restrictions are in force and carrying out works related to the "Regulations on Temporary Traffic Management during works on railroad tracks" despite the training received in accordance with the SMS.
– issuing and carrying out orders in violation of the rules
– the lack of ability to assess the reasonableness of the implementation of instructions received in the position occupied in relation to train operations and shunting.

The Investigation Team did not identify the influence of health or fatigue of the operator's and infrastructure manager's personnel on the causes of the incident.

3.2. Factors related to the work position

In the opinion of the Investigation Team, the working and ergonomic conditions of the on-call and point operator's workstation outlined below had contributed to the occurrence of the incident:
- The lack of active key boards on the Gg and Gg2 signal boxes at Gogolin station for switch locks built on non-independent switches in runs.
- Inappropriate ergonomics of the workstation of the train dispatcher and the point operator, consisting of placing the active keys for the temporary locks fitted in the switches on the spare key board in a place that is not visible to the operating personnel (also the hangers adapted to the key register were not placed on the board).

Factors related to the train driver's position were typical. Electric locomotive ET22-932 has the appropriate type approval for the operation on the PKP PLK S.A. network. Train crew working time is in accordance with the applicable standards.

3.3. Organisational factors and tasks

The material collected by the Investigation Team shows that the employer did not ensure the proper organisation of the work of the Gogolin station posts due to, among others:
– The lack of unified text of Temporary regulation no. 12/2018 of train traffic management during works on the territory of PKP PLK S.A. Zakład Linii Kolejowych [Railway Facility] in Opole.
- Failure to provide traffic stations with up-to-date dependency tables and schematic plan.
- The installation of bolt locks put in place for the duration of the works to allow free operation, as specified by the designer of the signalling equipment (unsealed keys, accessible to the contractor of the works placed on the key board in an unsealed manner with the recommendation of accessibility to the contractor, with no design of the active key board as a component of the runway).

The material collected by the Investigation Team shows that the train driver involved in the incident had the statutory rest period. The carrier PKP Cargo S.A., in accordance with the adopted Safety Management System, and within the framework of competence management in positions directly related to railway

traffic management and safety, as well as the driver and the driver of railway vehicles, has ensured cyclical training for its employees.

The personnel involved in the incident held all the authorisations and licences required by the legal regulations and instructions in relation to the undertaken activities. These employees were provided with the necessary instructions and regulations.

The Railway Commission, following an inspection report of the railway incident site, made recommendations requiring immediate action:

1. The Contractor shall immediately provide current documentation relating to the works carried out for Gogolin station in accordance with the applicable phases.
2. ISE Opole Główne shall provide the traffic stations with the up-to-date documentation provided by the contractor, and must check it for compliance for all the routes at the traffic stations in Gogolin station.

The contractor provided the aforementioned documentation for Gogolin stations. The supplied schematics of the stations – the schematic plan of the signalling equipment and the schematic plan of the Gogolin RTS station are incompatible, despite the fact they refer to the completion of the same phase of the works. Presented below is a selected excerpt from the documentation supplied to the traffic stations.

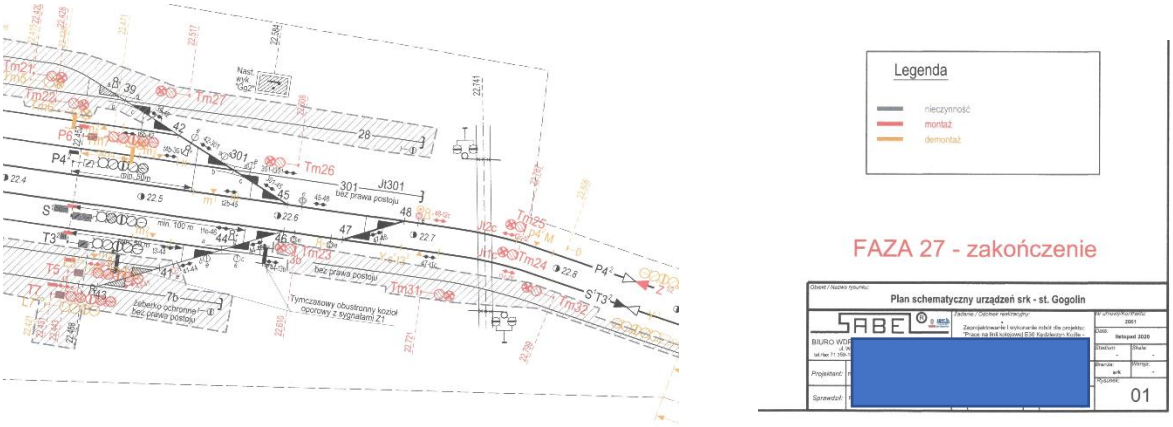


Figure 10 – Excerpt of a schematic plan of the signalling equipment

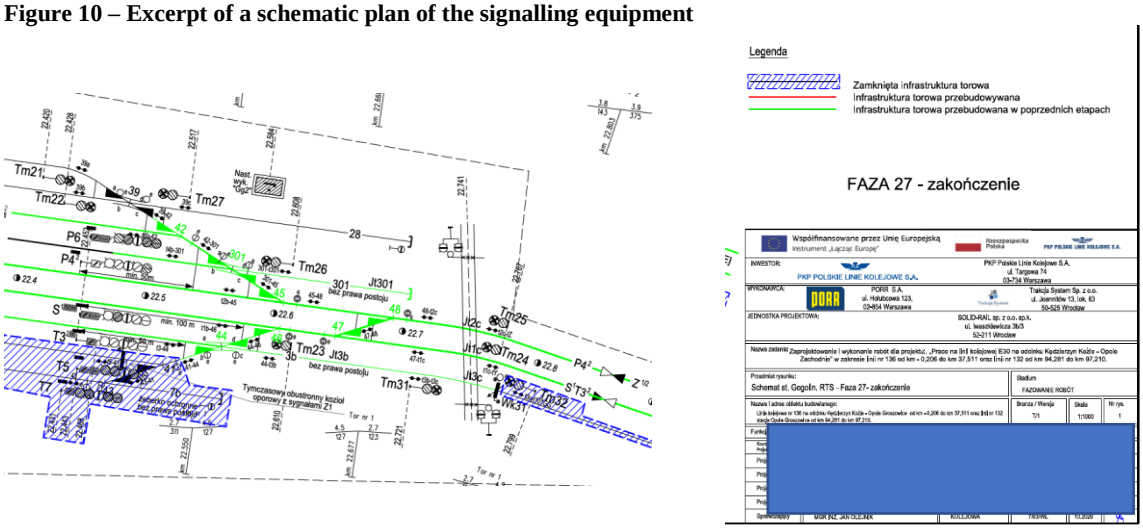


Figure 11 – Excerpt of a schematic diagram of Gogolin station

3.4. Environmental factors

The incident occurred during daylight hours with good air clarity, the terrain provided good visibility. Environmental factors did not contribute to the occurrence of the incident.

3.5. Any other factors relevant to the proceedings

None found.

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

The Investigation Team did not identify systemic factors influencing the incident.
Feedback mechanisms, control mechanisms across the railway system actively influencing the occurrence of similar events have not been identified.

5. Previous incidents of a similar nature

As part of the investigation carried out, the Investigation Team analysed a selection of events occurring between 2018 and 2020. A short description of the selected incidents, their effects and their causes are presented below:

- 30.06.2018, 9:00 a.m., Kostrzyn Wielkopolski station, railway line no. 3, 282.200 km, track no. 3, PKP PLK S.A. Zakład Linii Kolejowych [*Railway Facility*] in Poznań.
  The entry of train no. 771008 Odebruecke – Września with locomotive 3E-007 (DB Cargo Rail Polska S. A.) from line track no. 2 onto station track no. 1 without overhead line at Kostrzyn Wlkp station. Damage to the second pantograph.
  Direct cause: the electrically driven train entered a track without an overhead line.
  Root cause: inadequate organisation of train traffic during the works carried out at the traffic station.
  Indirect cause: none.
  Systemic cause: none.

- On 30 July 2019, at 16:53, Przewozy Regionalne Sp. z o. o. train APM 88247 travelling on the route Szczecinek – Szczecin Główny departed from Złocieniec station pursuant to written order "S" from the station track no. 2, which does not have an exit semaphore, towards Jankowo Pomorskie station. The point operator incorrectly prepared the route of the train; he arranged the route for track no. 2 instead of track no. 1. The train APM 88247 entered track no. 2 instead of track no. 1 at the Złocieniec – Jankowo Pomorskie route in the opposite direction to the main one. Train ZXS 889252 ZRK - DOM Sp. z o. o. in Poznań on the route Szczecin Dąbie – Złocieniec departed on the same railroad track at 17:02 on the basis of written order "S". The trains continued to ride along the same track in opposite directions until 17:07. At the same time, "Radiostop" was used by the train driver of train APM 88247 and the heads of the trains stopped approximately 600 metres from each other.
- Direct cause: departure of train APM 88247 from Złocienec station on track no. 2 instead of track no. 1 on the Zlocieniec – Jankowo Pomorskie line.
  Root cause: the point operator prepared the signal box "Zł1" of the route for the exit of the train APM 88247 from track no. 2 of Złocieniec station which does not have an exit semaphore to track no. 2 instead of track no. 1 on Złocieniec – Jankowo Pomorskie route.
  Indirect causes:
  1. The train dispatcher and the point operator at the Złocieniec station failed to comply with the binding rules for ordering and reporting the preparation of the route in case of train journey by phone without communicating the enabling signal on the semaphore (§ 39 section 7 item 2(b) of the Instruction Ir-1).
  2. Train APM 88247 was dispatched by train dispatcher at Zlocieniec station on the basis of written order "S" without prior ascertainment of correct route prepared by point operator of Zł1 station (§ 41 section 1 of the Ir-1 Instruction).

3. Failure to check the alignment of the route and failure to report the execution of the order to prepare the route for the departure of train APM 88247 by the point operator of Zł1 station, i.e., failure to report "position of switches and derails and the manner of securing them" (§ 41 section 6 item 1 of the Ir-1 Instruction).
4. The point operator of Zł1 station failed to observe the APM 88247 train leaving Złocieniec station outside its control area (§ 45 section 1 of the Instruction Ir-1).
5. Train APM 88247 was running in violation of the received permission (written order "S") and the train was not stopped by the train driver after departure from Złocieniec station, while continuing to run on track no. 2 – left, opposite to the main track despite receiving a written order "S" at Zlocieniec station, and failure to take action aimed at clarifying the situation after passing the last turnout along the path (§ 64 section 2 item 1) of the Instruction Ir-1).
6. The train dispatcher at Jankowo Pomorskie station downplayed the information received from the driver of train APM 88247 regarding the presence of the train on the track no. 2 Złocieniec – Jankowo Pomorskie.
7. The train dispatcher at Jankowo Pomorskie station ignored the indications on the "*buttons and repeaters box*" regarding the fact that track no. 2 was occupied and the track no. 1 was unoccupied in spite of the blocking being set on the track no. 1 from the station Złocieniec to the station Jankowo Pomorskie for this train.
8. The ZXS 889252 train was permitted to depart pursuant to the written order "S" by the station master of Jankowo Pomorskie station on track no. 2, without making sure that the track is unoccupied, in spite of the set direction of blockade on track no. 2 towards Złocieniec (§ 22 section 7 item 1) point d) of Ir-1 Instruction).

Systemic cause: inconsistency in the Ir-1 Instruction in the scope of:

§ 64 section 21 imposes obligations on the train manager with regard to the safe running of the train,

§ 58 section 21 does not specify how the content of the written orders should be communicated by train radio to the train manager.

- On 20.09.2020 at 22:08, Opole Groszowice station, railway line no. 132, 95.210 km, track no. 3, PKP PLK S.A. Zakład Linii Kolejowych [Railway Facility] in Opole
  At the entry of train no. 84102 on the permitting signal at main signal J12T and main signal B, with the i12T and b1 route lever moved and blocked by the restraining cross-carriage block, turnout no. 8 broke up, further journey towards track no. 101, and later stopped behind the exit main signal displaying the "Stop" signal.
  Direct cause: - running of a train on a hard surfaced road through a "proceed" permission signal on a main signal, at the erroneous position of turnout 14 on the route J1²r/B;
  Root cause: - the designer's failure to include in the documentation (locking sheet) for phase 29 of the works in progress, the dependency of turnout no. 14 on the route J1²r/B;
  Indirect cause: simultaneous preparation of the train path for two conflicting paths due to a design error – setting the signal on the semaphore at the wrongly set path.

V. CONCLUSIONS

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

The Investigation Team discovered:
- Train no. 844000 of the route Szczecin Port Centralny – Chałupki of the carrier PKP Cargo S.A. entered Gogolin station on the permissive signal on semaphore $Z^{1/2}$ on the fixed route, carrying out the route from $^{2}_{6}$. This train was moving along an incorrectly set route. The incorrectly set switch of turnout no. 42 (not dependent in the run) was set towards the direction of turnout no. 39ab, and then towards the non-electrified side track no. 8, instead of towards main auxiliary track no. 6.
- Issuing of an order by the point operator on duty to hand over the keys of the locks of points 39ab and 42 to the personnel of the motor power trolley who were not authorised to set the route for train no. 669234.
- The permission signal at the home signal $Z^{1/2}$ was possible due to the failure of the dependency circuits on the electrical path.
- On the day of the incident, train traffic at Gogolin station was being operated under the Temporary Regulations for the reconstruction of control and command and signalling equipment at the station. The reconstruction was at the stage of the completed phase 27 of Temporary Regulation No. 12/2018. Internal acceptance of the control and command and signalling equipment as part of the completion of phase 27 of Temporary Regulation no. 12/2018 for the operation of train traffic during the execution of the works (hereinafter Temporary Regulation no. 12/2018) were carried out in November and December 2020 and the equipment, in accordance with reports no.: 02/11/SRK/OP/2020 of 20.11.2020 and 01/12/SRK/OP/2020 of 01-02.12.2020, the equipment was accepted and handed over to operation.
The acceptance was carried out by a committee including representatives of the client, contractors, subcontractor and the user. The acceptance committee considered the scope of construction works on the facility to be completed without defects and carried out in accordance with the design. The equipment was checked for correct operation, and were handed over for use.
- The acceptance of phase 27 of Temporary Regulation No. 12/2018 was not carried out in a sufficiently thorough manner, in particular, there was no proper check of the conformity of the project documentation with the actual state of the signalling equipment at Gogolin station.

The Investigation Team concluded that contributing factors to the incident included:

- The lack of the "active key control board" at the signal box Gg2 at Gogolin station for switch locks built on non-independent switches on the routes.
- Placing the active keys for the switch locks built into switches 39ab and 42 in the "spare key cabinet," which was positioned in an area not visible to the operating personnel, resulting in improper ergonomics of the point operator's workstation.
- The installation of the pin locks put in place for the duration of the works allowed them to be operated freely, as specified by the designer of the signalling equipment (unsealed keys, accessible to the contractor of the works, placed on the key board in an unsealed manner with a recommendation of accessibility to the contractor, without designing the active key board as a component of the train path).
- The lock of up-to-date documentation of the signalling equipment (schematic plans and locking sheet) at the command box on the day of the incident.
- Discrepancy between the facts and the documentation for phase no. 27 of the Regulations on Temporary Traffic Management during works on railroad tracks – the locking sheet and schematic plan for this phase required the dependency of turnout no. 42 on the key road, while factually there was no dependency of it for the route from $^{2}_{4,}$ from $^{2}_{6}$, which was not disclosed during the acceptance of this phase of works and the plot no. 9 of the Technical Regulations of the Station during phase 27 of the Regulations on Temporary Traffic Management during works on railroad tracks with the facts.

- Inappropriate implementation of the contractual provisions for the author's supervision consisting in, inter alia, in the designer updating the design of the built facility after it is put into use.

2. Measures taken since the incident

After the incident, the following actions were taken by the infrastructure manager at the request of PKBWK (interim recommendation):
- making a board with active keys on the Gg2 dependent box at the Gogolin station and placing it in a place visible to the operating personnel,
- Preparation of the consolidated text of the Regulations on Temporary Traffic Management during works on railroad tracks no. 12/2018 on the premises of PKP PLK S.A. Zakład Linii Kolejowych [Railway Facility] in Opole.

The Railway Commission, following an inspection report of the railway incident site, made recommendations requiring immediate action:
1. The Contractor shall immediately provide current documentation relating to the works carried out for Gogolin station in accordance with the applicable phases.
2. ISE Opole Główne shall provide the traffic stations with the up-to-date documentation provided by the contractor, and must check it for compliance for all the routes at the traffic stations in Gogolin station.

The contractor provided the aforementioned documentation to the Gogolin station. The Investigation Team discovered that the provided station diagrams – the schematic plan of the signalling equipment and the schematic plan of the Gogolin RTS station are incompatible, even though they refer to the completion of the same phase of the works.

3. Additional remarks

The Investigation Team identified other irregularities as well:
- the lack of consolidated text of the Temporary Regulation no. 12/2018 at Gogolin station,
- the lack of a system for image recording of the forefield of electric locomotive ET22-932 of carrier PKP Cargo S.A.,
- no compliance between the diagram of the station with the actual situation in the field – track no. 10 is missing in the field.

VI. SAFETY RECOMMENDATIONS

Temporary recommendation:

Pursuant to Article 281 section 1a of the Act of 28 March 2003 on Railway Transport (i.e., Journal of Laws of 2020, item 1043, as amended). The Chairman of the Commission issued an interim recommendation for the Railway Department in Opole to implement the following measures aiming to improve safety in rail transport with respect to Gogolin station:

- making a board with active keys on the Gg2 dependent box at the Gogolin station and placing it in a place visible to the operating personnel,
- Preparation of the consolidated text of the Regulations on Temporary Traffic Management during works on railroad tracks no. 12/2018 on the premises of PKP PLK S.A. Zakład Linii Kolejowych [Railway Facility] in Opole.

Recommendations arising from the performance of the conducted procedure:

1) The railway infrastructure manager PKP PLK S.A. shall take measures intended to:
   a. increase the supervision of the Investment Performance Centre of the construction work contractors as part of ongoing investments.
   b. improve the quality and depth of technical acceptance of individual stages of works in terms of inspecting the conformity of the design documentation with the condition on the ground.
   c. the scope of the trainings for the personnel of the stations must include issues related to the operation of trains in the station and adjacent routes during restrictions, telephonic announcement of trains on the routes, telephonic recommendation and notification of the preparation of routes in the station.
2) Railway infrastructure manager PKP PLK S.A., within the framework of supervision over the executed investments shall extend the scope of inspection regarding the compliance of executed phases with the documentation, in particular during changes between successive transitional phases of investment works related to railway traffic operation and safety.
3) After completion of each stage of an investment project containing phases, new temporary train traffic regulations should be drawn up during execution of works on the premises of PKP PLK S.A. Zakład Linii Kolejowych, which will constitute a continuation of the specific investment task.

State Commission on Railway Accident Investigation
Chairman

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Tadeusz Ryś

List of entities appearing in the contents of Report No. PKBWK 06/2022

No.	Symbol (abbreviation)	Explanations
1	*2*	*3*
1.	EUAR	European Union Agency for Railways
2.	MIAA	Ministry of the Interior and Administration.
3.	ORT	Office of Rail Transportation
4.	PKBWK	State Commission on Railway Accident Investigation
5.	Managing Authority	PKP PLK S.A. – Zakład Linii Kolejowych
6.	IZDD	PKP PLK S.A. – Facility Dispatcher
7	CT	PKP CARGO S.A. The Company's Management Board
8.	ISE Opole	PKP PLK S.A. – Exploitation Section in Opole