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

REPORT No. PKBWK 03/2022

from the investigation of a railway accident which occurred on 30.04.2020 at 11:50 on the route: Swidnica Kraszowice – Jedlina Zdrój at km track no. 1 of railway line no. 285 Wrocław Główny – Swidnica Przedmieście

area of infrastructure manager PKP PLK S.A. Railway Tracks Facility in Walbrzych

WARSAW, 26 April 2022

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

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

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I. SUMMARY

Event type: Accident.

Description: During the reconstruction of the railway track on the route Świdnica Kraszowice – Jedlina Zdrój at the railway line no. 285, a PRSM-4 no. 47 type rail welding machine together with coupled technical-economic wagon no. 000071 (Dolnośląskie Przedsiębiorstwo Napraw Infrastruktury Komunikacyjnej "Dołkom" sp. z o.o. "Dolkom Wrocław" Sp. z o.o.) positioned on the side of the track have repositioned and collided with a rail-road vehicle type ATLAS 1604 ZW, factory no. 168Z301813 which was standing on the same track. The collision resulted in the two-way vehicle being pushed over the distance of 60 m.

Date of event: 30.04.2020 at 11:50.

Location of the event: Single-track railway line no. 285 Wrocław Główny – Świdnica Przedmieście route Świdnica Kraszowice – Jedlina Zdrój track no. 1, km 60,885.

Consequences of the event: As a result of this incident, the operator of the rail-road vehicle, who was an employee of DROMOSTTOR s.c. *(terminology in accordance with the time of the accident)* was seriously injured. In addition, the accident caused the destruction of a technical and maintenance wagon, and damage to a rail welder and a rail-road vehicle.

Causal relationship: The dislocation of the train set, i.e., a technical and maintenance wagon with a rail welding machine and collision with an ATLAS rail-road vehicle on the same track.

Contributing factors:

1. Failure to carry out a detailed brake test before starting to operate a train set of railway vehicles – a technical and maintenance wagon and a welder (in accordance with § 18, section 2 of Instruction Ir-1).
2. Uncontrolled overdrive of the brake system main line due to a defective pressure relief valve.
3. Leakage of the safety valve accelerating the drop of air pressure from the brake system main reservoir (2.5 kG/cm^2 in 5 minutes against an allowable 1 kG/cm^2 for 5 minutes).
4. Positioning the technical and maintenance wagon without a combined brake on the downhill side of the railway line.
5. The lack of an operator in the cab of the welding machine during operation on a significant incline of approximately 11‰ of the track (in violation of item 2.2.38. of the Operation and Maintenance Manual – OMM). The lack of reaction to stop a runaway train set and the operation on the route with incomplete personnel (in violation of 2.11.1. of the OMM).
6. The lack of coordination of works carried out at the same time and on the same track by the persons supervising the construction works and industry-specific works.
7. Failure to notify the economic operator on 30.04.20 that the subcontractor started works in the area where the accident occurred.
8. Lack of supervision over the discipline of the welding machine operators by the immediate supervisor.
9. The lack of team of workers to prepare the rails for joining by welding.
10. Failure of the contractor's and the subcontractor's teams to establish radio communications to provide each other with information regarding the

commencement of work on the same track at other locations and their progress in spite of having radio communications equipment available.

Systemic factors: None.

Recommendations and their recipients:

1. Dispatchers of special vehicles shall implement the Recommendation No. 4 contained in the Report PKBWK/03/2020 related to fitting the special vehicles with an on-board driving parameters recorder, and shall take additional measures aiming to retrofit these vehicles with the recorders of the foreground of the driving and working area.
2. The authorised infrastructure managers shall develop the rules for carrying out works on the slope of the railway track using self-propelled special vehicles combined with other, non-propelled railway vehicles, which are going to be mandatory for economic operators performing renovation and maintenance works, including the obligation to ensure supervision mechanisms over the application of this procedure.
3. Undertakings carrying out repair and maintenance works on railway infrastructure, organised on a long-term basis in a manner preventing direct contact with workers, shall implement a supervision system for maintaining discipline at work and compliance with regulations and instructions, and in particular for traffic management, the performance of work and the psycho-physical state of workers.
4. Infrastructure managers:

a. who do not have appropriate regulations for the operation of machinery and equipment running concurrently in different locations on the same track must develop provisions concerning mutual communication in these work situations, and must implement them,

b. those who have implemented the aforementioned provisions shall carry out a training reminding of the rules in place.

5. The authorised infrastructure managers, when drawing up the specifications for procurements in relation to planned investment/modernisation works shall take follow the recommendations issued concerning

a. equipping track-mounted mobile rail welding machines with recorders of data on travel parameters, and working video recorders of the foreground of driving and work area,

b. equipping workers with radio communication equipment.

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Photograph 1 – View of the area of the incident (Police footage)

Photograph 2 – View of the area and consequences of the incident (Police footage)

Photograph 3 – View of the area and consequences of the incident (Police footage)

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II. THE PROCEEDINGS AND THEIR CONTEXT

1. The decision to initiate the proceedings

At the request of the Public Prosecutor of the District Prosecutor's Office in Świdnica, the Chairman of the State Commission on Railway Accident Investigation Tadeusz Ryś issued a decision No. PKBWK.4631.6.2021 of 14 July 2021 to undertake proceedings in the case of an accident occurring during repair works carried out on railway line No. 285. Considering the above fact and the provisions of Article 28e section 4 of the Railway Transport Act (Journal of Laws of 2020, item 1043, as amended), hereinafter referred to as the "Railway Transport Act," on 16 July 2021 the event was reported to the European Union Railway Agency and was registered in its database under the number PL-10093.

2. The basis for the decision to open proceedings

On the basis of the analysis of the circumstances of this incident, considering the nature of the incident and the lack of participation of the representative of the company DROMOSTTOR s.c., whose employee was injured, in the works of the railway commission, as well as in order to fully illustrate and specify the circumstances and causes of this accident, the President of SCRAI decided to initiate proceedings of the Commission's Investigation Team.

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

The investigation to determine the causes of the incident was conducted under Article 28e section 2a of the Railway Transport Act, which, in accordance with the provision of Article 28f section 3, does not determine fault or liability.
Throughout the course of the proceedings, constraints occurred that adversely affected the course and conclusion of the proceedings, caused by:
- submission of an application for the initiation of proceedings only after a period of fifteen months after the date of the occurrence of the event,
- the need to complete the documentation in stages from the investor, the infrastructure manager and the contractor and subcontractor for the works,
- delay in carrying out the experiment with the participation of the rail welding machine type PRSM-4 No. 47 at the site of the incident due to the technical possibility of its use, which was caused by the lack of an up-to-date technical examination carried out by the OTI (Office of Technical Inspection).

The report was drawn up at the headquarters of the State Commission on Railway Accident Investigation, hereinafter referred to as "SCRAI" or the "Commission."

4. Aggregated description of the technical capacity of the functions in the team of persons conducting the proceedings

The Chairperson of the Commission has appointed from among the standing members of the Commission an Investigation Team that meets the technical requirements for the proceedings.

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

Pursuant to Article 28e section 2a of the Railway Transport Act, on 14 July 2021 the Chairman of SCRAI requested the Director of Zakład Linii Kolejowych in Wałbrzych, the President of the Management Board of DOLKOM Sp. z o. o., the Director of Centrum Realizacji Inwestycji Region Śląski in Wrocław, the company DROMOSTTOR s.c. to provide all materials concerning the accident in question.

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

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

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

Throughout the process aiming to clarify the causes and circumstances of the incident, the investigation team has relied on the provisions of national rules, internal rules of the infrastructure manager and railway undertaking, technical documentation, own knowledge, experience and findings.
They used their own documentation as well as documentation collected by the Railway Commission, the Public Prosecution Service and the Police.
As part of the investigation, the Investigation Team carried out, inter alia, the following activities:

- local inspections of the site
- taking photographs and visual inspections of the welding machine in question at the machine base
- the following were subject to analysis:
  - documentation provided by DOLKOM Sp. z o.o., the infrastructure manager, including the Accident Site Inspection Report and the Final Determination Report, and documentation provided by the owner of the ATLAS vehicle, DROMOSTTOR s.c.
  - expert materials commissioned by the Public Prosecutor's Office in Świdnica
  - materials received from the economic operator of the investment task, i.e., PKP PLK S.A. Investment Implementation Centre in Wroclaw
  - design documentation for the reconstructed line
  - the Railway Infrastructure Manager's internal regulations
  - the internal regulations of the contractors DOLKOM sp. z o.o. and DROMOSTTOR s.c. related to the event in question
  - the safety management systems (SMS) of the infrastructure manager and the general contractor
  - the maintenance system documentation (MSD) for the railway vehicle type PRSM-4
  - rules of procedure for the works carried out
- an experiment was carried out at the scene involving the welding machine and the main operator of the welding machine in the presence of the Prosecutor, the Police and interested parties
- employee hearings and interviews were held
- interrogation materials made available by the Police and the Public Prosecutor's Office were used.

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

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National regulations

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

Instructions and internal rules of the general contractor (DOLKOM)

1) DOL-M3 Train Manager Manual.
2) DOL-M1 Train Driver's Manual.
3) DOL-T4 Rolling Stock Auditor's Manual.
4) DOL-Ir8 Manual for Handling Severe Accidents, Accidents and Incidents in Rail Transport.
5) DOL-P Instruction on Professional Preparation, Examination and Training for Railway Posts and Train Drivers.
6) DOL-Ir5 Manual on the use and Maintenance of Train Radio Facilities.
7) DOL-T2 Operating and Maintenance Manual for Railway Vehicle Brakes.
8) DOL-T1 Railway Vehicle Maintenance and Operation Manual.
9) DOL-M5 Trail Familiarisation Manual.
10) DSU PRSM-4.
11) DTR PRSM-4.

PKP PLK S.A. infrastructure manager's internal manuals

1) Ir-1 Rail Traffic Management Manual.
2) Ir-3 Manual on the Preparation of Technical Regulations.
3) Ie-1 Signalling Manual.
4) Ir-8 Manual for Handling Severe Accidents, Accidents and Incidents in Rail Transport.
5) Id-1 (D-1) Technical Conditions for the Maintenance of Surface on Railway Tracks.
6) Id-10 Manual for Defectoscopic Testing of Rails, Welds and Seams in Railway Tracks.
7) Id-112 Technical Conditions for Making and Accepting Welds in New Railway Rails Joined by Stationary Welders, Requirements and Tests.
8) Ibh-105 Safety Rules Applicable on the Area of PKP PLK S.A. During Investment, Maintenance and Repair Works Performed by Employees of External Entities.

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

No difficulties or problems were encountered by the members of the Investigation Team which could have affected the conduct of the proceedings, the timeliness or its conclusions other than those indicated in item II section 3.

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9. Any interaction with the judicial authorities

The President of SCRAI applied to the District Public Prosecutor's Office in Świdnica for the access to the collected documents related to establishing the circumstances and causes of the incident. These documents were provided to the extent specified in the letter in question.
In the course of the proceedings, the Prosecutor took part in a site visit and information was exchanged on an ongoing basis regarding the proceedings.

10. Other information relevant to the proceedings

In the course of the investigation, hearings of employees related to the incident were conducted and the minutes of the hearings of employees made available by the Prosecution were used.
After analysing the minutes of hearings, interviews and interviews, the Investigation Team found that the information provided by the interviewees was mutually exclusive and inconsistent on many issues.
Inconsistencies include the records of work sheets, the number of workers performing welds, the exact location and number of welds performed on the day of the incident, the division of tasks between individual workers, the circumstances under which the machine ran off and the behaviour of workers after the incident, discrepancies regarding mental and physical state and alcohol consumption on the day of the incident.
In addition, the Investigation Team found that a representative of DROMOSTTOR s.c. was not allowed to work in the proceedings conducted by the Railway Commission, despite a written request from this company.

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III. DESCRIPTION OF THE INCIDENT

1. The incident and background information

1.1. Description of the type of event

During track reconstruction of the railway line no. 285 on the route Świdnica Kraszowice – Jedlina Zdrój, the rail welding machine type PRSM-4 no. 47 together with coupled freight-technical wagon no. 000071 (DOLKOM Wrocław Sp. z o.o.) located on the downgrade side of the track rolled down. For this reason, two machines, i.e., rail welding machine type PRSM-4 with a two-axle wagon came into contact. The incident occurred on track 1 of a single-track railway line closed to train traffic. On 30.04.2020 the welding machine operator started work at 08:00, leaving the machine's parking area from the town of Bystrzyca Dolna and travelling to the place where the welding was performed, i.e., approximately 2 km from the parking place.
After completing four welds and driving up to another pair of welds located approximately 120 metres away, the workers found an unprepared welding area consisting of an improperly positioned rail and decided to proceed with its proper alignment. They left the machine and got to work setting up the rail for welding, and later took a break. At the time, they were about 20 m from the machine, which remained on a slope of the track without an operator in the cabin.
While the operators were positioning the rail and preparing it for welding, the pressure in the welder's brake system dropped and the brake pads unlocked. At that time, a rail welding machine type PRSM-4 No. 47 with a technical and economic wagon No. 000071 (DOLKOM Wrocław Sp. z o.o.) rolled over and, after a distance of 3.5 km, it crashed into a road-rail vehicle type ATLAS 1604 ZW 168Z301813 standing on the same track. As a result of the rail welding machine coming together with the wagon, the train of machines moved uncontrollably and crossed three level crossings, then hit a two-way Atlas vehicle standing on this track at km 60.885 and pushed it for a distance of approx. 60 m. The machine was immobilised as a result of the accident. On the Atlas excavator, there was an operator on the outside of the engine housing with the engine compartment hatch raised and trying to locate the fault. As a result of the collision, the operator (an employee of DROMOSTTOR s.c.) was crushed by the flap and seriously injured.

1.2. Date, exact time and place of event

The incident occurred on 30.04.2020 at 11:50 on track no. 1 at km 60.885 of the route Swidnica Kraszowice – Jedlina Zdrój, single-track railway line no. 285 Wrocław Główny – Swidnica Przedmieście, undergoing reconstruction.

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

The incident occurred during the day, with a temperature of 15 °C, no cloud cover or precipitation. Audibility and visibility were good.
On the day of the incident, two vehicles were working simultaneously on the same track, i.e., a rail welder type PRSM-4 with a two-axle wagon and a rail-roader type ATLAS 1604 ZW. The vehicles were located approximately 3.5 km apart. Track on a slope of 11 ‰, with a curve of radius R250 m at the incident site.

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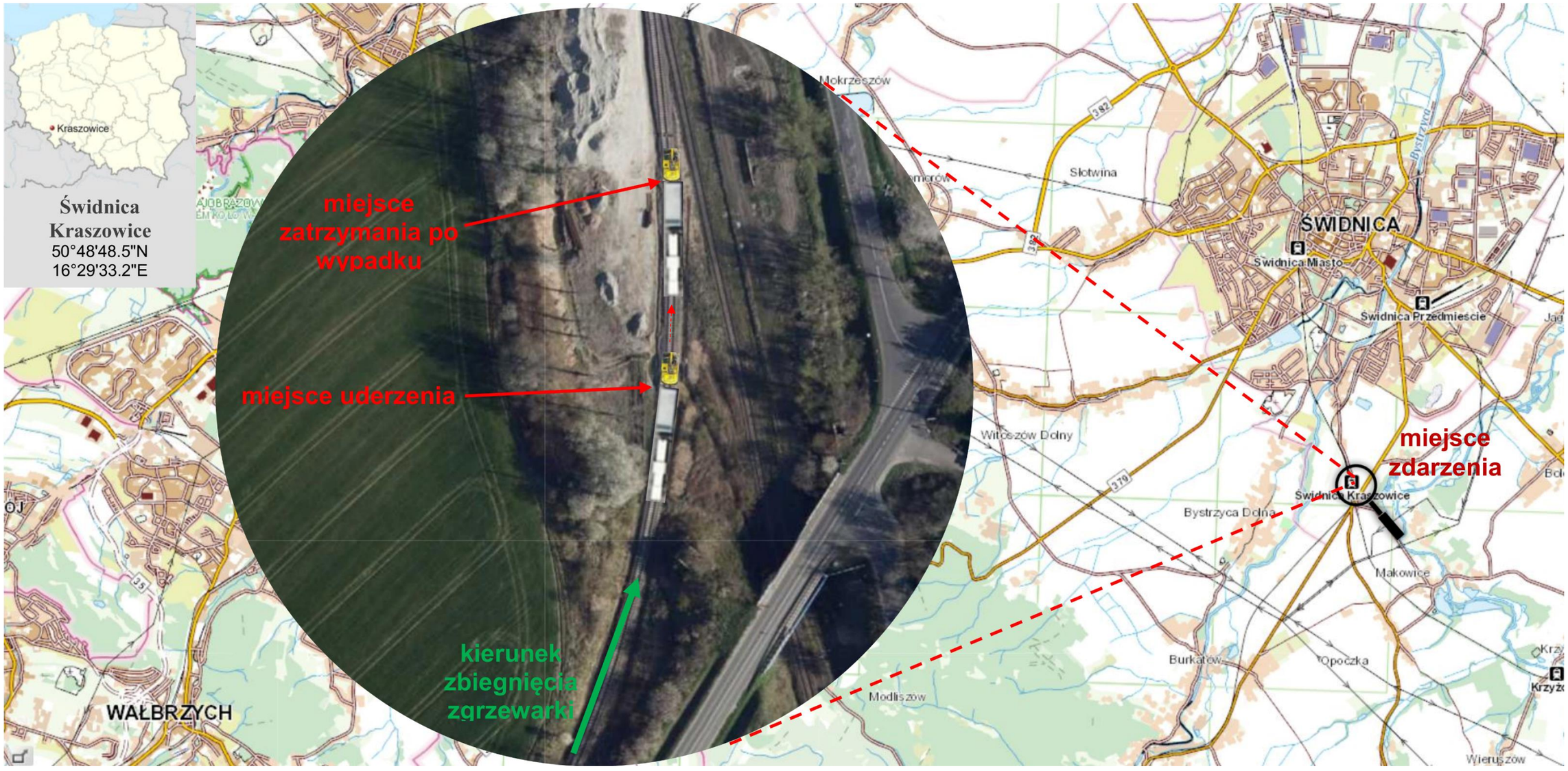
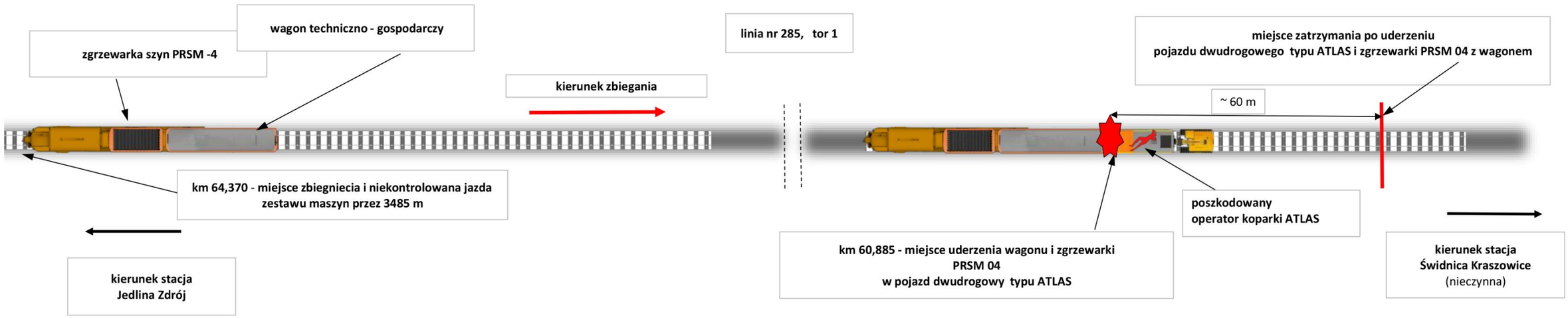
Photograph 4 – General view of the scene (source: phot. SCRAI)

Photograph 5 - View towards the entrance semaphore (Source: phot. SCRAI)



Drawing 1 – Sketch of the scene (developed by SCRAI)



Drawing 2 – Sketch of the accident (developed by SCRAI)

1.4. Deaths, injuries and damage to property,

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

As a result of the incident, the operator of the ATLAS 1604 ZW rail-road vehicle serial number 168Z301813 was seriously injured.

b) cargo, luggage and other property

A two-road Atlas vehicle was damaged.

c) rolling stock, infrastructure and environment

The maintenance car - storage depot No. 000071 (deleted) and damaged PRSM-4 track welding machine No. 47 (DOLKOM Wrocław Sp. z o.o.) were destroyed.

There was no damage to the railway infrastructure and no damage to the environment.

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

The incident occurred on an out of service track and did not affect train movements.

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

The Investigation Team identified individuals directly linked to the incident:
- Track welding machine operators – employees of DOLKOM Wrocław Sp. z o. o. (main contractor),
- Road-rail vehicle operator type ATLAS 1604 ZW factory no. 168Z301813 – employee of DROMOSTTOR s.c. (subcontractor).

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

Rail welding machine PRSM-4 No 47 year of construction 1991, serial No 47 manufactured in Kaluga II USSR.
Certificate of Authorisation to Operate Vehicle Type No. T/2001/0280 of 15.11.2001.
Railway vehicle identification number: 99 51 9 227 003-2 PL-DOLWR.
Certificate of Technical Fitness No. 05/2014 dated 07.05.2014 valid until 07.05.2020 for a mileage of 100,000 km calculated from 01377 km. The vehicle odometer read 17013.4 km at the time of the incident.
The last inspection of P3 was performed on 28.01.2020 in Wrocław.
Covered freight wagon type XG, year of construction 1974, serial number 000071, manufactured by ZNTK in Lubań Śląski.
Certificate of Authorisation to Operate Vehicle Type No. T/2000/0160 of 30.06.2000.
Railway vehicle identification number: 99 51 9 510 024-4 PL-DOLWR.
Certificate of Technical Fitness No. 69/2016 dated 26.07.2016 valid until 26.07.2022 for a mileage of 30,000 km calculated from 0 km.
The last inspection of P3 was performed on 03.07.2019 in Wroclaw, Poland.
Brake test sheet – last detailed brake test performed on 15.04.2020 in Wroclaw, train number 669032.
No annotation of detailed and simplified brake tests from 15.04 to 30.04.2020.
Total weight – 46 t,
Braking mass required – 14 t,
Actual braking mass – 36 t,
Required percentage of braking mass – 31 %,
Actual braking mass percentage – 78 %.

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

Track

Rails type.....	–	49E1 of 2019,
Sleepers.....	–	PS83 prestressed concrete from 2019,
Attachment type.....	–	SB7 resilient
Ballast type.....	–	ballast,
Track inclination	–	11 ‰.

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

On 30.04.2020, at 10:03 am (on the right track) and 10:10 am (on the left track), at the same height, two welds were made at km 64.130, which were marked with the number Z114 04 20 (the mark of a worker who, according to his explanation, was not present at work on that day). At 11:04 a.m. (on the left-hand run) and 11:10 a.m. (on the right-hand run), at km 64.250, two more welds were carried out at the same height, graded with the number Z 095 04 20.
The expert opinion of the PFEA (Polish Federation of Engineering Associations) shows that: the vehicle combination, beginning from the moment it started to move (run down) to the point where it ran into the excavator, travelled 3.45 km with a difference in level of 27 metres. At the time of the collision with the Atlas two-way excavator, the set was travelling at a speed of approximately 54 km/h, and approximately 7 to 8 minutes elapsed between setting off and the collision. The time of the accident adopted by the railway commission is not based on the records of any recorder, but results from the explanations and hearings of the workers. The operator, who was found to be under the influence of alcohol, did not perform welding on that day and did not operate the welding machine.

Photograph 6 – Welder operator identification number

Photograph 7 – Welder operator identification number

The Investigation Team, based on the analysis of the evidence, discovered that an employee (the welding machine operator) was drinking alcohol during working hours. The above was considered as another irregularity unrelated to the causal factors of the incident.

2. A factual account of events

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

The last detailed brake test was performed on the day the train set passed as train Rob1, i.e., on 15.04.2020. On 15-30.04.2020, work was carried out on rail welding on the route Świdnica Kraszowice – Jedlina Zdrój. The machine was parked in the area of Bystrzyca Dolna at a designated supervision point on the rebuilt track. The brake test sheet also lacks any record of detailed brake tests performed in the days leading up to the incident. On 30.04.2020 the welding machine operator started work at 08:00, leaving the machine's parking area from the town of Bystrzyca Dolna and travelling to the place where the welding was performed, i.e., approximately 2 km from the parking place. The train crew did not carry out the required detailed composite brake test on that day (standstill of over 12 hours without powering the brake equipment).
After completing two pairs of welds and driving up to another pair located about 120 metres away, the workers found the welding area unprepared, consisting of an incorrectly positioned rail, and decided to proceed with the correct positioning of the rail. After the operators had positioned the rail and prepared it for welding, the workers, according to the hearing, took a cigarette break. This caused a lack of supervision of the welding machine and during this time the pressure in the braking system of the welding machine gradually dropped spontaneously and the brake pads disengaged. The machine remained on the gradient of the track without an operator in the cab. The rail welding machine type PRSM-4 No. 47 and the technical and economic wagon No. 000071 (DOLKOM Wrocław Sp. z o.o.) began to roll off. One of the operators made an immediate attempt to catch up with this machine in order to stop it. This attempt (according to the explanations) proved unsuccessful and the train escaped in a forward carriage. Another operator attempted to catch up with the running machine by driving a car stopped on the road to stop it at one of the level crossings. This attempt was also unsuccessful.

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As a result of the rails welding machine coinciding with the wagon, the set of machines moved uncontrollably and crossed three level crossings, then hit the Atlas-type two-way vehicle standing on this track at 60,885 km and pushed it for a distance of 60 m. The Atlas vehicle was immobilised as a result of the accident. On the Atlas excavator, there was an operator on the outside of the engine housing with the engine compartment hatch raised and trying to locate the fault. The operator (an employee of DROMOSTTOR s.c.) was crushed with the engine casing flap of the excavator when a runaway train collided with an Atlas excavator and suffered serious injuries.

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

Based on the circumstances presented by the operators of the welding machine, it appears that:
after the incident, one of these operators, who was the first to arrive at the scene of the accident, found that a welder pushing a wagon had run into an excavator. For safety reasons, he switched off the engine of the welder and put the brake skid under the wagon between the welder and the excavator. At this time, he noticed the victim (excavator operator) crushed by the engine flap of the excavator (rail-road vehicle), giving signs of life, took the flap off him and threw it to the ground.
He then called the operator, who was operating the welding machine directly, to notify the emergency services and the Police, after which he left the scene to his residence without waiting for the emergency services and others to arrive, leaving the injured person unattended. He was unable to explain why he did not perform other actions in relation to the injured person. In the afternoon, the family drove this operator back to the scene to help assemble the head and secure this machine.
A third welder operator, who arrived by another car at the scene, despite having noticed the injured person lying on the engine of the excavator without giving him any assistance went to the damaged wagon and took a rucksack with clothes, after which he consumed alcohol near the scene and waited for the Police and emergency services to arrive.

The operator of the 112-emergency phone after receiving the call at 11:55am notified immediately:
- Swidnica Police, who arrived at 12:05pm, completed their operations at 4:10pm,
- Polish Medical Air Rescue – arrived at 12:10; departed at 12:30,
Police notified the Świdnica District Prosecutor's Office at 12:05 p.m., the Prosecutor arrived at the scene at 2:40 p.m. and completed his actions at 4:10 p.m.

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IV. ANALYSIS OF THE INCIDENT

1. Roles and responsibilities

1.1. Railway undertakings or infrastructure managers

On the route Świdnica Kraszowice – Jedlina Zdrój, the railway line No. 285 was reconstructed as part of the project titled "Reconstruction of the railway line No. 285 on the section Świdnica Kraszowice – Jedlina Zdrój." The investor of the works was the Investment Implementation Centre in Wrocław of the PKP PLK S.A. company.

Pursuant to § 14 of Temporary Regulation No. 135/2018 for traffic management during the execution of works prepared by Zakład Linii Kolejowych w Walbrzychu, the coordinator of the works was a representative of DOLKOM Sp. z o. o., who was responsible, among other things, for coordinating tasks aimed at protecting the safety and health and supervising the works in progress.

The economic operator for the works was DOLKOM Sp. z o. o. together with subcontractors, including, among others DROMOSTTOR s.c. Paweł Chapiński and Ireneusz Chapiński and PBW Inżynieria Jacek Garbacz, who were responsible, among others, for organising the Atlas rail-road vehicle in the area on the day of the incident. They were also responsible for supervising the safety of employees, securing and signalling the worksite in accordance with the instructions of PKP PLK S.A. Id-1 and Ie-1, § 55 of Ir-1 Instruction providing for securing employed people and rolling stock on closed track from being run over by other trains, as well as appendix no. 8 of Ibh-105 Instruction "Safety Rules Applicable on the Area of PKP PLK S.A. During Investment, Maintenance and Repair Works Performed by Employees of External Entities," and especially § 1, which states: "*Employers jointly asserted that their employees are simultaneously performing work at the same place, i.e., ..." and* § 2: *"Employers undertake to cooperate with each other and to inform each other and workers or their representatives of measures to prevent occupational hazards arising in the course of their work."*

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

Based on the survey material collected, the Investigation Team did not identify factors influencing the occurrence of the incident by maintenance operators, maintenance workshops and other maintenance providers.

1.3. Rolling stock manufacturers or other suppliers of railway products

Based on the survey material collected, the Investigation Team did not identify factors influencing the occurrence of the incident by maintenance operators, maintenance workshops and other maintenance providers.

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

The President of the Office of Rail Transportation (ORT) supervises railway traffic safety. The investigation team, based on the investigation material collected, did not identify any factors influencing the national safety authority ORT on the occurrence of the incident.

1.5. Notified bodies, designated bodies or risk assessment bodies

The study team, based on the study material collected, did not identify factors influencing the notified bodies and risk assessment bodies in the occurrence of the incident.

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

The study team did not identify factors influencing the railway undertaking's certification body on the occurrence of the incident on the basis of the material collected.

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

The railway vehicle (welding machine) was not equipped with devices for recording of driving parameters as well as with a system for recording of images of the foreground and the interior of the vehicle.

The Investigation Team found that:
- The PRSM4 track welding machine experienced an uncontrolled overcharge of the main brake system line due to a faulty safety valve.

- There was a pressure drop from the brake system main reservoir of 2.5 kG/cm2 over 5 minutes with an allowable 1 kG/cm2 for 5 minutes due to a leak in the safety valve.

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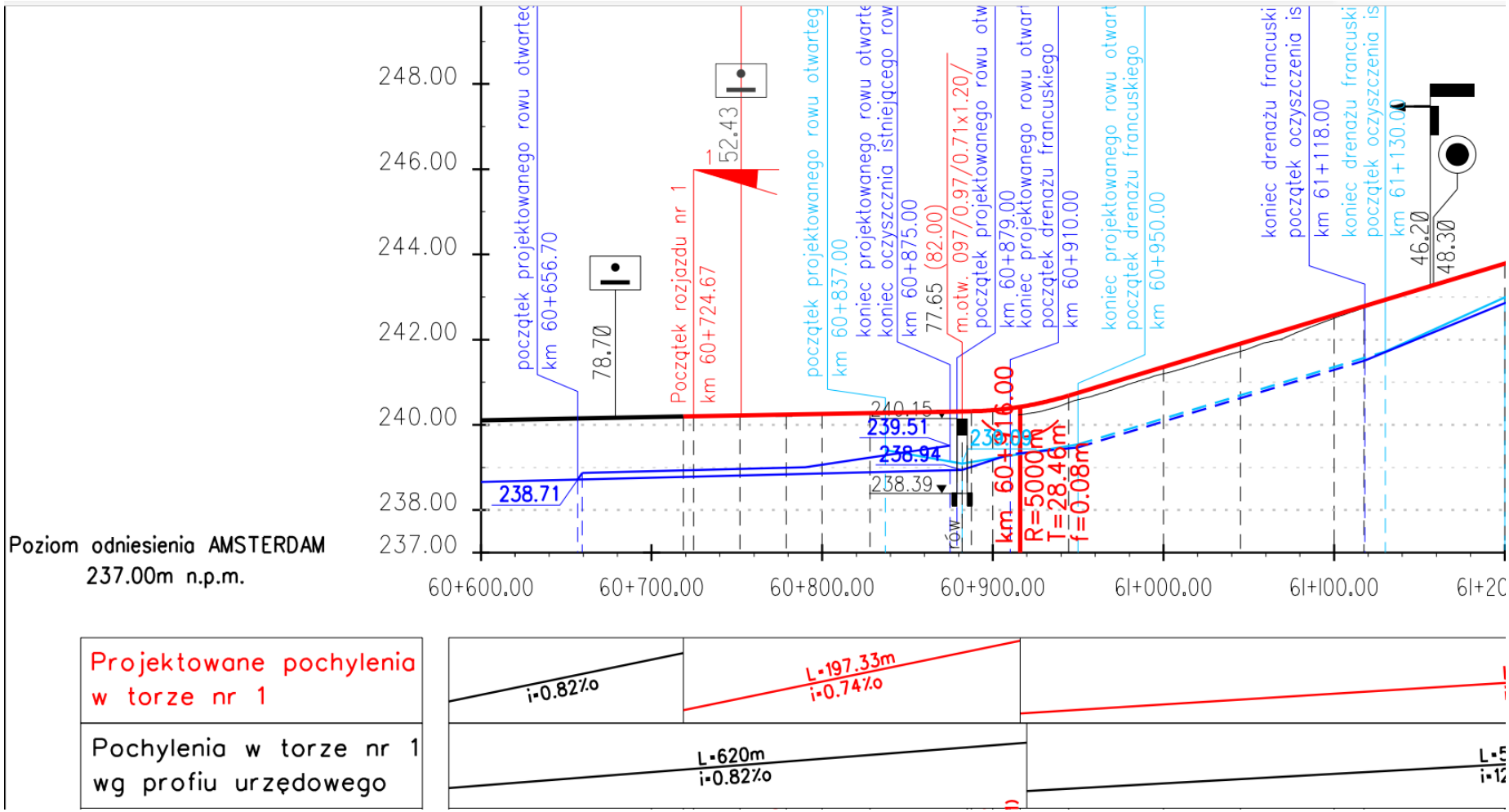

Figure 3 - Diagram of the track gradient at standstill km 60.885 (developed by SCRAI)

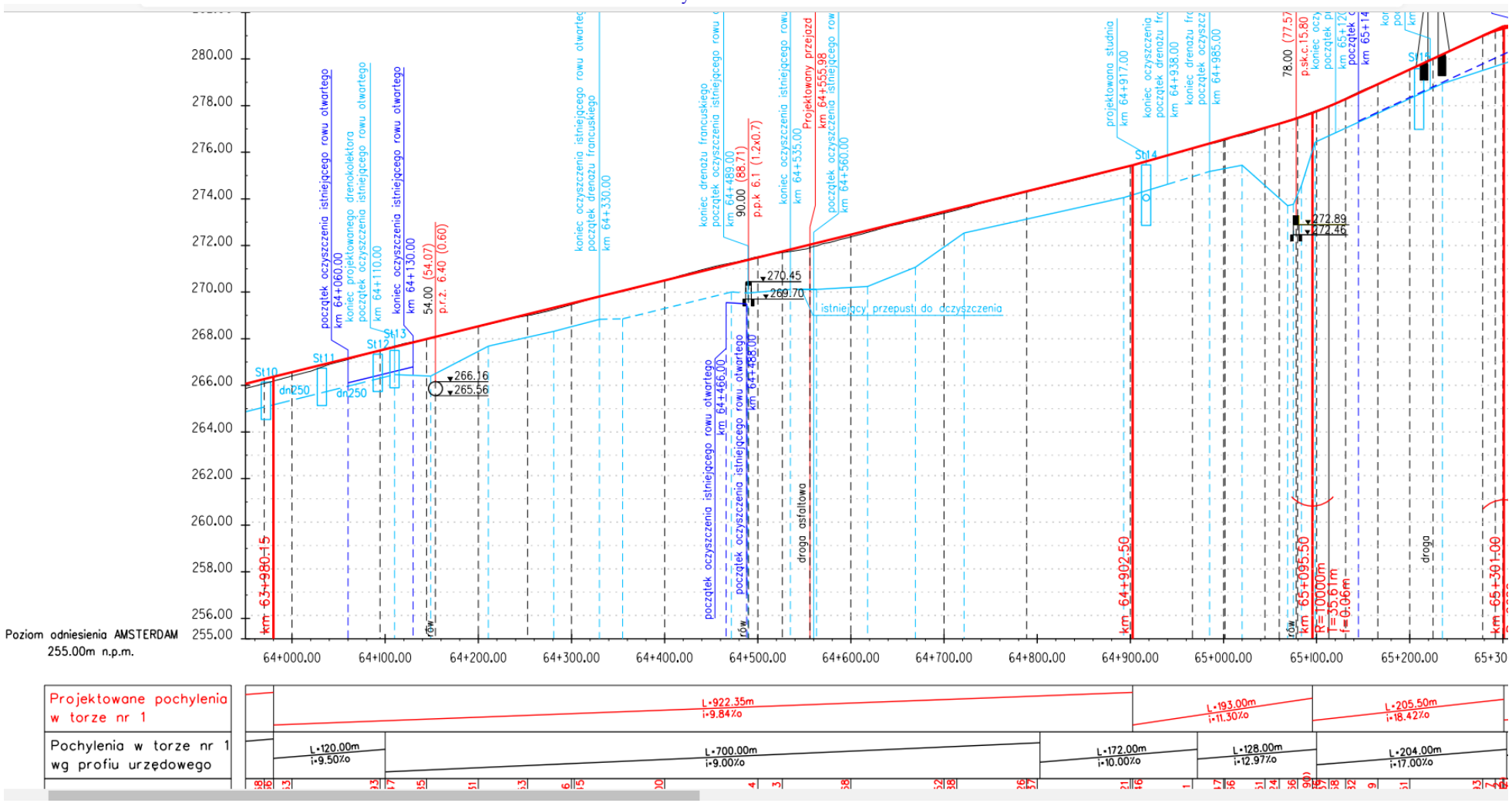

Figure 4 - Diagram of the gradient of the track at the point of the beginning of the convergence km 64 370 (developed by SCRAI)

3. Human factors

3.1. Human and individual characteristics

The investigation has shown that the employees of DOLKOM Sp. z o.o. connected with the incident did not fulfil their obligations resulting from § 18 item 2 of the Ir-1 Instruction, i.e., in the period from 16 April 2020 to the day of the incident they did not perform the required detailed brake tests of the working set of the welding machine with the technical wagon despite the fact that they should have performed the test before driving from the standstill to the welding place.

The investigation team, based on the analysis of the evidence, found that the welding machine operators were drinking alcohol during working hours. The above was considered as another irregularity unrelated to the causal factors of the incident.

The investigation team considers the above irregularities as contributing factors to the incident.

3.2. Factors related to job position

The study team did not raise concerns about factors related to the workplaces of the welding machine operators as well as the operator of the ATLAS excavator.

3.3. Organisational factors and tasks

Pursuant to § 14 of Temporary Regulation No. 135/2018 for traffic management during the execution of works prepared by Zakład Linii Kolejowych w Walbrzychu, the coordinator of the works was a representative of DOLKOM Sp. z o. o., who was responsible, among other things, for coordinating tasks aimed at protecting the safety and health and supervising the works in progress.

The economic operator for the works was DOLKOM Sp. z o. o. together with subcontractors, including, among others DROMOSTTOR s.c. Paweł Chapiński and Ireneusz Chapiński and PBW Inżynieria Jacek Garbacz, who were responsible, among others, for organising the Atlas rail-road vehicle in the area on the day of the incident. The analysis of documentation related to the execution of the said investment carried out by the Investigation Team has shown that DOLKOM Sp. z o.o. together with its subcontractor, i.e. DROMOSTTOR s.c. Pawel Chapinski and Ireneusz Chapinski on the basis of the Temporary Regulations, the mutually concluded Contractor's Agreement with the subcontractor and the Protocol of handover of the construction site (railway line No. 285 of the route Świdnica Kraszowice - Jedlina Zdrój from 60,129 km to 82,426 km) dated 3 April 2019 were the entities authorised to remain on the construction site.

They were also responsible for supervising the safety of employees, securing and signalling the worksite in accordance with the instructions of PKP PLK S.A. Id-1 and Ie-1, § 55 of Ir-1 Instruction providing for securing employed people and rolling stock on closed track from being run over by other trains, as well as appendix no. 8 of Ibh-105 Instruction "Safety Rules Applicable on the Area of PKP PLK S.A. During Investment, Maintenance and Repair Works Performed by Employees of External Entities," and especially § 1, which states: "*Employers jointly asserted that their employees are simultaneously performing work at the same place, i.e., ……..” and* § 2: *“Employers undertake to cooperate with each other and to inform each other and workers or their representatives of measures to prevent occupational hazards arising in the course of their work.”*

The investigation carried out showed that: the supervisory personnel of the above companies responsible for the safe organisation of work did not ensure:
- the proper organisation and coordination of work carried out at the same time on the same track, including the failure to inform the personnel of brigades working in different locations.

At the same time, the investigation revealed that the supervisory personnel of DOLKOM Sp. z o.o. responsible for the safe organisation of work failed to ensure:
- full staffing for rail welding (no team to prepare the rails for welding),

- the operator in the machine cab when working on a significant incline of the track of approx. 11‰ (not in accordance with 2.2.38. 2.11.1. OMM),
- supervision of the discipline of the welding machine operators by the direct management of the company,
- the correct positioning of a wagon without a combined brake from the side of the gradient of the railway line in the welder-wagon combination (welding should be done in the direction of the gradient of the line),

In addition, despite being equipped with mobile (on the welding machine) and mobile (on the excavator) radio communications equipment, the contractor's and subcontractor's employees did not establish radio communications to provide each other with information about the commencement of work on the same track at other locations and the process of the work. This was due to the failure to conclude the agreement referred to in Annex 8 of Instruction Ibh-105.

3.4. Environmental factors

The incident took place at noon in good air clarity, the track on a gradient of 11‰, the track in a curve with a radius of 250 m, the track laid partly in a trench. Adjacent to line 137, active, increased passenger and goods train traffic. The above conditions prevented the victim from properly identifying the sound of the moving rolling stock that was endangering his life.

Photograph 8 – View of the collision site on line 285 (right) adjacent to active line 137 (left)

3.5. Any other factors relevant to the proceedings

Not applicable.

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 its investigation, the Investigation Team analysed a selection of train convergence incidents occurring between 2017 and 2020.

The following is a brief description of selected events and impacts:

- On 10.11.2017. at 04:30 from the station track no 2 of Nysa station towards Nowy Swietów station on the track no 2 a goods train no TMS 624016 relation Kamieniec Ząbkowicki – Szeligi, comprised of 45 wagons self-unloading, four-axle The train was operated in double traction by diesel locomotives m62-1154 series, operated by the driver of the railway operator "Cargo PTT" in Wrocław, leading the train, and the second locomotive SM42-2444 employed in double traction, also operated by the driver of the railway operator "Cargo PTT" in Wrocław. During the journey of the train TMS 624016 along the route Nysa – Nowy Swietów, on the ascent of approx. 10,0‰ at the approach to the station Nowy Swietów at km 129,650 at the speed of approx. 10 km/h and not relaxed composition of the train, there occurred the breaking of the rod hook in the 43rd from the front (3rd from the end of the train) in the car No. 83 54 683 6 019-2, which caused tearing of the train into two parts. As a result of the automatic implementation of the train braking, caused by the loss of air from the main brake pipe, the brakes in the last three carriages of the train set were not effectively applied. After the first part of the train stopped, wagons numbered 83 54 683 6 019-2 (3rd from the end - 43rd wagon in the train set from the front of the train), 83 54 83 6 164-6 (2nd from the end – 44th wagon in the train set from the front of the train) and number 83 54 683 6 020-0 (last – 45th wagon in the train set from the front of the train) started to run down along track no. 2 towards Nysa station. There are 6 level crossings on the route Nysa – Nowy Swietow between km 127,594 km÷ 139,841 km (four level crossings of category "A" - at km 131,987, 136,642, 139,420 and 139,841, one level crossing of category "A" – at km 131,987, 136,642, 139,420 and 139,841, one level crossing category "C" – at km 133.869 and one pedestrian crossing of category "E" at km 137.341). As a result of a group of wagons converging on the above-mentioned section of the railway line, the passage was repeated twice, after which the wagons coming from the direction of Nowy Swietow (in the third cycle) were stopped in the station track no. 2 of the Nysa station in the Ns4 signalling circle at km 139,220 on a brake skid. Apart from the immediate serious risk to rail safety, there were no consequences of the accident and no victims in the rail incident.
  REPORT No. PKBWK/07/2018.

- On 01.01.2019 at km 203,1 of the line No 2 at 00:05 at the PKP CARGO Universal Terminal of Małaszewiczwe Logistic Centre Sp. z o.o. there was a convergence of wagons shunted by a road tractor and their entering the Wk 23 derailment. The runaway of the wagons occurred as a result of insufficient protection of the wagons during the shunting by a loader of 6 empty Russian Railway coal wagons on track No. 419S towards Kobylany station. The primary cause was the inadequate protection of shunted road tractors on a gradient of 5.4‰. The rope spontaneously detached, making it impossible to hold the wagons being shunted. The indirect cause was a failure to take into account the prevailing weather conditions, track profile and surface condition when shunting the wagons.

- On 04.03.2020 r. at 13:00:00 at the station Inowrocław Chemia, siding of Ciech Soda Polska S.A, Inowrocław plant, turnout Rkpd 26 there was a runaway of inactive electric locomotive E483 258 and derailment of three wagons being in a shunting consist wagon No 84 51 699 4049-9 (9th from the front)

derailed with all wheels to the right in the direction of travel and tilted to the right, it remained leaning against locomotive E483-258 with its left side looking in the direction of travel; - wagon No 84 51 689 1011-3 (10th from the front) derailed with all wheels to the right in the running direction - wagon No 8451 699 4036-6 (11th from the front) derailed to the right with all wheels of the first bogie in the running direction; on locomotive E483-258 all brake indicators were found to be green, indicating the brake was released. The primary cause was the failure to prevent the electric locomotive E483 258 from running away after it had finished shunting and was parked on track 7.

- On 08.04.2020 at 22:07 at Sadurki – Motycz station, at km 163.837 of line no. 7, there occurred a runaway of a train set left for a standstill on a newly built track no. 1, and it fell down behind turnout no. 6 in place of prepared substructure for installation of the further part of track no. 1, and 20 wagons loaded with ballast derailed. The following causes of the incident were identified: - leaving a secured train set at a standstill in an unfavourable profile location as a result of the need to carry out construction work to reinforce embankments and to assemble switches; - unforeseen external factors affecting the train set in the area of contaminated new, unsanded, rust-covered railhead surfaces due to grease from construction vehicles and machinery carrying out the new track construction process; - decrease of the friction coefficient between the wheel skids and the railhead and wheel running surface due to the contamination by corrosion of the running surface of the rail heads and contamination by grease from construction machines and vehicles working on this track resulting from the construction works. The indirect causes of the incident were identified as: - impact of trains passing on the active track no. 2, causing vibrations transmitted to the newly built unstable track no. 1; - impact of simultaneous construction works related to stabilisation of embankments by means of micro-pile driving with the use of vibration and drilling under the embankment causing additional vibrations.

V. CONCLUSIONS

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

The investigation team identified the coincidence of a train set, i.e., a maintenance car with a rail welding machine, and an ATLAS-type rail-road vehicle on the same track as the causal factor of the incident.
In addition, the Investigation Team found that:

1. The rail welding works on 30.04.2020 were carried out with an understaffed team of operators.
2. The operators of the welding machine while working on a significant incline of the track of about 11 ‰ did not comply with the provisions of items 2.2.38. and 2.11.1. The workers were working on the PRSM-4 welding machine, i.e., they carried out work consisting in operating the welding machine from an external control panel without ensuring that a driver was present in the welding machine cabin.
3. Welding was carried out without prior preparation of the rail for welding by the relevant brigade.
4. The start of operation of the set, i.e., the welding machine together with the technical and economic wagon, took place without performing a detailed brake test of the working set of the welding machine with the wagon.
5. The adopted direction of welding resulted in the positioning of the welding set with a technical and economic wagon without a combined brake on the downhill side of the railway line.
6. Work was carried out by two work trains on a single track with a gradient of 11‰ without mutual information about the work being carried out at the same time in different locations.
7. There was no proper coordination of works carried out at the same time and on the same track by the persons supervising the construction works and industry-specific works.
8. Failure to notify the contractor on 30.04.20 that the subcontractor started works in the area where the accident occurred.
9. Despite being equipped with mobile (on the welding machine) and portable (on the excavator) radio communication devices, the contractor's and subcontractor's employees did not establish radio communication in order to provide each other with information about the commencement of work on the same track in other locations and the process of its progress (the contract concluded between the general contractor and subcontractors provided for simultaneous execution of work in different locations).
10. The company’s management failed to ensure that the discipline of the welding machine operators was properly supervised.
11. There were discrepancies in the record sheets regarding the number of workers carrying out the works on 30.04.2020 (suggesting that the record sheets had been reworked a number of times).
12. During working hours, the welding machine operator consumed alcohol.

The above irregularities were considered by the Investigation Team as contributing factors to the incident.

As a result of its analysis, the Investigation Team identified other anomalies that may affect safety, resulting from additional observations in a context other than the causal or contributing context of the incident:

1. The use of welding machine operator identification numbers at the site of the welds made by an employee who, according to the record sheet, was not at work on the day of the incident.
2. Unauthorised removal of a worker from the scene of an accident and the workplace after the accident has occurred and failure to provide assistance to the injured person.
3. Discrepancies in the testimonies and explanations of the workers regarding: the course of work and the circumstances of the accident on 30.04.2020.
4. The Investigation Team, based on the analysis of the evidence, discovered that an employee (the welding machine operator) was drinking alcohol during working hours. The above was considered as another irregularity unrelated to the causal factors of the incident.

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2. Measures taken since the incident

The investigation team did not make recommendations during the investigation because the railway commission made recommendations on 29.12.2020 addressed to Dolkom sp. z o.o.:
- Unit managers at daily pre-work briefings will remind their subordinates of their obligations towards the Employer in accordance with the provisions of DOLKOM's Labour Regulations and Article 211 of the Labour Code, as well as the consequences of non-compliance with the provisions of the Employment Agreement and the aforementioned regulations.
- Prior to commencing work on any given day on the designated site, the main contractor's co-ordinator must agree with the sub-contractors' works managers, the scope of work stating the location of the machinery work, the sub-contractor must notify the main contractor's co-ordinator.
- Discuss the incident at the next periodic briefing for the DOLKOM Company.

3. Additional remarks

Not applicable.

VI. SAFETY RECOMMENDATIONS

1. Dispatchers of special vehicles shall implement the Recommendation No. 4 contained in the Report PKBWK/03/2020 related to fitting the special vehicles with an on-board driving parameters recorder, and shall take additional measures aiming to retrofit these vehicles with the recorders of the foreground of the driving and working area.
2. The authorised infrastructure managers shall develop the rules for carrying out works on the slope of the railway track using self-propelled special vehicles combined with other, non-propelled railway vehicles, which are going to be mandatory for economic operators performing renovation and maintenance works, including the obligation to ensure supervision mechanisms over the application of this procedure.
3. Undertakings carrying out repair and maintenance works on railway infrastructure, organised on a long-term basis in a manner preventing direct contact with workers, shall implement a supervision system for maintaining discipline at work and compliance with regulations and instructions, and in particular for traffic management, the performance of work and the psycho-physical state of workers.
4. Infrastructure managers:
   a. who does not have appropriate regulations for the operation of machinery and equipment running concurrently in different locations on the same track must develop provisions concerning mutual communication in these work situations, and must implement them,
   b. those who have implemented the aforementioned provisions shall carry out a training reminding of the rules in place.
5. The authorised infrastructure managers, when drawing up the specifications for procurements in relation to planned investment/modernisation works shall take follow the recommendations issued concerning:
   a. equipping track-mounted mobile rail welding machines with recorders of data on travel parameters, and working video recorders of the foreground of driving and work area,
   b. equipping workers with radio communication equipment.

CHAIRMAN
OF THE STATE COMMISSION ON RAILWAY ACCIDENT INVESTIGATION

……
Tadeusz Ryś

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List of entities specified in the contents of Report No. PKBWK 03/2022

No.	Symbol (abbreviation)	Explanations
1	*2*	*3*
1.	EUAR	European Union Railway Agency
2.	SCRAI	State Commission on Railway Accident Investigation
3.	ORT	Office of Rail Transportation
4.	IM	PKP PLK S.A. Railway Tracks Facility
5.	OTI	Office of Technical Inspection
6.	DOLKOM Sp. z o. o.	Dolnośląskie Przedsiębiorstwo Napraw Infrastruktury Komunikacyjnej “Dolkom” sp. z o. o.
7.	DROMOSTTOR s.c. *(terminology at the time of the accident)*	Dromosttor Polska Spółka z ograniczoną odpowiedzialnością Sp.k.
8.	PFEA	Polish Federation of Engineering Associations