R E P U B L I C OF B U L G A R I A
NATIONAL AIR, MARITIME AND RAILWAY TRANSPORT, ACCIDENTS INVESTIGATION BOARD (NAMRTAIB)

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FINAL REPORT

of

Investigation of accident - Collision of shunting train with locomotive No98520055057-4 in the last coach of fast train No 1621 in Sofia station on 28.05.2024

Sofia 2024

OBJECTIVE OF INVESTIGATION AND EXTENT OF RESPONSIBILITY

The National Air, Maritime and Railway Transport Accidents Investigation Board (NAMRTAIB), which is an independent investigation body on safety performs the investigation of significant accidents, accidents and incidents. The National Board is within the Council of Ministers (CM) of the Republic of Bulgaria, and aims to find the circumstances and causes that led to the accidents and incidents occurrence in order to improve the safety and to avoid such in future as the priority is given to avoiding significant accidents.

The investigation, which the NAMRTAIB performed is independent from any judicial investigation, and does not include the determination of fault or responsibility.

The investigation is performed in accordance with the requirements of DIRECTIVE (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway transport safety, the Railway Transport Act (RTA), Ordinance No59 dated 5.12.2006 on the rail transport safety management, as well as per Agreement dated 11.04.2023 on the interaction during investigation of accidents and incidents in the air, maritime and railway transport between the Prosecutor's Office of the Republic of Bulgaria, Ministry of Interior, and the National Air, Maritime and Railway Transport Accidents Investigation Board.

The Investigation reports follow the requirements of REGULATION (EU) 2020/572 of the Commission dated 24 April 2020 on the reporting structure for railway accident and incident investigation reports.

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ABBREVIATIONS, USED IN THE REPORT

FT – Fast train
BDZ PP EOOD – State enterprise for passenger transport
TDRC – Train Dispatching Radio Connection
TOS – Train Operation Schedule
SE NRIC – State enterprise „National railway Infrastructure Company "(railway infrastructure manager)
RTA – Railway Transport Act
TOU – Traffic organization unit at the Railway Infrastructure Manager
RAEA– Railway Administration Executive Agency, National Safety Authority in the rail transport of the Republic of Bulgaria
km – Kilometre along the rail track
OCL – Overhead contact line (catenary)
ST – Shunting train
MoI – Ministry of Interior
RCI – Route Computer Interlocking
SL – Shunting locomotive
RRI – Route Relay Interlocking
ORDINANCE No 58 – on the rules for the technical operation, train traffic and signalling in the rail transport
Ordinance № 59 – Ordinance on the rail transport safety management
NAMRTAIB – National Air, Maritime, and Railway Transport Accidents Investigation Board (Safety Investigation Body of the Republic of Bulgaria)
NIS – National Investigation Service (pre-trial investigation body at the prosecutor's office)
TF – Task Force
SE – Signalling equipment
PT – Passenger train
TCB – Temporary Control Board
RTOSART – Rules for the train operation and shunting activity in the rail transport
RRS – Rail Rolling Stock
RTORI – Rules of technical operation of the railway infrastructure of SE NRIC
RITS – Regional inspection Transport Safety at SE NRIC
CDoIMoI – Capital Directorate of Interior at the Ministry of Interior
CIW – Construction installation works
ECM – Entity in Charge of Maintenance
SMS – Safety Management System
TMWI – Technician Mechanic Wagon Inspector
TI – Technical Inspection
SD – Supervision Device
TOSAMD – Train operation and station activity management Division (division of SE NRIC)
TOCMD – Train Operation and Capacity Management Division
DCCM – Device for communications, connections and messages in stations
UMHAT – University multi-disciplinary hospital for active treatment
PQC – Professional qualification centre at SE NRIC
PQC – Professional qualification centre at Holding BDZ EAD
GSM-R – Global system for mobile communications – railways

1. Summary

1.1. Brief description of the event.

On 28.05.2024, a shunting train with three coaches was prepared at the Nadezhda Technical Station for FT No. 3625, headed by shunting locomotive No. 98520055057-4 (II shunting) for Sofia Station. The shunter and the shunting switchman boarded the last coach, and the second shunting switchman, together with two cleaners of the RRS at the Nadezhda Technical Station, boarded the first coach. The two women used the shunting train to travel to Sofia Station.

At 16:20 p.m., the traffic manager on-duty at the Nadezhda Technical Station requested "consent" from the traffic manager on-duty at the Sofia Station to send the shunting train, ready to depart at 16:25 p.m. The station dispatcher at Sofia station ordered the traffic manager on duty at Sofia station to accept the shunting team on the first track, and the same should have been established in the western part of the track until the departure of FT No. 1621 from the first track. In that time interval, around 16:20 p.m., all tracks in operation at Sofia station were occupied by arriving and departing trains (according to his written testimony). According to the approved Plan II-24 for the reception and dispatching of trains at Sofia station, FT No. 1621 and FT No. 3625 should have departed from the first receiving and departing track at 16:20 p.m. and 16:40 p.m., respectively.

During the movement of the shunting train with shunting locomotive No. 98520055057-4 (II shunting) between the Nadezhda Technical Station and Sofia Station, the station dispatcher at Sofia Station notified via the radio station of the II shunting that the shunting train would have been accepted on the first track, on which FT No. 1621 was composed, and would have established itself on the western part of the track. The shunter confirmed that the order had been understood. That notification was also heard by the other members of the shunting crew, as well as by the driver (confirmed in their written statements, since they were all equipped with radio stations operating on the II shunting frequency). In that way, a three-way connection was established between the station dispatcher, the shunter and the driver.

After receiving the order from the station dispatcher, the traffic controller on duty at Sofia station takes action with the RCI to accept the shunting team from the III-rd parallel track on the first receiving-departing track at Sofia station for subsequent composition.

At around 16:30 p.m., the station dispatcher at Sofia station had a telephone conversation with the train dispatcher on the Sofia - Septemvri section at the Sofia Railway Station regarding regulation of the movement of FT No. 1621 and FT No. 3692, which was due to arrive from Poduyane station at Sofia station. The second traffic manager on duty at Sofia station reported to the station dispatcher by radio that a full test of the automatic brakes of FT No. 1621 has now begun. For that reason, the station dispatcher ordered the traffic manager on duty at Sofia station to ensure the movement of FT No. 3692 from Poduyane station and to accept the train on the fifth blind track.

At that time, the shunting train of the 2nd shunting, led by locomotive No. 98520055057-4, was moving along the route, and after entering the first track, it did not stop in the western part of the track, and at 16:30 p.m. (according to the speedometer tape) at km 0+088, a hit occurred in the last coach of the train of FT No. 1621, displacing the entire train 15 meters forward.

As can be seen from the testimony of the locomotive driver of locomotive No. 98520055057-4 of the 2nd shunting, at a distance of about 20÷30 meters from the standing coaches, he felt bad and lost consciousness.

As a result of the collision of locomotive No. 98520055057-4 on the 2nd shunting in the composition of FT No. 1621, passengers in FT No. 1621 and personnel serving the train and the 2nd shunting were injured.

The head of FT No. 1621 notified the emergency number 112 for the CRW, as well as interested services and persons, about the accident that occurred at 16:40 p.m.

In the first minutes after 16:40 p.m., teams of the CRW and FSaCP arrived at the scene.

8 people were slightly injured in the accident, including 3 passengers from FT No. 1621 and 5 employees.

Material damage was caused to passenger coaches from the FT 1621 train and from the 2nd shunting train for FT No. 3625, as well as to the shunting locomotive No. 98520055057-4.

1.2. Location and time of the event occurrence.

The event has occurred at km 0+088 (in the Eastern part) on the first track in Sofia station at 16:30 p.m. The permanent way of the track is in a straight line, inclination 0 ‰ (fig. 1.1).

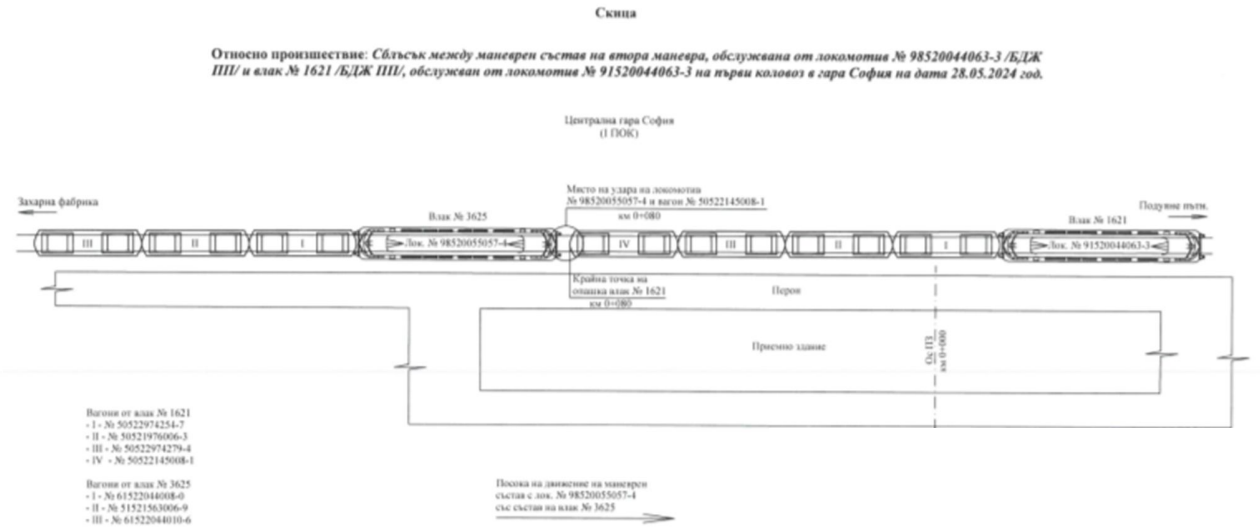

Fig. 1.1. Scheme of the place of the accident in Sofia station

1.3. Factors determining and contributing the event.

Determining factor for the event occurrence is the wrong performance of the functional obligations of the locomotive driver and the shunter during the movement of the shunting rolling stock with locomotive № 98520055057-4.

Contributing factors for the accident occurrence are:

- Disrespect of the normative documents for the work organization in Sofia station and the Technical station in Nadezhda;
- Lack of coordination between the traffic managers on duty in Sofia station and wagon-inspector section;
- Lack of coordination between the traffic manager on-duty in Nadezhda technical station and traffic manager on-duty I-st person in Sofia station;
- Incomplete and incorrect set of instructions, regulating the work between SE NRIC and BDZ PP EOOD during the shunting activity performance in Sofia station;
- Non-functional supervision device of the shunting locomotive № 98520055057-4.

Съпътстващи фактори за настъпване на произшествието са:

- Acceptance of the rolling stock of the II-nd shunting with locomotive № 98520055057-4 on an occupied first track in Sofia station on which was composed FT № 1621, on which a test was performed at that moment;
- The shunting crew was not allocated properly and there was a lack of coordination in the activities of all the participating employees in the composition of the II-nd shunting.

1.4. Direct causes and consequences of the event.

Failure to activate the braking system of the shunting train by the locomotive driver and/or the shunting crew, and/or the vigilance device.

The consequences of the event are: minor injuries and traumas to passengers and staff, damage to the passenger coaches of the two trains (FT No. 1621 and FT No. 3625) and to the shunting locomotive No. 98520055057-4, servicing the II -nd shunting.

1.5. Safety recommendations and addressees to which they are addressed.

In order to prevent other similar accidents, the Investigation Commission proposes to the National Safety Authority (RAEA) safety recommendations related to the SE NRIC and "BDZ Passenger Services" EOOD.

- Recommendation 1, proposes that SE NRIC and BDZ PP EOOD familiarize the interested personnel with the contents of this report;
- Recommendation 2 proposes that the personnel involved in ensuring train movement and shunting work of the SE NRIC, as well as the personnel involved in performing shunting work of BDZ PP EOOD, performing their duties at Sofia Station, be re-equipped with mobile terminals for using the existing GSM-R radio connection in order to carry out a permanent objective recording of the conversations;
- Recommendation 3 proposes that, until the introduction of the route-computer interlocking at Sofia Station into regular operation, in the daily briefings conducted for the personnel of both enterprises, attention be paid to strict compliance with the Instruction regulating the organization of movement and shunting work, as well as to performing tests of the train brakes of departing trains in order to improve and refresh the knowledge of the personnel;
- Recommendation 4 proposes that BDZ PP EOOD, until the introduction of the route-computer interlocking at Sofia Station into regular operation, turn on and seal the devices for monitoring the vigilance of the shunting locomotives;
- Recommendation 5 proposes that, in order to achieve higher efficiency in shunting work, SE NRIC and BDZ PP EOOD change the shunting arrangements and plans with a view to the simultaneous movement and composition of several trains departing from the same track according to Plan Rev. II -24 at Sofia Station.

2. Investigation

2.1. Decision for starting the investigation.

Decision to initiate a safety investigation was made by the member of Management Board of the NAMRTAIB in the Republic of Bulgaria, leading the investigation of railway accidents and incidents as per art. 22, paragraph 3 of Directive (EU) 2016/798 of the European Parliament and the Council. Given the severity of the accident and its impact on the railway safety, the investigation was focused on establishing the causes and the analysis, aimed at preventing other accidents of a similar nature at the SE NRIC.

2.2. Motives for the decision to initiate the investigation.

The member of the Management Board of the NAMRTAIB, leading the railway investigation section, took the decision to initiate the investigation based on art. 20, paragraph 1 (a) and (c) of Directive (EU) 2016/798, art. 115к, paragraph 1, item 1 of RTA, and art. 76, par. 1, item 1 of Ordinance No 59 dated 5.12.2006.

The investigation was initiated in view of the circumstances that led to traumas, injuries and abrasions to passengers and staff, resulting from a subsequent collision of the shunting rolling stock on the last coach of FT No. 1621 on the first track at Sofia Station.

2.3. Scope and restrictions of the investigation.

The scope of the investigation included and analysed the organizational and human factor, the Safety Management System related to the operation of new RCI signalling equipment at Sofia Central Station, as well as the operation and management of shunting locomotives. This includes the risk assessment with the registered hazards, listed in regulatory acts, instructions and rules of the railway infrastructure manager and the railway undertaking.

Restrictions and delays during the investigation were not allowed.

2.4. Competences of the persons, involved in the investigation.

In accordance with the requirements of Art. 22, paragraph 1 of Directive 2016/798, the Safety Investigation Commission is headed by the member of the Management Board of the NAMRTAIB, the head of the railway investigation department. The members of the commission are independent external experts - qualified persons from higher transport educational institutions, experts in the field of human and organizational factors from health institutions with qualifications in railway transport operation and management, railway rolling stock and signaling equipment.

2.5. Communication and consultations with the persons and entities, involved in the event.

The Commission determined the parameters of the investigation and coordinated its actions with the Task Force, which includes heads of divisions and transport safety authorities of the two entities (SE NRIC and BDZ PP EOOD). The Task Force collected all documents, samples, materials and written statements of the personnel of the two entities. The materials and documents were provided to the member of the Management Board of the NAMRTAIB. At the scene of the accident, the Investigation Commission conducted an interview with the locomotive crew of locomotive No. 91520044063-3 of FT No. 1621, the train's transport crew (train chief and conductor), the locomotive driver of the shunting locomotive No. 98520055057-4, the shunting crew (shunter and two shunting switchmen), the station dispatcher at Sofia station and the two traffic controllers on duty at Sofia station. It reviewed the statements of the persons involved in the accident. Additional information for the investigation was requested and provided by SE NRIC and BDZ PP EOOD. An interview was conducted with the transport safety authorities of the two entities.

2.6. Extent of cooperation from the participating entities.

During the investigation conducted by the Investigation Commission at the NAMRTAIB and the management of the railway entities SE NRIC and BDZ PP EOOD provided full cooperation and the necessary set of materials and documents required for the investigation. Access was provided for inspections of shunting locomotive No. 98520055057-4 and the temporary control panel of the RCI at Sofia station. The recordings downloaded from the recording device of shunting locomotive No. 98520055057-4 were deciphered.

2.7. Methods and techniques of investigation and analysis.

On 28.05.2024 at 17:08 p.m., the member of the Management Board of the NAMRTAIB with competence to investigate railway accidents received a written notification via SMS on the mobile phone from the central senior dispatcher on duty at the railway infrastructure manager with the text:

"At 16:30 p.m. at Sofia station, while performing a shunting with locomotive 55-057 BDZ PP, pulling the train 3625/BDZ PP on the first track from the Nadezhda depot, the same hit the last coach of train 1621/BDZ PP."

The member of the Management Board of the NAMRTAIB with competence to investigate railway accidents left for Sofia station with external experts and arrived at around 17:30 p.m. Several inspections were carried out at the site of the collision on the first track at Sofia station. Inspections were carried out of the rolling stock of the second shunting and FT No. 1621. An inspection of shunting locomotive No. 98520055057-4 was carried out. An inspection of locomotive No. 91520044063-3 was carried out and it was established that the FT No. 1621 train was moved 15 meters forward as a result of the collision of the shunting train of the second shunting. At the time of the collision of FT No. 1621, test A of the train brake was carried out before the train departed. Interviews were held on site with the locomotive crew of locomotive No. 91520044063-3 of FT No. 1621, with the train's transport crew (train chief and conductor), the locomotive driver of the shunting locomotive No. 98520055057-4, the shunting crew (shunter and two shunting switchmen), the station dispatcher at Sofia station and the two duty traffic controllers at Sofia station. The statements of the persons related to the accident were reviewed. The statements of the persons who were eyewitnesses to the accident were reviewed.

After arriving at the scene of the accident, the pre-trial investigation bodies from the National Investigation Service (NIS), together with the member of the Management Board of the NAMRTAIB with competence to investigate railway accidents, organized and conducted joint inspections. The pre-trial investigation bodies from the NIS drew up a report after the inspections of the scene of the accident.

At 20:30 p.m., the teams of the SMP, FSaCP, the investigative bodies of the pre-trial proceedings of the NIS and the member of the Management Board of the NAMRTAIB with competence to investigate railway accidents finished their work. A written permit was issued to the head of the Task Force to begin emergency and recovery work to restore the train traffic at the station and release from supervision the FSaCP of FT No. 1621 and the shunting locomotive No. 98520055057-4 with the coaches for FT No. 3625.

On 31.05.2024, the head of the Investigation Commission with external experts inspected the work of the station interlocking RRI at Sofia station and conducted an interview with the shift personnel - a station dispatcher and two traffic managers on duty.

On 20.06.2024 The Investigation commission in the building of the NAMRTAIB conducted an interview with the locomotive driver of shunting locomotive No. 98520055057-4, which served the second shunting with the composition of FT No. 3625. On the same date, interviews were held with the following employees: station dispatcher on shift at Sofia station, the two duty traffic managers on shift at Sofia station, shift manager at Post 14, duty traffic manager at Post 13 and the shunter of the second shunting.

The recordings taken from the recording device of shunting locomotive No. 98520055057-4 during the movement from the Nadezhda Technical Station to the subsequent collision of the last coaches of FT No. 1621 on the first track were deciphered.

On 14.06.2024 The Investigation commission at the NAMRTAIB, after receiving the documents and materials from the head of the Task Force, continued the investigation of the accident until a draft final report was prepared.

2.8. Difficulties faced during the investigation.

During the time of the Investigation Commission at the NAMRTAIB did not encounter any difficulties. The representatives of the two entities – SE NRIC, BDZ PP EOOD and the Task force assisted the Investigation Commission.

2.9. Interaction with the judicial authorities.

In accordance with the requirements of the Agreement on Cooperation between the Pre-Trial Authorities, the Prosecutor's Office of the Republic of Bulgaria, the Ministry of Interior and the NAMRTAIB, effective from 11.04.2023, the investigation actions were coordinated. The pre-trial authorities of the NIS and the head of the safety investigation from the NAMRTAIB coordinated the boundaries of the accident scene and the sequence of investigation actions in order to safely handle and preserve the established evidence.

The Ministry of Interior authorities guarded the accident site, as well as all traces of the vehicle and did not allow evidence to be moved or destroyed during the inspections. Only the investigation authorities of the NAMRTAIB, NIS, the Ministry of Interior were allowed within the scope of the guarded area. The movement of trains on reception and dispatching service at Sofia station was suspended. Independent parallel inspections were carried out in connection with safety and pre-trial proceedings. The investigation into the pre-trial proceedings is being carried out by competent investigative bodies of the NIS, under the supervision of a supervising prosecutor from the Sofia District Prosecutor's Office. Media access to the scene was restricted.

2.10. Other important information for the investigation context.

2.10.1. Materials provided by the pre-trial proceedings – NIS:

The Chair of the Investigation Commission on Safety at NAMRTAIB required from NIS, the following materials on the investigation that were provided regarding:

1. Protocol dated 28.05.2024 at 17:08 p.m., issued by the Sofia Emergency Medical Center for a medical examination performed at the scene of the accident of the driver driving shunting locomotive No. 98520055057-4 (II shunting) at Sofia station:

• Before the doctor of the SMP - Sofia, the driver declared that he "blacked out for a moment and after the examinations he refused hospitalization in a hospital".

The examinations performed on site established a satisfactory general condition.

2. By decree No. 35/03.06.2024 The National Medical Council of Bulgaria has appointed a Complex Forensic Medical Expertise to conduct medical examinations and psychological tests at the National Multidisciplinary Transport Hospital "Tsar Boris III" regarding the health condition of the locomotive driver:

• Conclusion of the expert commission from the National Medical Center "Tsar Boris III" consisting of a neurologist, cardiologist and psychologist:

- Neurologist: The circumstances preceding the attack (physical and mental stress), the clinical characteristics of the attack and the results of the essential examinations gave grounds for a diagnosis: Post-syncope condition. Neurally mediated syncope is most often caused by a situationally determined, transient dysfunction of the autonomic nervous system and is very difficult to diagnose and predict.
- Cardiologist: Of the tests performed - ECG, echocardiography, ECG Holter, EEG, Head Scanner without data on medically significant deviations. The patient was assessed by the Transport Regional Medical Expert Commission as capable of being a train driver under the current Regulation 54/2003.
- The health and psychological state of the person at the time of the accident was not within the scope of our expertise.
- From the documentation presented upon the arrival of the ambulance, the patient was contact, adequate with normal physical indicators and a normal ECG.
- Psychologist: The professionally significant psychological qualities of the locomotive driver were within the norms and did not imply a risk in the performance of the activity.

3. Description of the event

3.1. Information on the event and the context.

3.1.1. Description of the event type.

In implementation of project 2014-BG-TMC-0133-W "Development of the Sofia Railway Junction: Railway Section Sofia - Voluyak" under Contract No. 11274/30.10.2020 with subject "2017-OP-098 Design and construction for modernization of track construction at Sofia Central Station and railway section Sofia Central Station - Voluyak", as of 30.04.2024, Phase B of the construction and installation activities at Sofia Station has started.

After successfully completed functional tests, a Route Computer Interlocking (RCI) type QUASAR Q4e has been put into trial operation with temporary software from the company "CAF Signalling" with the following functional capabilities:

• Electrical control and reversal of all repaired and existing switches included for control by the RCI for phase 1;

• Control of the freedom and occupancy of all switch sections of the newly repaired and existing railway, included in the control by the RCI for phase 1;

• Control of the invitation signals of the entrance and exit traffic lights in the station, included in the control by the MCC for phase 1;

• The reception and dispatch of trains from and to all directions included in the RCI for phase 1 is ensured by invitation signal routes, in which the position of the running and guard switches and the freedom of the controlled sections in the route are checked;

• Visualization on a video terminal of the operator of the facilities included for control by the RCI.

All ground shunting signals installed in this phase of construction remain unlit and inoperative.

With RCI with temporary software, new tracks No. 3, 4, 5d, 1d, 6d (and adjacent switches) and a third parallel track to the Nadezhda Technical Station were put into trial operation at Sofia Station.

Note: New repaired tracks No. 1, 2, 2d and 4d were put into operation on 14.09.2022.

The next stage of (Phase B) of the construction and commissioning of the above-mentioned project started on 08.05.2024, when at Sofia Station:

• The operation of the Route-Relay Interlocking type "Russian Block" operating until that period was interrupted;

• Traffic on the old tracks No. 6d, 7d, 8, 9 and 10 was interrupted;

• Traffic on the first parallel track to the Nadezhda Technical Station was interrupted;

• The movement of trains on the current route No. 1 in the Sofia - Voluyak interstation and on the current route No. 2 in the Sofia - Sofia North interstation has been interrupted;

• An entrance semaphore (Temporary Control Panel) has been put into trial operation on the current route No. 1 towards Sofia North for the reception of trains on tracks 13g and 14;

• Tracks 13g and 14 have been put into trial operation.

In this regard, as of 08.05.2024 the following work organization has been introduced at Sofia Station:

I. A QUASAR Q4e type route-computer interlocking with temporary software manages the newly built facilities adjacent to tracks No. 1, 2, 2d, 4d, 3, 4, 5d, 1d and 6d, as well as entrance semaphores on current track No. 2 from Zaharna Fabrika Station, from a third parallel track at Nadezhda Technical Station, on current track No. 1 from Voluyak Station and from a single track from Poduyane Station, as follows:

1. The movement of trains in the Sofia - Zaharna Fabrika interstation was ensured according to the rules of the telephone method and a single railway line on current track No. 2:

- from Sofia Station, trains were sent with an invitation signal to the exit semaphore, controlled via the RCI;
- at Sofia station, trains were accepted with an invitation signal at the entrance semaphore controlled via the RCI;
- from Zaharna Fabrika station, trains were sent with a regularly open exit semaphore via the RCI type "Russian block" and an order given by the traffic controller on duty;
- at Zaharna Fabrika station, trains were accepted with regularly open entrance and warning semaphores via the MCC type "Russian block";

2. The movement of trains on the Sofia - Poduyane passenger interstation was ensured according to the rules of the telephone method and a single railway line;
- from Sofia station, trains were sent with an invitation signal at the exit traffic light controlled via the RCI;
- at Sofia station, trains were accepted with an invitation signal at the entrance semaphore controlled via the RCI;
- from Poduyane passenger station, trains were sent without an exit signal with an order given by the traffic controller on duty;
- at Poduyane passenger station, trains were accepted with entrance and warning semaphores through the PVU.
3. The movement of trains in the Sofia - Voluyak interstation on current route No. 2 was ensured according to the rules of the telephone method and a single railway line on current route No. 2;
- from Sofia station, trains were sent with an invitation signal at an exit semaphore, controlled through the RCI;
- at Sofia station, trains were accepted with an invitation signal at an entrance semaphore, controlled through the RCI;
- from Voluyak station, trains were sent with a regularly open exit semaphore through the RCI type MN-70 and with an order from the traffic manager on duty;
- at Voluyak station, trains were accepted with regularly open entrance and warning semaphores through the RCI type MN-70;
4. The movement of shunting and isolated locomotives to and from the Sofia Locomotive Depot was carried out on 41 tracks according to a prepared and approved Instruction;
5. The movement of shunting trains from and to the Nadezhda Technical Station on the 3rd parallel track was ensured according to the rules of the telephone method and a single railway line;
- from Sofia Station, shunting trains departed with an invitation signal at the exit semaphore;
- at Sofia Station, shunting trains were accepted with an invitation signal at the entrance semaphore;
6. Shunting movements were carried out without shunting signals according to a prepared and approved Instruction;
7. In accordance with a regulation issued by the Railway Administration Agency of 23.09.2014, the speed of all trains and vehicles at Sofia Station was limited to 25 km/h;
8. The signalling equipment operated with a controlled command for invitation signals of the entrance and exit semaphores according to the protocols approved by the General Director of the State Enterprise NRIC dated 30.04.2024 and 08.05.2024.
II. Temporary control panel for the entrance semaphores from the current track No. 1 towards Sofia North for receiving trains on tracks 13 and 14 (equipped with switches No. 112 and No. 116, which are equipped with manual switch reversing devices):

1. The movement of trains in the Sofia - Sofia North interstation was ensured according to the rules of the telephone method and a single railway line on the current track No. 1;
- from Sofia station, trains were sent without an exit signal from the 13th "deaf" or 14th tracks, by order of the traffic manager on duty;
- at Sofia station, trains are accepted with a regular input signal, controlled via the PVU.
- from Sofia North station, trains are sent with a regularly open exit traffic light through the RCI type "Russian block";
- at Sofia North station, trains were accepted with a regularly open input signal through the RCI type "Russian block".

Employees on shift at railway enterprises on 28.05.2024
• At Sofia station, employees of SE NRIC:
- Traffic manager / dispatcher at the station;
- Traffic manager first person of the RCI (two people);
- Traffic manager second person (two people);
• At Sofia station, employees of BDZ-PP EOOD:
- Traffic manager / shift manager;

- Locomotive driver of locomotive No. 98520055057-4 (II shunting);
- Shunt operator of II shunting;
- Switchman, shunter on the 2nd shunting;
- Switchman, shunter on the 2nd shunting;
- Technician, mechanic, wagon inspector;
• At the Nadezhda Technical Station, employees of BDZ-PP EOOD:
- Traffic manager at Post No. 13;
- Traffic manager at Post No. 14;
- RRS cleaner at the Nadezhda Technical Station;
- RRS cleaner at the Nadezhda Technical Station;
• Train crew of FT No. 1621 of BDZ PP EOOD:
- Driver/locomotive first person of locomotive No. 91520044063-3;
- Driver/locomotive second person of locomotive No. 91520044063-3;
- Train manager, passenger traffic of FT No. 1621;
- Conductor of FT No. 1621;
• In the Sofia Railway Transport Authority, staff of the State Enterprise NRIC:
- Senior Train Dispatcher;

At 14:30 p.m. in the Book of the Condition of the RCI with temporary software, model VII-51 at Sofia station, the duty manager first recorded a failure of switch No. 90, which occurred during a set exit route for sending FT No. 10208 from the sixth dead track along the current route No. 2 to Voluyak station. This, in turn, led to significant difficulties in the operational situation with regard to the performance of the shunting activity to release the fourth track from the composition of FT No. 8610 (including operations to remove the train locomotive, feed the shunting locomotive and transport the coaches from the train composition to the Nadezhda Technical Station), as well as the sending of FT No. 10208 to release the sixth dead track.

Around the same time, the Traffic Manager/Shift Manager at the Nadezhda Technical Station had a telephone conversation with the Traffic Manager/Dispatcher at the central post at Sofia Station regarding the organization of composing and transporting the shunting trains with coaches for upcoming departing trains, with which he was informed about the damage to switch No. 90 and that at the moment no other shunting train could be “taken from the Nadezhda Technical Station”.

At 16:00 p.m., after the damage to switch No. 90 was repaired, an entry was made in Book No. VII-51 about the status of the RCI with temporary software at Sofia Station. After the restoration, the same was operating normally.

The conversation between the latter two has been restored again and at Sofia station shunting trains with coaches for departing trains could be accepted, the trains for FT No. 1621, "pushing" with a diesel locomotive on the 1st shunting and FT No. 3625, "pulled" with a diesel locomotive on the 2nd shunting have been prepared.

The damage to switch No. 90 has led to a delay in the composition of the trains for FT No. 1621 and for FT No. 3625 from the Nadezhda Technical Station to Sofia station.

At 16:10 p.m., the traffic controllers on duty at the Nadezhda Technical Station and at Sofia station ensure the movement of a shunting train, including four coaches for FT No. 1621, pushed by a diesel locomotive on the 1st shunting, ready to depart at 16:15 p.m. The train was accepted on the first receiving-departing track and the train was composed in the eastern part of the track at 16:25 p.m., after which the shunting locomotive was promptly overtaken by the first receiving-departing track, and at 16:27 p.m. a train locomotive No. 91520044063-3 was attached to the train, to service FT No. 1621.

At that time, a shunting train of three coaches of FT No. 3625, headed by locomotive No. 98520055057-4 (II shunting), was prepared for departure at the Nadezhda Technical Station. The shunter and one shunting switchman boarded the last coach, and the other shunting switchman, together with two employees (cleaners of the RRS at the Nadezhda Technical Station) boarded the first coach, with the goal of the two women being to move to Sofia Station.

During the conversation between the two duty traffic controllers, the Traffic Controller/Dispatcher at Sofia Station ordered the duty traffic controller at Sofia Station to accept the

shunting train of the 2nd shunting on the first occupied track, and the same should have been located on the western side of the track until the departure of FT No. 1621, (given the facts described in his written testimony: "at 16:20 p.m. all tracks at Sofia Station were occupied by arriving trains and trains for departing", and that "the senior inspector had not asked me for permission to carry out a complete test of the train for FT 1621"). According to the approved Plan for Accepting Trains at Sofia Station, model II-24, FT No. 1621 and FT No. 3625 should have departed from the first receiving-departing track, respectively at 16:20 p.m. and 16:40 p.m.

During the movement of the shunting team between the Nadezhda Technical Station and Sofia Station, the Traffic Manager/Dispatcher at Sofia Station notified via the radio station on the II shunting channel that the shunting team would have been accepted on the first track, occupied by the FT No. 1621 train, and should have been located in the western part of the track, to which the shunter of the II shunting replied that the order had been accepted. The notification was also heard by the other members of the shunting team, as well as by the driver of locomotive No. 98520055057-4 of the II shunting (evident in their written statements, since they were all equipped with radio stations operating on the II shunting channel). In that way, a threelateral connection was established between the station dispatcher, shunter and driver.

After receiving the order, the traffic controller first person at Sofia station, through the RCI with temporary software, prepared and closed the route along the 3rd parallel track for the first receiving-departing track at Sofia station.

Around 16:30 p.m., the traffic controller/dispatcher at Sofia station, had a telephone conversation with the traffic controller/train dispatcher at the Sofia - Septemvri dispatching section in the Sofia Railway Station), regarding traffic regulation for FT No. 1621 and FT No. 3692, which is at the Poduyane passenger station, and received information from the traffic controller second person that a full test of the automatic brakes on FT No. 1621 has just begun. For that reason, the traffic controller/dispatcher at Sofia station gave an order to the traffic controller first person at Sofia station to ensure the departure of FT No. 3692 at the Poduyane station and for it to be accepted on the fifth blind receiving-departing track.

While these conversations were taking place, the shunting train of the 2nd shunting with the coaches for FT No. 3625, led by locomotive No. 98520055057-4, was moving along the assigned route, and after entering the first receiving-departing track at 16:30 p.m. at km 0+088, it collided with the last coach of the FT No. 1621 train and moved the entire train by 15 meters.

As can be seen from the Protocol of findings on the condition of the rail track, the visibility from the 3rd parallel track to the place of the collision on the first track at Sofia Station was 1146 meters.

It was evident from the testimony of the locomotive driver of locomotive No. 98520055057-4 on the 2nd shunting with the coaches for FT No. 3625, at a distance of 20-30 meters from the FT No. 1621 train, that he felt sick and lost consciousness.

As a result of the collision, the train driver of FT No. 1621 notified the persons on duty at BDZ-PP EOOD and reported to the emergency telephone number 112 about injured passengers from the train and personnel from the shunting team of the 2nd shunting.

At around 16:40 p.m., teams of Emergency Medical Aid, Fire Safety and Population Protection and bodies of the Regional Directorate of the Ministry of Interior arrived on the spot.

Medical assistance was provided on the scene to three passengers and five employees, including the locomotive driver of locomotive No. 98520055057-4 on the 2nd shunting.

3.1.2. Date, punctual time and location of the event.

The event occurred on 28.05.2024 at 16:30 p.m. in the eastern part of first track at km 0+088 in Sofia station. The track is with total length 750 meters in a straight line with inclination 0 ‰ (fig. 3.1).

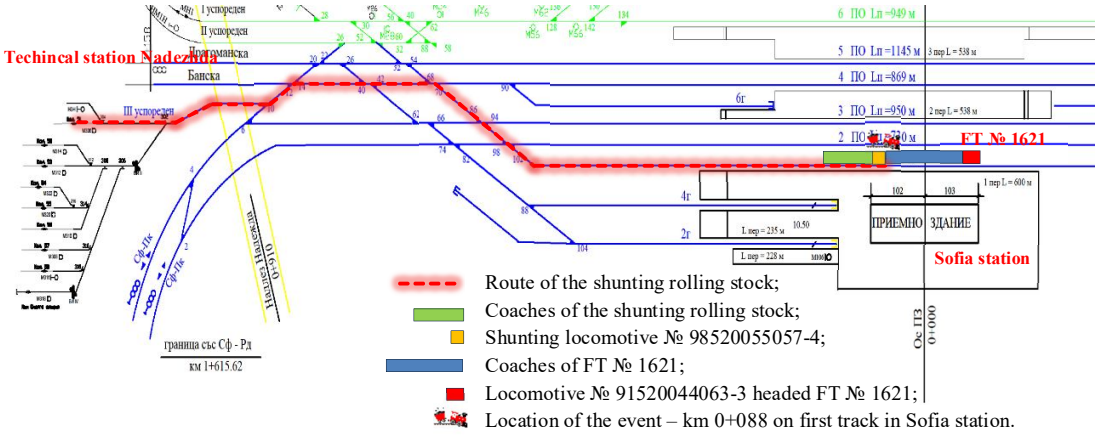

Fig. 3.1. Route of movement of II-nd shunting with shunting locomotive № 98520055057-4

3.1.3. Description of the event location:

3.1.3.1. Location of the place of the accident (fig. 3.2).

Geographic width: 42°42'45.71"N

Geographic length: 23°19'13.14"E

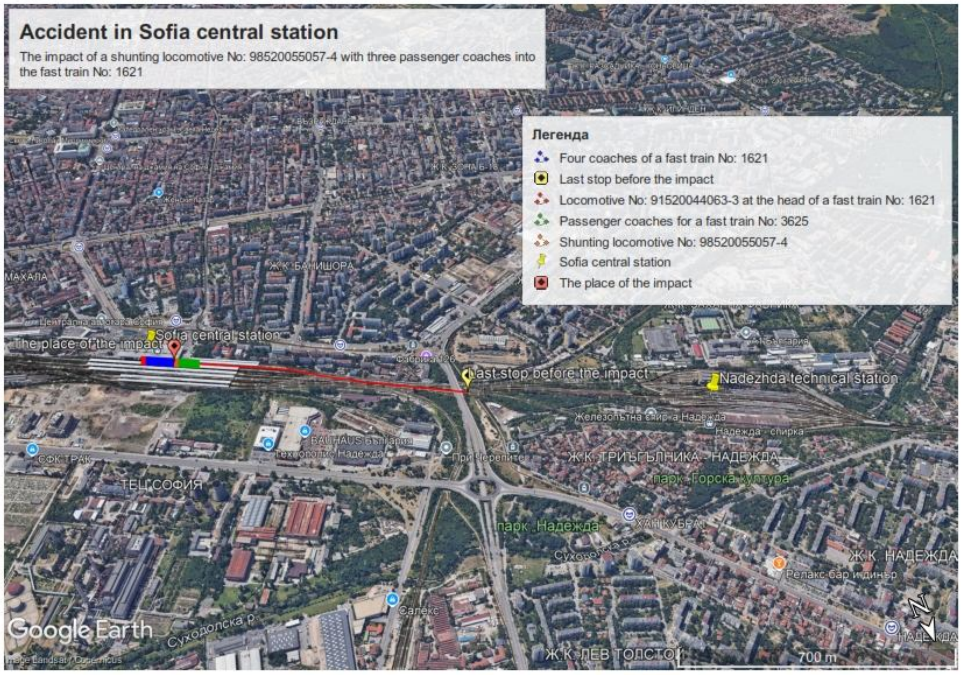

Fig. 3.2. GPS location of the accident in Sofia

3.1.3.2.Meteorological and geographic conditions at the time of the event on 28.05.2024.

- In the light part of the day – 16:30 p.m. (under data of the speedometer in locomotive № 98520055057-4);
- Air temperature: 19ºC;
- Weather – clear;
- Wind – 14 km/h, north-west;
- Average relative humidity 52 %;

- No registered rains.

3.1.3.3. Performance of construction activities on the site or in vicinity.

In implementation of project 2014-BG-TMC-0133-W "Development of the Sofia Railway Junction: Railway Section Sofia - Voluyak" under Contract No. 11274/30.10.2020 with subject "2017-OP-098 Design and construction for modernization of track construction at Sofia Central Station and railway section Sofia Central Station - Voluyak", as of 30.04.2024, Phase B of the construction and installation activities at Sofia Station has started.

In that regard, after successfully completed functional tests, a new signalling equipment has been put into trial operation - Route Computer Interlocking (RCI) type QUASAR Q4e with temporary software from the company "CAF Signalling".

Along with the RCI with temporary software, new tracks and adjacent switches Nos. 3, 4, 5d, 1d, 6d and a third parallel track for the Nadezhda Technical Station have been put into trial operation at Sofia Station.

Note: New tracks No. 1, 2, 2d and 4d were put into operation on 14.09.2022.

At the next stage of Phase B of the construction and commissioning of the above-mentioned project, starting from 08.05.2024, the organization of train and shunting work at Sofia station will be changed:

A QUASAR Q4e route computer interlocking with temporary software manages the newly built facilities adjacent to tracks No. 1, 2, 2d, 4d, 3, 4, 5d, 1d and 6d;

The movement of shunting trains from and to the Nadezhda Technical Station was provided along the 3rd parallel track according to the rules of the telephone method and a single railway line;

- from Sofia station, shunting trains departed with an invitation signal at an exit semaphore;
- at Sofia station, shunting trains are accepted with an invitation signal at the entrance traffic light.

Shunting movements were carried out without shunting signals according to an Instruction prepared and approved in the relevant manner and procedure.

In implementation of regulation No. 2014/009/10 of 23.09.2014 of the Railway Administration Executive Agency, Sofia station was signaled with signals for a speed limit of up to 25 km/h.

The RCI operated with a controlled command for invitation signals at the entrance and exit semaphores according to protocols approved by the Director General of the State Enterprise NRIC of 30.04.2024 and 08.05.2024.

As of 28.05.2024, no construction works have been carried out on the first receiving and dispatching track at Sofia station.

3.1.3.4. Fatalities, injuries, material damages:

3.1.3.4.1. Employees of the railway infrastructure manager or railway undertaking.

Traumas and injuries of five employees of the railway undertaking BDZ PP EOOD.

3.1.3.4.2. Other persons, officially related to the place of the accident.

None.

3.1.3.4.3. Passengers:

Traumas and injuries of three passengers in FT № 1621.

3.1.3.4.4. External persons.

None

3.1.3.4.5. Freights, luggage and other property.

None.

3.1.3.5. Rolling stock, infrastructure and environment.

- Damages caused to shunting locomotive № 98520055057-4 – 1 635,18 BGN.;
- Damages caused to passenger coaches;

1. Coach № 50522974254-7 – first from the composition of FT № 1621 – 780,64 BGN.;
2. Coach № 50521974006-3 – second from the composition of FT № 1621 – 44 175,02 BGN.;
3. Coach № 50522974279-4 – third from the composition of FT № 1621 – 40 336,67 BGN.;
4. Coach № 50522145008-1 – fourth from the composition of FT № 1621 – 3 646,81 BGN.;

5. Coach № 61522044008-0 – first from the shunting composition of FT № 3625 – 3 646,81 BGN.;

6. Coach № 51521563006-9 – second from the shunting composition of FT № 3625 – 1 175,34 BGN.;

7. Coach № 61522044010-6 – third from the shunting composition of FT № 3625 – 735,97 BGN.

- Damages caused to the rail track – None;
- Damages caused to the catenary – None;
- Damages caused to the signaling equipment – None;
- Damages caused to the environment – None;
- **Total costs: 96 132,44** BGN**.**

3.1.4. Description of other consequences, including the event impact on the usual activity of the participants.

In the period from 16:30 p.m. to 20:30 p.m. on 28.05.2024 the railway infrastructure manager and the railway undertakings have generated additional costs for changing the train schedule and capacity in the section.

- Deviated trains of the railway undertakings – 2;
- Cancelled trains – 1 – 202,27 BGN.;
- Appointed trains of railway undertakings – None;
- Delayed passenger trains – 19 – 8501,05 BGN.;
- Costs for rehabilitation means – None;
- **Total other costs: 8703,32 BGN.**

3.1.5. Identity of the participants and their functions.

Railway infrastructure:

The National Railway Infrastructure Company provides equal and non-discriminatory access to all licensed and certified railway undertakings for the transport of passengers and cargo on the railway infrastructure of the Republic of Bulgaria.

Personnel of SE NRIC in relation to the accident:

- Train dispatcher in Sofia station;
- Traffic manager on duty I-st person in Sofia station (two employees);
- Traffic manager on duty II-nd person in Sofia station (two employees);

Railway undertaking:

BDZ PP EOOD has a license and a Single safety certificate, which guarantees performing of safe railway services for passenger transport along the railway network of the Republic of Bulgaria.

Personnel of BDZ PP EOOD involved in the accident:

- Engine driver, locomotive of shunting locomotive № 98520055057-4;
- Shunter servicing the composition of the II-nd shunting with locomotive № 98520055057-4;
- Shunting switchman of the II-nd shunting with locomotive № 98520055057-4 (two persons);
- Traffic manager on duty/Manager shift at BDZ PP EOOD;

3.1.6. Description of the respective parts of the railway infrastructure and signalling system:

3.1.6.1. Type of the track, railway switch, rail crossing etc

Sofia Station is the central railway station of the city of Sofia. The first track of the station has a useful length of 750 meters.

At the time of the accident, construction and installation works were being carried out at the station on all the facilities. The railway track is being renewed on all tracks, which currently have S49 rails, ST-4 sleepers and PAK 68 fasteners, with new U-60 type rails, ST-6 sleepers and SKL-14 fasteners. Given the construction and installation works being carried out, traffic was carried out on part of the tracks in the station, which hindered the train movement of arriving and departing trains, as well as the

shunting activity when composing and decomposing train sets. The tracks on which train movement and shunting activity were provided are in blue (Fig. 3.3).

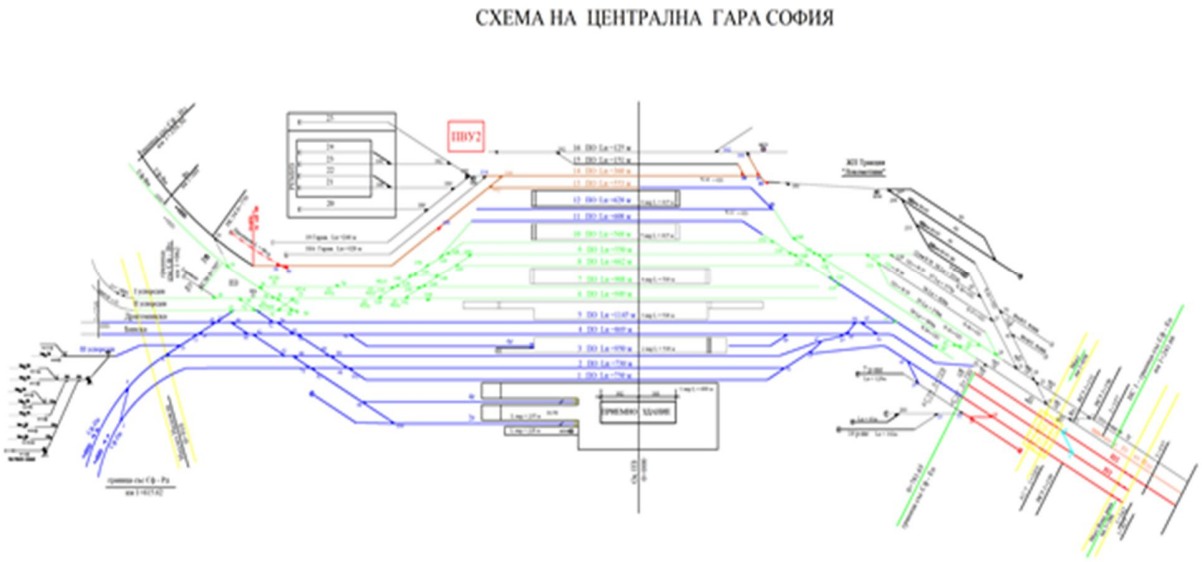

Fig. 3.3. Scheme of Sofia station at 28.05.2024

The operational activity in Sofia station is performed on:

- 11 acceptance-departure tracks;
- 5 head acceptance-departure tracks;
- 2 passing tracks;
- 1 track for connection with Sofia locomotive depot.

At the time of the accident, the activity in Sofia station was performed on:

- 5 acceptance-departure tracks: №№ 1, 2, 3, 4 and 5;
- 5 head acceptance-departure tracks №№ 2^{g}, 4^{g}, 5^{g}, 1^{g} and 6^{g}.

3.1.7.1. Interstation block system, station interlocking, type of signalling and messages.

Interstation block system

The movement of trains in the adjacent neighboring stations from Sofia Station to Poduyane Station, Voluyak, Sofia North, Zaharna Fabrika and Nadezhda Technical Station is provided according to the rules of the telephone method on a single railway line;

Interlocking

Sofia Station is equipped with a QUASAR Q4e Route Computer Interlocking - control with temporary software (Fig. 3.4). Shunting movements in the station are carried out with invitation signals on the tracks and manual signals given during shunting.

Post No. 13 of the Nadezhda Technical Station is equipped with a Russian block type RRI.

Sofia Station also operates with temporary control panels that are not related to the accident.

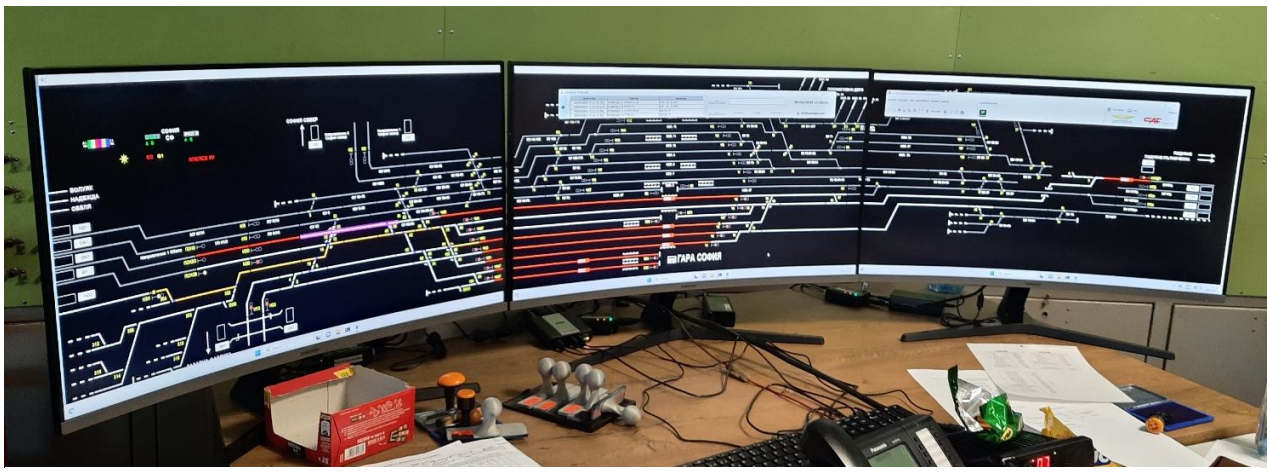

Fig. 3.4. RRI QUASAR Q4e – with temporary software for command and control of Sofia station

Type of signalling

Sofia Station is equipped with semaphores for speed signalling. The entrance and exit semaphores at Sofia Station only give invitation signals. The reception and dispatch of trains at the station from all directions is carried out with invitation signals.

The shunting semaphores at Sofia Station are turned off (unlit) and the movements of the shunting trains are carried out by giving manual signals.

Messages

The communications (incoming and outgoing) between Sofia Station and Nadezhda Technical Station are carried out via a railway telephone network of the UKSS and DIKORA type;

The station and the neighboring inter-stations are equipped with a train dispatcher radio link (TDRC), with the help of which radio connections are established between the locomotive drivers with the traffic controller on duty, with the train dispatcher, with individual stations and with the trains in the respective section - not working;

Communications between the station and the shunting crews when carrying out shunting activities at Sofia Station are carried out with ALAN HM-06 type radio stations for fast radio connections;

Locomotive No. 91520044063-3 is equipped with TDRC;

The locomotive driver of locomotive No. 98520055057-4 is equipped with an ALAN HM-06 type radio station for fast radio connections;

3.1.7.2. Train protection systems.

Sofia Station does not have train protection systems.

Locomotive No. 91520044063-3 is equipped with a vigilance device, a tape tachograph type "Hasler RT9" and a tachometer type "Hasler A16" - in working order.

Locomotive No. 98520055057-4 is equipped with a vigilance device (insulated), a tape tachograph type "Hasler RT12" and a tachometer type "Hasler A28" - in working order.

3.1.8. Other information referring the event.

3.1.8.1. Train documents of locomotive № 98520055057-4.

The train documents „Way-bill“ (fig. 3.6 and 3.7) correspond to the movement of the locomotive from the presented data;

Brake Mass Certificate VP-11 for the composition of FT № 3625, serviced by II-nd shunting was not found in the locomotive cabin.

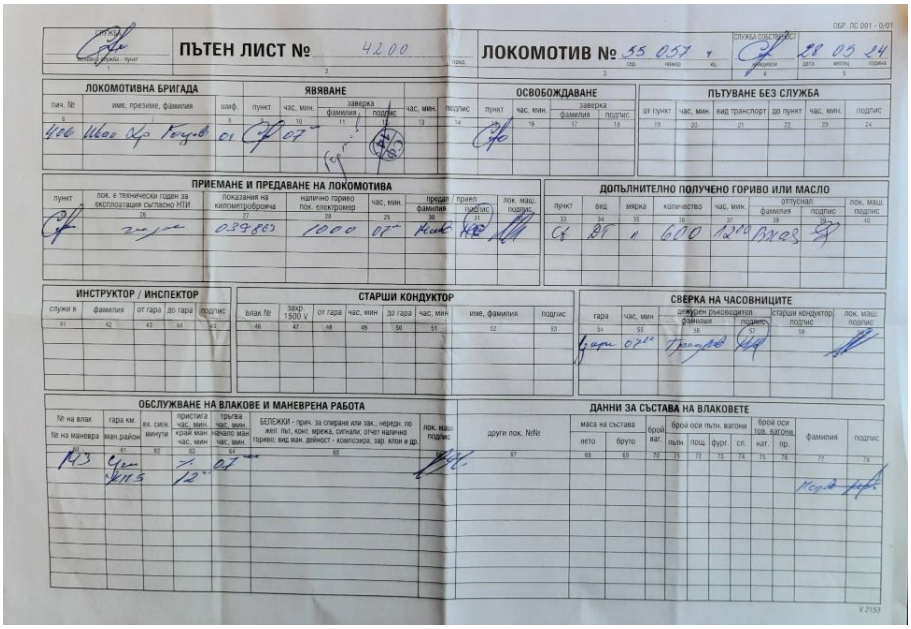

Fig. 3.6. Waybill of locomotive № 98520055057-4 – front part

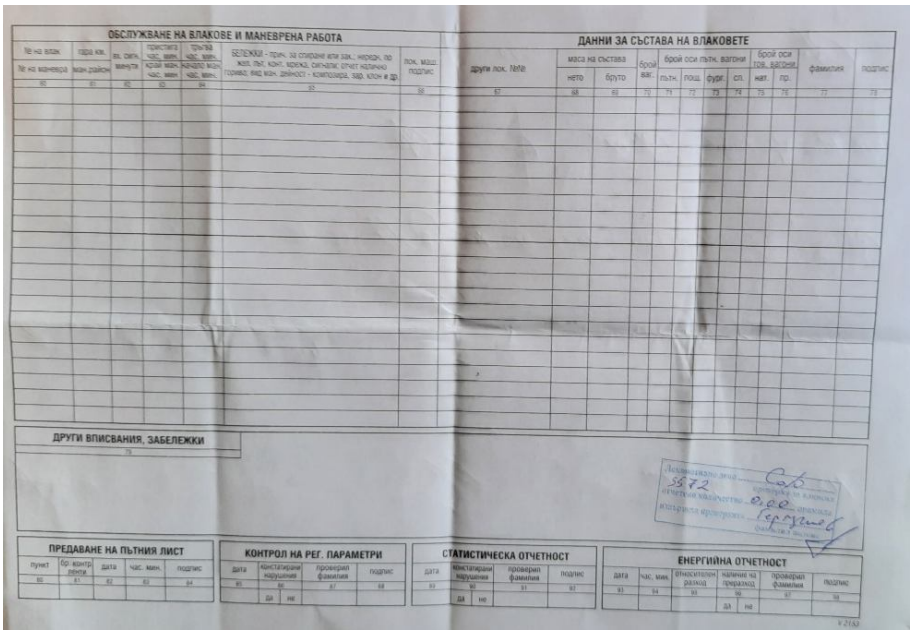

Fig. 3.7. Waybill of locomotive № 98520055057-4 – rear part

3.2. Factual description of the occurred.

3.2.1. Immediate sequence of events that led to the accident, including:

3.2.1.1.Actions that the involved in the event persons undertook.

At 16:00 p.m., the duty traffic controller 1st person entered in Book no. VII-51 the status of the RCI with temporary software at Sofia station that switch No. 90 was damaged. For that reason, from 14:30 p.m. to 16:00 p.m., shunting trains from and to the Nadezhda Technical Station were not accepted at Sofia station due to the untimely removal of the damage by a SE mechanic.

A telephone conversation was held between the dispatcher at Sofia station and the duty traffic controller at Post No. 13 of BDZ PP EOOD that only shunting trains for departing passenger trains would be accepted at Sofia station. FT No. 1621, "pushing" with a diesel locomotive on the first shunting, and FT No. 3625, "hauled" with a diesel locomotive on the second shunting, were proposed for Sofia station.

At 16:10 p.m., the traffic controllers on duty at the Nadezhda Technical Station and at Sofia Station ensured the movement of a shunting train, including four coaches for FT No. 1621, powered by a diesel locomotive on the first shunting. At 16:25 p.m., the train was accepted on the first receiving-departing track at Sofia Station in the eastern part of the track. The shunting locomotive was overtaken on the first track and at 16:27 p.m., a train locomotive No. 915200440633 was attached to the FT No. 1621 train.

After these shuntings were completed, the station dispatcher at Sofia Station notified the information service at BDZ-PP EOOD, "that FT No. 1621 will depart from the first track east with a 10-minute delay". The information was entered into the electronic boards of the station and communicated via the passenger information system of the station. Thus informed passengers headed to board and accommodate themselves on the train.

At that time, at the Nadezhda Technical Station, a second shunting train consisting of three coaches for FT No. 3625, hauled by locomotive No. 98520055057-4, was prepared for departure.

At 16:20 p.m., the traffic controllers on duty at the Nadezhda Technical Station and at Sofia Station ensure the movement of the second shunting train consisting of three coaches for FT No. 3625, hauled by locomotive No. 98520055057-4. The shunter and the shunting switchman boarded the last third coach, and the second shunting switchman and the two employees at the Nadezhda Technical Station boarded the first coach (two cleaners, used the movement of the shunting train to Sofia Station).

The station dispatcher at Sofia station ordered the duty traffic manager I at Sofia station to accept the shunting train of the II shunting on the first track, which should have been established westwards until the departure of FT No. 1621, (it is evident from his written testimony that "at 16:20 p.m. the operating tracks at Sofia station were occupied and the TMWI did not request written permission to carry out a full test of the train for FT No. 1621). In the logbook form II-76 kept by the TMWI at Sofia station from 08.05.20224 there was no telephone message recorded for carrying out Test A of departing trains. Test A of the train brakes began with a verbal order from a station employee at Sofia station (Fig. 3.8, 3.9, 3.10).

Fig. 3.8. Logbook for telephone grammes of the wagon-inspection section in Sofia station

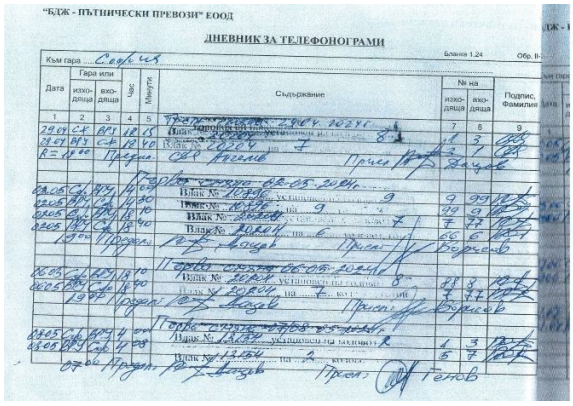

Fig. 3.9. Logbook for telephone grammes of the wagon-inspection section in Sofia station

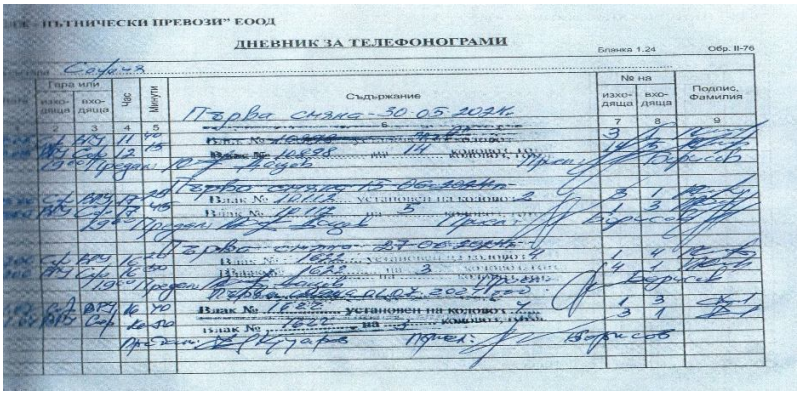

Fig. 3.10. Logbook for telephone grammes of the wagon-inspection section in Sofia station

According to the approved Plan sample II-24 for the reception and dispatch of trains at Sofia Station, FT No. 1621 and FT No. 3625 departed from the first track according to the schedule at 16:20 p.m. and 16:40 p.m., respectively.

During the movement of the shunting train between the Nadezhda Technical Station and Sofia Station, the station dispatcher at Sofia Station informed via the radio station on the channel for the 2nd shunting that the shunting train would be received on the first track, occupied by FT No. 1621, and must be located on the track, west side. The shunter responded that the order has been accepted. The order was also heard by the other members of the shunting crew, as well as by the locomotive driver of the 2nd shunting (as evident from their written statements).

After receiving the order, the duty traffic controller at Sofia station first person undertook manipulations with the RCI with temporary software to accept the shunting team from the Nadezhda Technical Station on the 3rd parallel track of the first track at Sofia station.

At around 16:25 p.m., the station dispatcher at Sofia station held a telephone conversation with the train dispatcher of the Sofia - Septemvri section at the Sofia Railway Station, regarding the organization of the departure of FT No. 1621.

At around 16:28 p.m., the station dispatcher at Sofia station had a radio conversation with the second person traffic controller at the station, from whom he learned that test A of FT No. 1621 had now begun. For that reason, the station dispatcher at Sofia station ordered the first person traffic controller on duty to organize the reception of FT No. 3692 from Poduyane station on the fifth front track at the station.

While these conversations were taking place, the shunting crew of the second shunting, led by locomotive No. 98520055057-4, moved along the assigned route, and after entering the first track, it did not stop on the western side of the track, but continued its movement.

At 16:30 p.m., the shunting crew of the second shunting collided with the last coach of FT No. 1621 during test A and moved the entire composition about 15 meters forward.

3.2.1.2. Rolling stock and technical facilities functioning.

The locomotive and the coaches of FT № 1621, composed on the first track, were technically sound.

The passenger coaches in the composition of the II-nd shunting were technically sound for composing FT № 3625.

Locomotive № 98520055057-4 was not technically sound (unsealed non-working vigilance device – evident from the testimonies of the locomotive driver) (fig. 3.11).

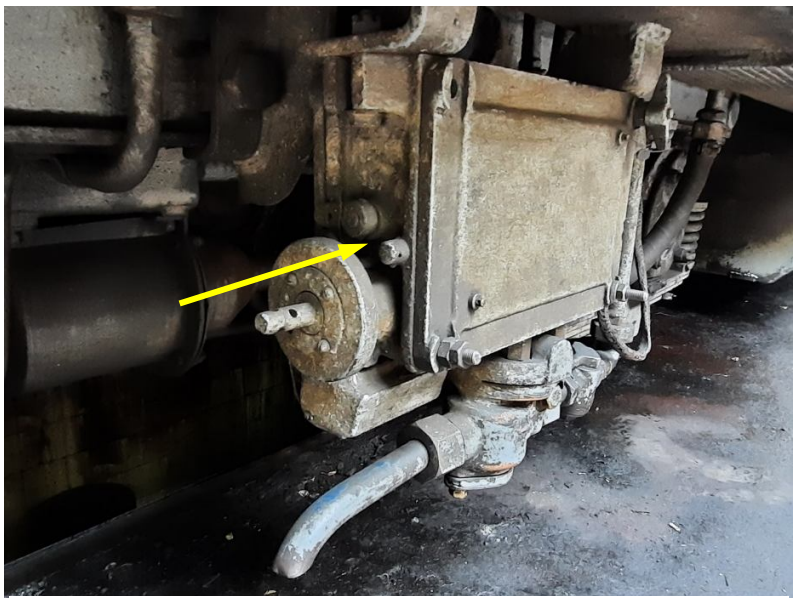

Fig. 3.11. Vigilance device of locomotive № 98520055057-4 – unsealed

The locomotives and coaches are with regular registration in the European Vehicle Register (EVR).

3.2.1.3. Operational system functioning.

Sofia station is equipped with Route Computer Interlocking QUASAR Q4e – handling with a temporary software. The shunting activities in the station are performed with inviting signals on the tracks and manual signals given in a case of shunting (fig. 3.12).

Fig. 3.12. Reserve monitors of RCI QUASAR Q4e – handling with a temporary software in Sofia stations

Sofia Station also operates with temporary control panels that are not related to the accident.

After the accident, train traffic on the first track at Sofia Station was stopped from 16:30 p.m. to 20:30 p.m. on 28.05.2024.

There was a radio connection for managing shunting activities without the possibility of recording conversations between individual employees.

At Sofia Station, the organization of traffic was carried out by a station traffic controller, two duty managers, the first person at the RCI, and two duty managers, the second person at the platforms.

The movement of shunting trains from and to the Nadezhda Technical Station was carried out on a third parallel track by telephone on a single railway line.

• From Sofia Station, shunting trains departed with an invitation signal at an exit semaphore;

• At Sofia Station, shunting trains were accepted with an invitation signal at the entrance semaphore;

• From the Nadezhda Technical Station, shunting trains departed with a regular exit signal;

• At the Nadezhda Technical Station, shunting trains were accepted with a regular entry signal.

The movement of shunting trains between the two stations was carried out with open entrance and exit semaphores and according to prepared and approved Instructions:

• Instruction on the relations between the employees and workers of the State Enterprise NRIC Sofia Station and BDZ PP EOOD dated 27.02.2017;

• Instruction for receiving and sending trains at Sofia Station and performing shunting activities during construction works during phase "A" and under "B1" of phase "B" of the project: "Design and construction for the modernization of the track development of Sofia Central Station" dated 13.09.2022;

• Temporary instruction for receiving and sending trains at Sofia Station and performing shunting activities during the implementation of construction works of phase "B" of the project: "Design and construction for the modernization of the track development of Sofia Station" dated 23.04.2024;

• Instruction for ensuring the movement of trains and vehicles between Sofia Central Station and Technical Station Nadezhda post No. 13 (SF 4) dated 29.04.2024;

• Rules for the movement of trains and shunting activities in railway transport from 2020;

The operational system between Sofia Station and Technical Station Nadezhda on 28.05.2024 functioned normally until the subsequent order of the employees at Sofia Station to accept a second

shunting on the first track at Sofia Station, occupied by the composition of FT No. 1621, which was currently undergoing test A.

3.2.2. Sequence of the events from the beginning of the occurrence until the end of the rescue services actions:

3.2.2.1. Undertaken measures for protecting and guarding the event location.

At around 16:40 p.m., the bodies of the Second Police Department of the Ministry of Interior and the State Security Service of the Republic of Bulgaria arrived at the scene of the accident. The scene of the accident was isolated and guarded by the Ministry of Interior and restricted to the employees of the two entities present and to the passengers of the station. Only the bodies of the emergency and rescue services of the CRW, the Ministry of Interior, the NIS, and the head of the safety investigation at the NAMRTAIB were allowed on site.

3.2.2.2. Actions of the emergency rescue services.

At around 16:40, teams of Emergency Medical Service and Fire Safety and Civil Protection arrived at the scene of the accident at Sofia Railway Station.

The teams of the Emergency Medical Service on site provided assistance to five employees with abrasions and injuries, one from the transport crew of FT No. 1621, two from the shunting crew and two employees (cleaners of the RRS) during the journey in the first coach of the 2nd shunting.

In the interval 17:00÷17:08 p.m., a doctor from the Emergency Medical Service on site performed a medical examination of the locomotive driver of locomotive No. 98520055057-4, servicing the 2nd shunting, for which a protocol was issued with visible indicators within the norms.

The teams of the Emergency Medical Service on site provided assistance to three injured passengers from FT No. 1621 with abrasions and injuries from the subsequent collision on the train.

3.2.2.3. Actions of the emergency rehabilitation services

Non-applicable

3.2.2.4. Actions that SE NRIC and BDZ PP EOOD undertook for recovering the schedule and capacity along the railway line

On 28.05.2024, at around 20:30 p.m., the procedural and investigative actions of the investigative bodies in the pre-trial proceedings from the NIS and the investigative bodies for safety from the NAMRTAIB were completed at Sofia Station. The head of the Task force was given written permission to undertake the restoration of the traffic schedule and capacity at the station.

At 23:15 p.m. on 28.05.2024, after inspections and damage to locomotive No. 98520055057-4, the same was moved to the Sofia Locomotive Depot;

At 00:01 a.m. on 29.05.2024, after inspections and damage to the coaches of the FT No. 3625 train, the same were taken to the Nadezhda Technical Station;

At 02:00 a.m. on 29.05.2024 after inspections and damage to the coaches of the FT No. 1621 train, they were taken to the Nadezhda Technical Station.

Other coaches were provided for the trains of the two FTs No. 1621 and No. 3625.

4. Analysis of the event

4.1. Participation and responsibilities of the entities, involved in the event

4.1.1. Railway undertaking

Analysis of the movement of shunting locomotive № 98520055057-4.

Analysis of the movement of shunting locomotive No. 98520055057-4 on the 2nd shunting was made for the period from the departure from the Nadezhda Technical Station to the collision on FT No. 1621 on the first receiving-departing track at Sofia Station.

A decoding was made of the data recorded on the speedometer tape of locomotive No. 98520055057-4, at the head of the shunting train of three passenger coaches, operating as the second shunting at Sofia Station on 28.05.2024.

The registration of the main and most important parameters of the movement of the locomotive, respectively of the train, in speedometer installations of the "Hasler" system was expressed by recording on a speedometer control tape:

• Track speed (V-S);

• Astronomical time through a graph and printing on the tape, as well as travel and stay time (T diagram);

• Distance traveled for individual track sections (through perforations on the tape – 2.5 mm = 0.5 km);

The speedometer tape was checked to establish:

• The prescribed maximum speed for train movement;

• Is the speed limited under the prescribed speed when passing a section that must be traveled at a limited speed;

• Is the duration of movement at reduced speed observed, i.e. a distance equal to the length of the reduction plus the length of the entire train that must be traveled;

• Are there any unforeseen stops at the station;

• Are there any locomotive slippages noted;

• Availability of all records for the relevant TRRS.

Speedometer control tapes can also be used for other clarifications in train movement, namely:

• Delays in departure and arrival;

• Stopping at closed signals and at stations;

• When calculating energy consumption, etc.

Speedometer control tapes were considered a valuable objective document in the investigation of transport safety accidents and railway accidents.

Any falsification of the speedometer tape, intentional destruction or intentional interference with the clock or recording mechanism is considered a transport safety violation.

Locomotive No. 98520055057-4 is equipped with a "Hasler" type speedometer installation, which consists of a three-phase alternating current collector converter (geber), driven by one of the locomotive's axles. The resulting three-phase voltage with a variable frequency, depending on the speed of movement, drives the mechanical speedometer synchronous electric motors mounted on it. One speedometer is installed in the locomotive cabin: the recording device (tape tachograph) RT12 on control panel No. 1 (Fig. 4.1) and the non-recording device (tachometer) A28 on control panel No. 2 (Fig. 4.2). The two speedometers have a range of 0÷120 km/h.

The tape tachograph measures and displays on a clear dial the following data during the movement of the locomotive:

• Track speed in km/h;

• Time in hours and minutes;

• Total distance traveled in km (odometer);

The tachometer measures and displays on a clear dial the same data that the tape tachograph displays, without the distance traveled and without recording the information. It is electrically connected to the tachograph and in the event of a possible interruption of the power cable, both devices stop measuring the speed of movement.

The registering facilities of the tachograph RT12 register the following main parameters:

- Track speed in km/h;
- Astronomic time, as well as the travelling and the stopping time;
- The passed track for separate track sections.

Fig. 4.1. Tape tachograph RT12

Fig. 4.2. Tachometer A28

The registering (speedometer) tape is of waxed paper. It has linear fields for registering the

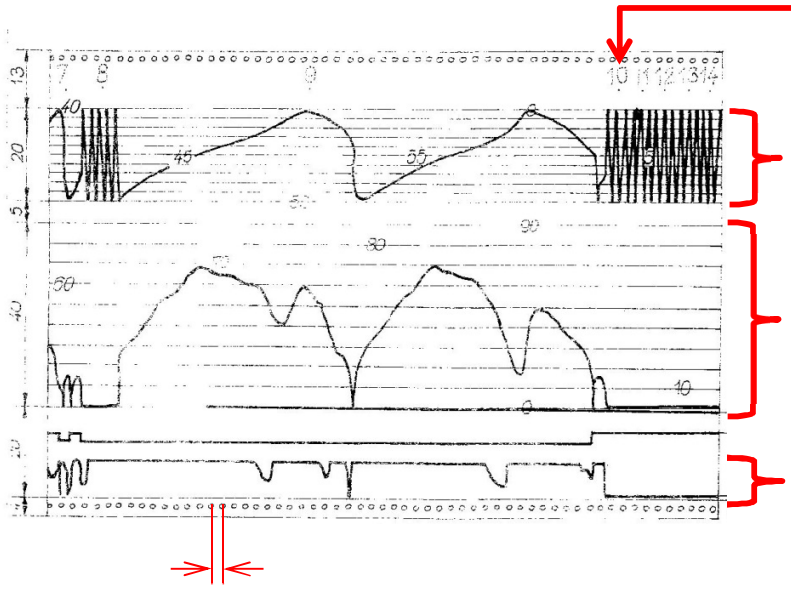

Fig. 4.3.

information, transmitted by the tape tachograph (fig. 4.3). The speedometer tape is a valuable objective source of data for the right definition of the start, duration and end of processes related to the movement.

On the speedometer tape are registered:

- The track speed in km/h;
- Astronomic time;

- Travelling time;
- Stopping time;
- The passed track for separate sections;
- Other data (non-obligatory).

It should be noted that the speedometer tape is graduated for a registration range of up to 150 km/h, and the speedometers installed on the shunting locomotive No. 98520055057-4 (see above) have a range of up to 120 km/h. For that reason, as well as due to the need for better clarity in the analysis, an additional scale is placed on the speed scale, graduated up to 120 km/h, which clearly and unambiguously shows the actual speed of the locomotive (Fig. 4.4, pos. 1). The speedometer tape was not stored carefully, which damaged its surface in the registration area and made it difficult to download data for analysis of the locomotive's movement.

The locomotive departed from the Nadezhda Technical Station at 16:20:00 p.m. (Fig. 4.4, pos.

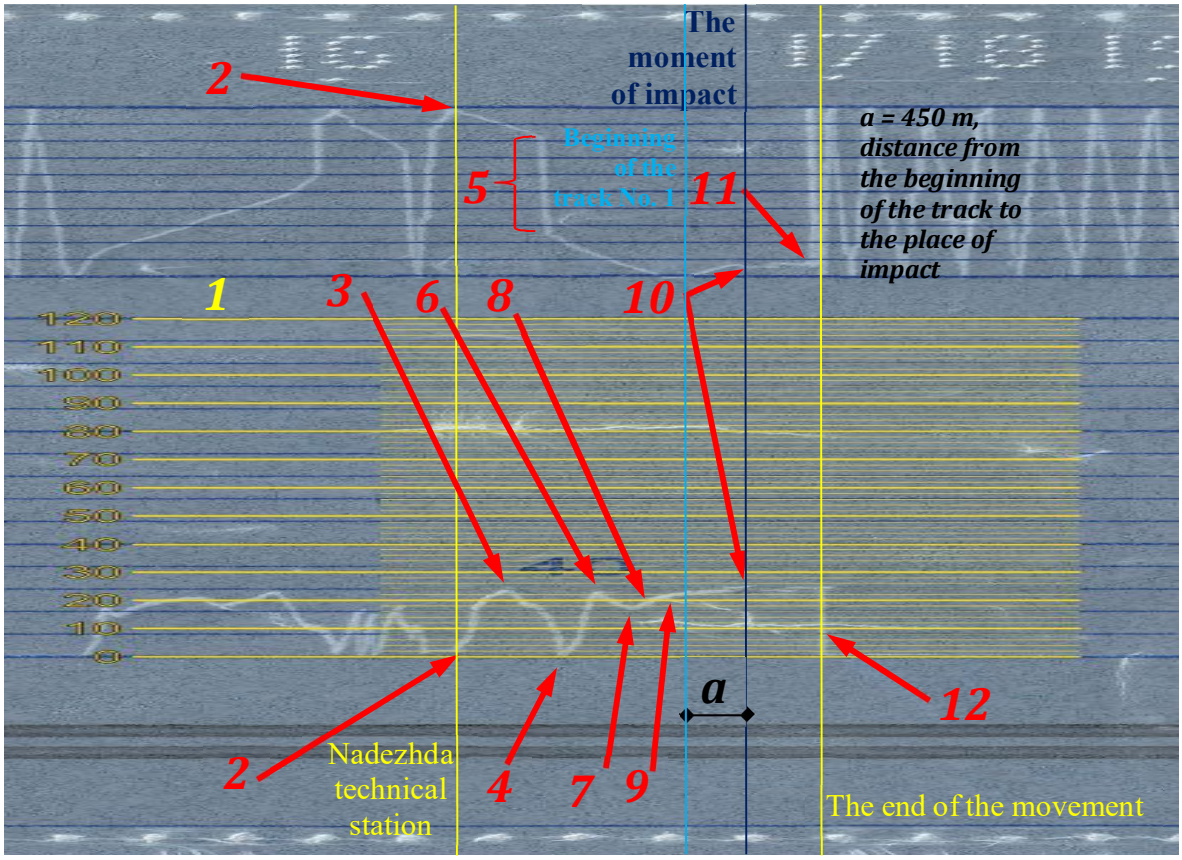

Fig. 4.4. Part of the speedometer tape of locomotive № 98520055057-4 with additional indications for facilitating the analysis

2), accelerated and its speed reached 24-25 km/h (Fig. 4.4, pos. 3), after which it immediately began to decrease: initially at a higher rate to about 19 km/h, then more smoothly to 15 km/h and again at a higher rate until a complete stop at 16:21:40 p.m. (Fig. 4.4, pos. 4), i.e. the train moved for 1 minute and 30 seconds, during which time it travelled about 660 meters. Apparently, the locomotive driver held it with the automatic train brake, which contributed to a faster establishment of the shunting train. The train stopped from 16:21:40 to 16:27:30 p.m. for 6 minutes and 50 seconds (Fig. 4.4, pos. 5).

At 16:27:30 p.m. the shunting train set off, accelerated to about 6 km/h more smoothly, and then to 23 km/h more steeply, and upon reaching a speed of 23 km/h (Fig. 4.4, pos. 6), it has traveled about 200 meters in about 35 seconds, the speed began to decrease, reaching about 16 km/h (Fig. 4.4, pos. 7), it travelled another about 200 meters in 45 seconds. After reaching 16 km/h, the speed began to increase again, and during the first 200 meters the increase was steeper to 22 km/h (Fig. 4.4, pos. 8), and then the angle of increase in speed decreased, i.e. the acceleration became smoother until reaching a speed of 24

km/h (Fig. 4.4, pos. 9), with the train traveling about 620 meters in about 1 minute and 15 seconds until 16:30:45 p.m. The total distance that the shunting train travelled from departure to the collision was about 1020 meters, traveled in 2 minutes and 35 seconds. From the moment the locomotive entered the first track until the moment of collision, the train traveled about 450 meters in about 35 seconds without the driver's reaction to reduce speed and stop (distance a in Fig. 4.4.).

From that moment, for a few millimeters of the speedometer tape, the recorders did not correctly register the speed and time caused by the collision of the locomotive on the stationary FT No. 1621. The registration of speed and time was restored after the action of the forces caused by the collision had passed (Fig. 4, pos. 10). That happened at 16:30:50 p.m. (Fig. 4.4, pos. 11), and the speed with a strictly vertical line indicated a decrease from 24 to 0 km/h (Fig. 4.4, pos. 12).

4.1.2. Infrastructure manager.

Analysis of the train movement organization in Sofia station.

The occurrence of the accident was due to technical and organizational reasons related to the movement of trains and shunting activities:

- Shunting locomotive No. 98520055057-4 on the 2nd shunting at Sofia station, operated with an inoperative insulated vigilance device;
- Untimely removal of the failure that occurred on switch No. 90 in the interval from 14:30 p.m. to 16:00 p.m., led to a violation of the TOS and Plan sample II-24;
- Constant work with a controlled command for working with invitation signals at the entrance and exit semaphores was of a high-risk nature, which led to a decrease in the vigilance of the station dispatcher and the first-person duty managers working with the RCI at Sofia station;
- The shunting crew was not distributed correctly and there was a lack of coordination in the activities of all those involved in performing the shunting;
- No measures were taken by the shunting crew to stop the shunting train after the train had not settled at the location indicated by the station dispatcher on the track;
- The connection of the relevant trains according to the Plan, sample II-24, was designed in such a way that it did not allow the acceptance of a shunting with two or more trains from the Nadezhda Technical Station to Sofia Station, which would depart from the same track;
- After violating the TOS, the operating personnel at the Nadezhda Technical Station and Sofia Station did not take measures to promptly remove the trains for FT No. 1621 and 3625 with one shunting movement. The composition of the trains of FT No. 1621 and 3625 with one shunting locomotive would have prevented the accident that occurred;
- The temporary organization of work and the tracks in operation at Sofia Station as of 28.05.2024 did not allow parallel movements of both shunting trains and arriving and departing trains;
- Locomotives at the Sofia Locomotive Depot from and to trains were accepted and sent only on one track.

Analysis of the work of the signaling equipment work in Sofia station

The QUASAR Q4e route computer interlocking, installed at Sofia station, has a device for archiving the status of the interlocking during its operation. The information about the status of the RCI for the period from 16:14 to 16:33 p.m., which was provided by the manufacturer of the RCI – CAF Signalling, was downloaded from that device:

- 16:14:20 p.m.: The train, stopped on the receiving-departing track 2, passed the red signal, Ch2, occupying the section SU 77-79 and continued through switch 79 (in position +) and switch 77 (in position -), until it occupied the switch section SU 67.
- 16:14:54 p.m.: The automatic switch reversal command (MAG/OC 79) was executed. Its new position was (-).
- 16:15:14 p.m.: An exit route from Ch4 to Poduyane was ordered, which changed the position of switch 77, for flank guarding the route. The new position of switch 77 was (+).
- 16:15:32 p.m.: The automatic route unlocking command (DAI/OM) on signal Ч4 has been successfully executed.

- 16:15:36 p.m.: The automatic turn signal reversal command (MAG/OC) was executed on switch 77. Its new position was (-).
- 16:16:44 p.m.: An input route has been ordered from signal H3H to signal CH1 (marked in yellow route).
- 16:17:14 p.m.: The train, stopped at switch section SU 67, occupied section SU 77-79 and returned back along switch 77 (in position -) and switch 79 (in position -) to track 1.
- 16:17:16 p.m.: The Open invitation signal (OCS/PS) command for signal H3H was executed. At that moment, the route has fulfilled the safety conditions for opening an invitation signal and therefore the command is accepted, the route was displayed in orange and the H3H signal turned on a white flashing display.
- 16:17:51 p.m.: The train, located on SU 77-79, continued its movement and occupied the section of the receiving-departing track 1. At that moment, the route no longer had safe conditions for opening an invitation signal, and therefore, the H3H signal was closed and turned on a red display – the route was displayed in yellow.
- 16:18:12 p.m.: The train, located in the section of the H3H line from 16:13:28 p.m., passed the H3H signal on red and ended the movement along the route to the receiving and departing track 1.
- 16:21:17 p.m.: At that moment, two trains were present on the receiving and departing track 1, the movements of which had already been described above.
- 16:26:08 p.m.: An exit route from H1 to Zaharna Fabrika was arranged on track 2 (marked in yellow route).
- 16:26:29 p.m.: The command for automatic unlocking of the route (DAI/OM) starting from the H1 signal has been successfully executed.
- 16:27:36 p.m.: The train, stopped on the receiving and departing track 1 (west side), passed the H1 signal on red and occupied the section of the 98-102 SU. It continued to move, occupying section SU 74-82-88 and ended the movement/route when the entire train occupied section MU 2-82 at 16:29:34 p.m.
- 16:29:43 p.m.: An entry route was ordered from signal H3H to signal Ch1 (marked in yellow route).
- 16:30:02 p.m.: The command: Insulation of a track section (TDC/PSPU) was executed, which allowed the reception of a train on an occupied 1 receiving-departing track, from the train whose movement has already been described above.
- 16:30:10 p.m.: The command: Opening an invitation signal (OCS/PS) on signal H3H was executed. The command was accepted because the only safety limiting condition (occupied target section – receiving-departing track 1) was deactivated by the execution of the Track Section Insulation (TDC/PSPU) command, executed in the previous point. The H3H signal turned on a flashing white display and the route was colored orange.
- 16:30:41 p.m.: The train located in the section MU H3H from 16:23:46 p.m. occupied the entry route from signal H3H to Ch1.
- 16:33:10 p.m.: The train moving along the entry route from signal H3H to Ch1 completely occupied the receiving-departing track 1 from the side of the SU 98-102. The receiving-departing track 1 was already occupied by the presence of another train from 16:17:51 p.m.

Condition of the signaling equipment systems at the time of the accident occurrence.
Route Computer Interlocking (RCI):

- System name QUASAR Q4e;
- Software version: Interim software of CAF Signalling;
- Available functions of the RCI:
    - o Electrical control and monitoring of all repaired and existing switches included for control by the RCI in phase 1;
    - o Control of freedom/occupancy of all switch and non-switch sections of the newly repaired and existing rail track included for control by the RCI in phase 1;

o Control of the prohibitory indication and the invitation signal of the entry and exit signals in the station controlled by the RCI in phase 1;
o Reception and dispatch of trains from/to all directions included in the RCI in phase 1, which was ensured by routes with an invitation signal. The routes were used to check the safety conditions:
o proper and correct final position of the switches participating in the route;
o vehicle-free condition of the track sections of the route;
o presence of flank guarding – respective position of guard switches and freedom of oversized sections;
o locked running and guard switches;
o Management and visualization of the facilities included in the RCI, through a human operator – machine interface.

Argument for RCI operation:

In implementation of project 2014-BG-TMC-0133-W "Development of the Sofia railway junction, Sofia - Voluyak railway section" under contract No. 11274/30.10.2020 with subject "2017-OP-098 Design and construction for modernization of track development of Sofia Central Station and railway section Sofia Central Station - Voluyak", as of 30.04.2024, Phase B of the construction and installation activities under it has been launched at Sofia Station, in which, after successfully completed functional tests, a new route computer interlocking (RCI), type QUASAR Q4e, has been put into trial operation.
Shunting semaphores - Off;
Shunting activity - Shunting movements were carried out without shunting semaphores, according to the currently valid Instruction in the relevant order and manner.
Rolling stock station speed – 25 km/h;
Automatic blocking in the Sofia – Nadezhda Technical Station – None;
Method of controlling train traffic between Sofia and Nadezhda Technical Stations – Telephone method.
Train radio communication: By radio station – conversations were not recorded;
Temporary control panels – temporary control panel (PCP) at the entrance semaphore from current route No. 1 Sofia North side, for receiving trains on tracks 13G and 14 (equipped with switches No. 112 and No. 116, which were equipped with manual switch reversing devices).
Invitation signals – They were used as an operational means of ensuring train and shunting traffic.
Vigilance control system – The vigilance control system in shunting locomotive No. 98520055057-4 was illegally turned off (Fig. 3.11)

Organization of the rail rolling stock operation:

Tracks on which train and shunting traffic was carried out

• Together with the RCI with temporary software, new tracks (and adjacent switches) 3, 4, 5G, 1G, 6G and a third parallel track - for the Nadezhda Technical Station (and adjacent switches) have been put into trial operation at Sofia Station.

Note: New tracks 1, 2, 2G and 4G were put into operation on 14.09.2022.

• Scope of action of the RCI from 08.05.2024:

o The RCI manages the newly built facilities adjacent to tracks 1, 2, 2G, 4G, 3, 4, 5G, 1G and 6G, as well as entrance semaphores from the current track No. 2, Sugar Factory side; from the third parallel road, towards the Nadezhda Technical Station; from the current track No. 1, towards Voluyak and from the current track, towards Poduyane.

Train operation organization:

Sofia – Zaharna fabrika – Sofia

The movement of trains in the Sofia - Zaharna Fabrika interstation was ensured according to the rules of telephone means in two directions on a single railway line on current track No. 2:

• from Sofia station, trains were sent with an invitation signal at an exit semaphore, controlled via the RCI;

• at Sofia station, trains were received with an invitation signal at an entrance semaphore controlled via the RCI;
• from Zaharna Fabrika station, trains were sent with a regularly open semaphore via the RCI type "Russian block" and an order given by the traffic controller on duty;
• at Zaharna Fabrika station, trains were received with regularly open entrance and warning semaphores via the RCI type "Russian block";

Sofia – Poduyane – Sofia

The movement of trains on the Sofia - Poduyane interstation was ensured according to the rules of the telephone method in both directions on a single railway line:

 from Sofia station, trains were sent with an invitation signal at an exit semaphore controlled via the RCI;
 at Sofia station, trains were received with an invitation signal at an entrance semaphore controlled via the RCI;
 from Poduyane station, trains were sent without an exit signal, with an order given by the traffic controller on duty;
 at Poduyane station, trains were received with regularly open entrance and warning semaphores via the TCB.

Sofia – Voluyak – Sofia

The movement of trains on the Sofia - Voluyak interstation was ensured according to the rules of the telephone method in two directions on a single railway line on the current route No. 2:

● from Sofia station, trains were sent with an invitation signal at an exit semaphore controlled by the RCI;
● at Sofia station, trains were received with an invitation signal at an entrance semaphore controlled by the RCI;
● at Voluyak station, trains were received with regularly open entrance and warning semaphores via the RCI type "MN-70";
● from Voluyak station, trains were sent with an exit semaphore via the RCI type "MN-70" and an order given by the traffic controller on duty.

Locomotive Depot Sofia

The movement of locomotives and shunting locomotives from and to the Sofia Locomotive Depot was carried out on 41 tracks, according to an Instruction approved in the relevant manner and procedure.

Sofia – Nadezhda Technical Station – Sofia

The movement of trains between the stations Sofia - Technical Station Nadezhda - Sofia was ensured according to the rules of telephone means in two directions on a single railway line on the III parallel track.

● from Sofia station, shunting trains were sent with an invitation signal at an exit semaphore, controlled via the RCI;
● at Sofia station, shunting trains were accepted with an invitation signal at an entrance semaphore controlled via the RCI;
● at Technical Station Nadezhda, shunting trains were accepted with regularly open entrance and warning semaphores via the RCI type "Russian Block";
● from Technical Station Nadezhda, shunting trains were sent with regularly open exit semaphore via the RCI type "Russian Block" and an order given by the traffic manager on duty.

Sofia – Sofia North – Sofia

The movement of trains in the Sofia - Sofia North interstation was ensured according to the rules of the telephone method in two directions on a single railway line on the current route No. 1:

 from Sofia station, trains were sent without an exit signal from 13 "deaf" tracks or 14 tracks, with an order given by the traffic controller on duty;
 at Sofia station, trains were received with a regular entry signal, controlled via the TCB;

 from Sofia North station, trains were sent with a regularly open exit semaphore via the "Russian Block" type RCI;
 at Sofia North station, trains were received with a regularly open entry signal via the "Russian Block" type RCI.

Sofia Locomotive Depot

The movement of insulated and shunting locomotives from and to the Locomotive Depot was carried out on track 14, according to an Instruction approved in the relevant manner and procedure.

Shunting activity in Sofia station

The shunting activity in Sofia station was performed through manual signals

Temporary control boards

Temporary control board/panel (TCB) was for receiving trains from Sofia North station on current track No. 1 on tracks 13G and 14 (equipped with switches No. 112 and No. 116, which were equipped with manual switch reversing devices).

Safety Assessment of the signaling equipment system

1. Report and list of events for 28.05.2024, issued by CAF Signalling – manufacturer of RCI type QUASAR Q4e with temporary software:

• Document name: Report and list of events for 28/05/2024;
• Document date: 05/06/2024;
• Document prepared by: CAF Signalling;
• Document author (name and signature): None;

2. Recording of the image on the monitor of the duty manager for 28.05.2024, in the interval from 14:55:01 p.m. to 15:49:40 p.m. – 240528_Incidente Via 1 280524.mp4:

• Interface language of the video recording system on the RCI screens: Spanish;
• Time: UTC +2/ Central European Summer Time (CEST);
• There is a difference of one hour from the time in the Republic of Bulgaria (UTC+3);

3. Date and time of the accident: 16.30 p.m. (relative to the speedometer tape):

● Route-computer interlocking type QUASAR Q4e with temporary software and other security equipment at Sofia station, which are not related to the accident;
● Analysis of the reliability of the technological process;
● The analysis of the reliability of the technological process was carried out in order to analyze the control complex *Human - Machine*;
● The person is a key factor in the above-mentioned complex and errors made in the operations carried out by the person can lead to dangerous failures in the entire control complex *Human - Machine*;
● In the case of the analyzed accident, we have a computer interlocking with a safety level of SIL 4 and despite this, a series of human errors were made, which led to the occurrence of the accident;
● From that point of view, the safety of the transport process was influenced by:
- Safety equipment devices;
- Proper compliance with the regulatory framework regulating the safe implementation of the technological process at the station;

Signalling equipment devices should not be considered in isolation, but as part of the *Human-Machine* complex. In the complex, the avoidance of errors made by humans can only be prevented by *strict compliance with the regulatory framework*.

Conclusion:

The analysis of the above-described events shows the admission of a series of errors caused by non-compliance and violation of regulatory acts, which led to the realization of a dangerous failure of the *Human-Machine* complex, due to the "Human" component.

4.1.3. Entities in charge of the technical maintenance.

Infrastructure manager

SE NRIC has a Certificate of a structure responsible for maintenance with EIN BG /31/0020/ 0003, valid from 01.07.2020 to 30.06.2025.

SE NRIC has a Certificate of a structure responsible for vehicle maintenance with EIN BG/31/0023/0001, valid from 22.03.2023 to 21.03.2028.

Railway undertaking

"BDZ-Passenger Transport" EOOD holds a Certificate of a structure responsible for maintenance with EIN BG /31/0021/0001, valid from 19/04/2021 to 18/04/2026;

4.1.4. Manufacturers or providers of rolling stock and railway products.

Non-applicable.

4.1.5. National Safety Authority.

Railway Administration Executive Agency is the National Safety Authority for railway transport in the Republic of Bulgaria.

4.1.6. Notified bodies or Risk assessment bodies.

"TINSA" EOOD owns Permit No. 002-2 for carrying out activities to evaluate activities of a subsystem or a part of a subsystem with the requirements of the national safety rules or with the technical rules, valid from 15.07.2021.

Scope of permission

Subsystems:

- Energy;
- Infrastructure;
- Control, command and signalling;
- Rolling stock - freight wagons;
- Rolling stock - locomotives and passenger rolling stock.

"TINSA" EOOD holds Certificate No. BG/36/0021/0001 for an assessment body for performing an independent assessment of the implementation of the risk management procedure and its results, valid from 05.02.2023 to 02.04.2026.

Scope of evaluation activities

Structural areas of the railway system:

- Infrastructure;
- Energy;
- Control, command and signalling on railway lines;
- On-board control, command and signalling;
- Rolling stock.

Functional areas of the railway system:

- Traffic operation and management;
- Maintenance;
- Telematic applications for freight and passengers.

Assessing the overall coherence of risk management:

- The organization;
- The methodology;
- Technical aspects necessary to assess the compliance and completeness of the risk assessments and the safety level of the system.

4.1.7. Certifying bodies of the entities in charge of the technical maintenance.

The Railway Administration Executive Agency as the National Safety Authority for railway transport performs certification of the entities in charge of the vehicles maintenance (ECM) in accordance with Directive 2004/49/EC and Regulation (EU) 445/2011, as per Ordinance No 59 on the railway transport safety management and on the maintenance functions in accordance with Directive 2004/49/EC and Regulation (EU) 445/2011.

From June 16, 2020 the RAEA performs certification of the ECM as per the Commission Implementing Regulation (EU) 2019/779 of 16 May 2019 laying down detailed provisions on a system of certification of entities in charge of maintenance of vehicles pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulation (EU) No 445/2011.

4.1.8. Persons or entities involved in the event, documented or not in the respective safety management systems or indicated in register.

Railway infrastructure

• SE NRIC implements Safety Procedure SP 2.09 "Methodology for determining, assessing and managing of the risk" version 05 effective from 01.03.2019, part of the SMS.

Railway undertaking

● BDZ PP EOOD implements the Procedure of "Integrated Management System" - P-2-15, "Management of Safety of Passenger Transportation. Monitoring and information" from 25.03.2024, and Safety Risk Assessment Methodology in BDZ PP EOOD from 2024.

4.2. Rolling stock and technical facilities.

4.2.1. Factors, deriving from the design of the rolling stock, railway infrastructure or technical facilities.

Non-applicable.

4.2.2. Factors deriving from the installation and placing into service of the rolling stock, railway infrastructure and technical facilities.

Non-applicable.

4.2.3. Factors deriving from manufacturers or another provider of railway products

Non-applicable.

4.2.4. Factors, deriving from the technical maintenance and/or modification of the rolling stock or the technical structures.

Non-applicable.

4.2.5. Factors due to the entity in charge of the technical maintenance, workshops for technical maintenance and other technical maintenance service providers.

Non-applicable.

4.2.6. Other factors or consequences considered as involved within the investigation objectives.

Non-applicable.

4.3. Human factor

4.3.1. Individual human characteristics:

4.3.1.1. Training and development, including skills and experience.

Railway undertaking:

• Locomotive driver of a shunting locomotive No. 98520055057-4 at BDZ PP EOOD:

Diploma No. 20068, professional qualification "Operation and repair of diesel locomotives", training conducted in the period 1980÷1983, training institution PZI "Todor Kableshkov", issued by PZI "Todor Kableshkov"

Certificate for driving a locomotive BG 71 2018 1548, issued by RAEA;

Certificate No. III-1340 for holding the position of "Locomotive driver" at BDZ PP EOOD, issued on 16.03.2023.

Additional certificate No. 71 2018 1548 from BDZ PP EOOD for rolling stock for which the driver is permitted to drive - series 52, 55, 07,00 from 22.03.2022 on the national railway infrastructure of the Republic of Bulgaria until 21.03.2025.

● Traffic Manager/Shift Manager at BDZ PP EOOD:

Certificate of competence No. 11206 acquired qualification for "Traffic Manager", training conducted in the period 15.09.2008÷11.02.2009, training institution PQC at BDZ, issued by the RAEA;

Certificate No. II-1754 for holding the position of "Traffic Manager/Shift Manager" at BDZ PP EOOD, issued on 02.08.2019.

● Shunting Operator of the 2nd shunting with shunting locomotive No. 98520055057-4 at BDZ PP EOOD:

Certificate of competence No. 10007 acquired qualification for "Shunter", training conducted in the period 27.02.÷25.04.1989, training institution PQC at BDZ, issued by PQC at BDZ;

Certificate No. II-2211 for holding the position of "Shunter" at BDZ PP EOOD, issued on 27.02.2020.

Railway infrastructure:

● Traffic Manager/Dispatcher at Sofia Station:

Diploma No. 22852, professional qualification "Eng. Transport Operator - Traffic Manager", training conducted in the period 1985÷1988, training institution VTU "Todor Kableshkov";

Certificate No. 6301 for holding the position of "Traffic Manager/Station Dispatcher" at the Sofia Railway Transport and Traffic Management Department from 01.03.2022.

● First Traffic Manager, First Person at Sofia Station:

Certificate of Competence No. 9711, acquired qualification "Traffic Manager", training conducted in the period 07.05. ÷ 12.09.2008, training institution PQC at SE NRIC, issued by RAEA;

Certificate No. 6305 for holding the position of "Traffic Manager" at the Sofia Railway Station, issued on 01.03.2022.

• Second Traffic Manager 1st person at Sofia Station:

Certificate of Competence No. 14852, acquired qualification for "Traffic Manager", training conducted in the period 02.07. ÷ 10.08.2012, training institution VTU "Todor Kableshkov", issued by the RAEA;

Certificate No. 6441 for holding the position of "Traffic Manager" at the Sofia TOCMD, issued on 01.11.2022.

4.3.1.2. Medical and personal circumstances, which influence the event, including the presence of physical and psychological stress.

Railway undertaking:

• Locomotive driver of a shunting locomotive No. 98520055057-4:

Single health information file dated 12.03.2024, issued by the National Multidisciplinary Transport Hospital - Sofia;

Conclusion: fit for a locomotive driver.

Psychological certificate No. 8/08.01.2024, issued by the Psychological Laboratory of Railway Transport Sofia at the National Multidisciplinary Transport Hospital - Sofia for a locomotive driver.

Conclusion: admitted for a period of 3 years.

● Traffic Manager/Shift Manager at BDZ PP EOOD:

Single health information file dated 08.06.2023, issued by the National Multidisciplinary Transport Hospital - Sofia;

Conclusion: fit for Traffic Manager/Shift Manager;

Psychological certificate No. 28/10.01.2023, issued by the Psychological Laboratory of Railway Transport Sofia at the National Multidisciplinary Transport Hospital - Sofia for a Shunting Operator.

Conclusion: admitted for a period of 3 years.

• Shunting Operator of the 2nd shunting with a shunting locomotive No. 98520055057-4 at BDZ PP EOOD:

Single health information file dated 16.06.2022, issued by the National Multidisciplinary Transport Hospital - Sofia;

Conclusion: fit for a Shunting Operator;

Psychological certificate No. 1105/20.10.2021, issued by the Psychological Laboratory of Railway Transport Sofia at the National Multidisciplinary Transport Hospital - Sofia for a Shunting Operator.

Conclusion: admitted for a period of 3 years.

Railway infrastructure:

● Traffic Manager/Dispatcher at Sofia Station:

Single health information file dated 14.04.2024, issued by the National Multidisciplinary Transport Hospital – Sofia;

Conclusion – fit for Traffic Manager/Dispatcher at Sofia Station;

Psychological certificate No. 253/22.02.2022, issued by the Psychological Laboratory for Railway Transport Sofia at the National Multidisciplinary Transport Hospital Sofia for Traffic Manager/Dispatcher at Sofia Station.

Conclusion: admitted for a period of 3 years.

● First Traffic Manager 1st Person at Sofia Station:

Single health information file dated 09.06.2023, issued by the National Multidisciplinary Transport Hospital – Sofia.

Conclusion – fit for Traffic Manager.

Psychological certificate No. 93/23.01.2024, issued by the Psychological Laboratory for Railway Transport Sofia at the National Multidisciplinary Transport Hospital Sofia for Traffic Manager.

Conclusion: admitted for a period of 5 years.

● Second Traffic Manager First Person at Sofia Station:

Periodic Medical Examination Card dated 06.06.2023, issued by the National Multidisciplinary Transport Hospital Sofia;

Conclusion: fit for Traffic Manager;

Psychological certificate No. 1004/20.08.2020, issued by the Psychological Laboratory for Railway Transport Sofia at the National Multidisciplinary Transport Hospital Sofia for Traffic Manager.

Conclusion: admitted for a period of 5 years.

4.3.1.3.Fatigue.

Railway undertaking:

● Locomotive driver of a shunting locomotive No. 98520055057-4:
Break: from 27.05.2024 at 19:00 to 28.05.2024 at 07:10
Started work: 28.05.2024 at 07:10 – (12 hours and 10 minutes)

● Traffic manager/Shift manager at BDZ PP EOOD:
Break: from 25.05.2024 at 19:00 to 28.05.2024 at 06:55
Started work: 28.05.2024 hour 06 minutes 55 – (35 hours and 05 minutes)

● Shunting operator of the 2nd shunting with shunting locomotive No. 98520055057-4:
Rest: from 26.05.2024 hour 07 minutes 00 to 28.05.2024 hour 07 minutes 00
Started work: 28.05.2024 hour 07 minutes 00 – (48 hours and 00 minutes)

Railway infrastructure:

● Traffic Manager/Dispatcher at Sofia Station:
Break: from 26.05.2024 at 07:00 to 28.05.2024 at 06:40
Started work: 28.05.2024 at 06:40 – (47 hours and 40 minutes)

● First Traffic Manager, First Person at Sofia Station:
Break: from 25.05.2024 at 19:00 to 28.05.2024 at 06:50
Started work: 28.05.2024 at 06:50 – (59 hours and 50 minutes)

● Second Traffic Manager, First Person at Sofia Station:
Break: from 26.05.2024 at hour 07 minutes 00 to date 28.05.2024 hour 06 minutes 40
Started work: 28.05.2024 hour 06 minutes 40 – (47 hours and 40 minutes)

4.3.1.4.Motivation and attitudes

Non-applicable

4.3.2. Work related factors:

4.3.2.1.Tasks planning.

Railway infrastructure

● SE NRIC –manager carries out maintenance, repair and operation of the railway infrastructure. Prepares a year-round timetable for the movement of all categories of trains on the main and secondary railway lines. Prepares schedules and timetables for additionally requested trains and vehicles submitted by the railway undertakings for movement on the railway network.

Railway undertaking

● "BDZ-Passenger Transport" EOOD - a national railway carrier that transports passengers according to an approved Train Movement Schedule and Plan for composing the trains under a contract for the carriage of passengers with the state.

4.3.2.2.Constructive particularities of the facilities that influence the connection human-machine.

Non-applicable.

4.3.2.3.Communication means.

Communication links at Sofia station with neighboring stations are implemented through UKSS-8 and Dikora.

Communication between the station dispatcher, the traffic controllers on duty at Sofia station, the first and second person, the locomotive driver of the shunting locomotive No. 98520055057-4 and the shunting crew is implemented with NM-06 type radio stations for fast radio connections between them.

The operational staff working in shift mode at the State Enterprise NRIC and BDZ PP EOOD are also provided with official mobile phones for communication.

4.3.2.4.Practices and processes.

Non-applicable.

4.3.2.5.Operation rules, local instructions, staff requirements, prescriptions for technical maintenance and applicable standards.

Railway infrastructure

● SE NRIC applies national and departmental regulations part of the SMS, relevant to the activities of the railway infrastructure manager:

- Working procedure RP 5.01-08 Rules for interaction between the operational services of SE NRIC and railway undertakings/carriers in the daily planning and management of trains on the railway infrastructure of SE NRIC;
- Working procedure RP 5.01-07 Instructions for work of switchman/posts at the operational points of SE NRIC;
- Working procedure RP 5.01-04 Instructions for work of the traffic manager on duty at the operational points of SE NRIC;
- Instruction VND – 1 for interruption and restoration of the operation of railway infrastructure sites managed by SE NRIC, when carrying out reconstructions, modernizations, renewals, rehabilitations and repairs;
- Instruction VND-130 for the movement of trains during reconstruction, modernization, renovation (renewal), rehabilitation and replacement (repair) within the framework of maintenance of railway infrastructure sites managed by SE NRIC.

Railway undertaking

● BDZ PP EOOD implements the national and departmental normative acts, which are part of the SMS in the Integrated Management System from 03.25.2024, which includes:

- Procedure P-2-8 – Repair and maintenance of traction rolling stock;
- Procedure P-2-6 – Management of transport activity;
- Procedure P-2-10 – Control and operation of the track transport system;
- Procedure P-2-11 – Repair control. Report and commissioning of TPRRS and passenger coaches;

- Instructions for the work of a locomotive driver and assistant locomotive driver in "BDZ-Passenger Transport" EOOD;

- Instruction on the order and method of performing the operational inspections of TPS MV;

- Prescriptions for the inter-repair runs and the cyclicality and planned inspections and repairs of ETPS and EMU - EOOD, PP_PLS 100/23.

4.3.2.6.Working time of the involved personnel.

• In accordance with the requirements for the implementation of Ordinance No. 50 of 28.12.2001. and the Labour Code:

The personnel involved in the accident at the SE NRIC works on a 12-hour work shift, for which a cumulative calculation of working time is applied (inter-shift breaks are respected).

The personnel involved in the accident of BDZ PP EOOD works on a 12-hour work shift, for which a cumulative calculation of working time is applied (inter-shift breaks are respected).

4.3.2.7. Risk treatment practices.

Railway infrastructure

● SE NRIC applies safety procedure SP 2.09 „Methods of evaluation, assessment and management of the risk „version 05 effective from 01.03.2019, which is part of the SMS.

Railway undertaking

• "BDZ-Passenger Transport" EOOD implements the following procedures:

- Methodology for safety risk assessment in BDZ PP EOOD;

- Quality procedure PK-2-15 "Safety management of passenger transport. Monitoring and exchange of information';

- Register of hazards during operation, repair and maintenance of road transport in BDZ PP EOOD.

4.3.2.8. Context, machinery, equipment and indications for shaping the working practices

Non-applicable.

4.3.3. Organizational factors and tasks:

4.3.3.1.Planning of the working force and the working load.

The entities BDZ PP EOOD and SE NRIC in accordance with the requirements of the European and national normative acts, the entities have approved methodologies and models of good European practices and professional experience. The work is planned and related to the staff directly responsible for the safety and operation of railway transport in accordance with the norms prescribed in the SMS.

4.3.3.2.Communications, information and teamwork.

Non-applicable.

4.3.3.3.Recruitment, staffing requirements, resources

Railway undertaking

• In BDZ PP EOOD, the selection of personnel is carried out according to an established "Human Resources Management System", which includes:

o Recruitment and selection rules;

o Rules for appointment and changes in employment relationships;

o Rules for staff training and development;

o Rules for ensuring HSWC, Ecology, and organization of the activity of STM.

The entity's personnel are selected and appointed with the relevant legal capacity, professional qualification and skills for working in the management and executive staff.

Railway infrastructure

• SE NRIC has an approved "Strategy for Human Resources Management 2021÷2025".

In the SE NRIC, the selection of personnel is carried out according to the established "Rules for recruitment, selection and appointment of personnel in the central administration of the SE NRIC" in force from 01.12.2020.

The recruitment, selection and appointment of personnel is carried out by the "Human Resources Management" department, which is responsible for:

- Recruitment;
- Maintaining a database of the personnel;
- Creation of a system of selection techniques for recruitment;
- Carrying out the selection together with the head of the unit;
- Documenting the process and communicating with staff;
- Appointment.

4.3.3.4.Implementation management and supervision

Non-applicable

4.3.3.5.Compensation (remuneration).

Railway undertaking:

● BDZ PP EOOD has approved "Internal rules for wages" effective from 03.12.2024, which regulate the general conditions for the organization of wages:

- Formation and distribution of funds for salary in the company;
- Determination and amendment of the basic salaries by position;
- Determination of the types and amounts of additional and other remunerations;
- Regulation of the order and manner of payment of staff salaries.
- Determination of minimum values and/or ranges of basic salaries.

Railway infrastructure

SE NRIC has approved "Internal rules for wages" in force from 01.09.2024, which regulate issues related to the wages of the company's personnel:

- General provisions for the organization of the salary in the entity;
- Determining and distributing the funds for wages - sources, order and way of forming the remuneration;
- Determination and amendment of wages and additional remuneration;
- Regulation, order and method of payment of wages.

4.3.3.6.Leadership, powers related issues.

Non-applicable.

4.3.3.7.Organizational culture.

Non-applicable.

4.3.3.8.Legal issues (including the respective European and national rules and provisions).

Non-applicable.

4.3.3.9.Regulatory framework conditions and safety management system application.

Railway undertaking.

• Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety;

• Commission Delegated Regulation (EU) 2018/762 of 8 March 2018 establishing common safety methods on safety management system requirements pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulations (EU) No 1158/2010 and (EU) No 1169/2010;

• COMMISSION IMPLEMENTING REGULATION (EU) 2019/779 of 16 May 2019 laying down detailed provisions on a system of certification of entities in charge of maintenance of vehicles pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulation (EU) No 445/2011;

• COMMISSION IMPLEMENTING REGULATION (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009;

• Railway Transport Act;
• ORDINANCE No 59 dated 5.12.2006 on the railway transport safety management.

<u>*Railway infrastructure.*</u>
• Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety;
• Commission Delegated Regulation (EU) 2018/762 of 8 March 2018 establishing common safety methods on safety management system requirements pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulations (EU) No 1158/2010 and (EU) No 1169/2010;
• COMMISSION IMPLEMENTING REGULATION (EU) 2019/779 of 16 May 2019 laying down detailed provisions on a system of certification of entities in charge of maintenance of vehicles pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulation (EU) No 445/2011;
• COMMISSION IMPLEMENTING REGULATION (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009;
• Railway Transport Act;
• ORDINANCE No 59 dated 5.12.2006 on the railway transport safety management.

4.3.4. Environmental factors:
4.3.4.1.Labour conditions (noise, illumination, vibrations).
Non-applicable for SE NRIC and BDZ PP EOOD.

4.3.4.2. Meteorological and geographic conditions.
Described in detail in item 3.1.3.2.

4.3.4.3. Construction works, performed on the spot or in very proximity.
Described in detail in item 3.1.3.3.

4.3.5. Any other significant factor for the investigation objectives.
Non-applicable.

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

4.4.1. Regulatory framework conditions.

Commission Delegated Regulation (EU) 2018/761 of 16 February 2018 establishing common safety methods for supervision by national safety authorities after the issue of a single safety certificate or a safety authorisation pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulation (EU) No 1077/2012

Commission Delegated Regulation (EU) 2018/762 of 8 March 2018 establishing common safety methods on safety management system requirements pursuant to Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulations (EU) No 1158/2010 and (EU) No 1169/2010

ORDINANCE No 59 dated 5.12.2006 on the railway transport safety management.

4.4.2. Processes, methods and results from the activities on the risk assessment and monitoring that the involved entities performed:
<u>*Railway undertaking.*</u>

● "BDZ-Passenger Transport" EOOD implements the Quality Management System PK 2-15 "Safety Management of Passenger Transportation. Monitoring and exchange of information." dated 25.03.2024. In section 6.7. "SMS implementation control, item 6.7.2. "Periodic control of the implementation of the SMS is carried out through internal audits: monthly and complex. Comprehensive audits are conducted once a year of all safety-related structures.'

● In accordance with the requirements of the "Methodology for safety risk analysis and assessment in force from 23.02.2012", the railway enterprise BDZ PP EOOD prepares and presents

monthly reports for the current year, as well as a complex (annual) audit report for the previous year regarding risk monitoring.

Railway Infrastructure Manager

SE NRIC implements a safety procedure PB 2.09 "Methodology for determining, assessing and managing risk" version 05 effective from 01.03.2019, which is part of the SMS.

4.4.2.1.Entities in charge of the technical maintenance.

Railway undertaking

● "BDZ-Passenger Transport" EOOD has a Certificate of a structure in charge of maintenance with EIN BG /31/0021/ 0001, valid from 19.04.2021 to 18.04.2026.

Railway infrastructure

● SE NRIC has a Certificate of a structure in charge of maintenance with EIN BG /31/0020/ 0003, valid from 01.07.2020 to 30.06.2025.

● SE NRIC has a Certificate of a structure in charge of maintenance of vehicles with EIN BG/31/0023/ 0001, valid from 22.03.2023 to 21.03.2028.

4.4.2.2.Producers and all other participants.

Non-applicable.

4.4.2.3.Reports for independent risk assessment.

No assessment has been made by an Independent Assessor (AsBo) of any changes in operating conditions or factors relevant to the occurred accident.

4.4.3. Safety management system of the involved:

Railway undertaking.

● "BDZ-Passenger Transport" EOOD implements the "Methodology for Analysis and Assessment of Safety Risk", which is part of the SMS.

Railway infrastructure.

● SE NRIC implements a safety procedure SP 2.09 "Methodology for determining, assessing and managing the risk" version 05 effective from 01.03.2019, which is part of the SMS.

4.4.4. Safety Management System of the entities in charge of the technical maintenance.

Railway undertaking.

● "BDZ-Passenger Transport" EOOD implements an approved "Safety Management System" effective from 27.09.2022, which regulates the technical maintenance of traction and non-traction rolling stock.

Railway infrastructure

● SE NRIC implements Safety Procedure WP 7.01 "Regulations for maintaining the signalling system (Signalling equipment)", which is part of the SMS;

● SE NRIC implements approved "Rules for current maintenance of a rail track" in force from 2021.

4.4.5. Results from the supervision, performed by the National Safety Authority.

The results of the performed audits and inspections regarding the functioning of the Safety Management System of SE NRIC and "BDZ-Passenger Transport" EOOD in accordance with the requirements of Regulation (EU) 2018/761, Regulation (EU) No. 1169/2010, Regulation No. 56 and Ordinance No. 59 to satisfy the specific requirements of European legislation and national rules for the design, maintenance and operation of the managed railway infrastructure, show that the companies maintain an SMS and can fulfil the requirements provided for in the relevant legal acts.

● *Railway infrastructure*

1. In the period from 25.04.2023 to 05.05.2023, the National Safety Authority (RAEA) carried out an annual planned supervision of the SMS of SE NRIC for the renewal of the Safety Certificate in accordance with Delegated Regulation (EU) 2018/762 of the Commission for the establishment of

common safety methods in relation to the requirements for SMS according to Directive (EU) 2016/798, no inconsistencies were found.

2. In the period from 22.04.2024 to 15.05.2024, the National Safety Authority (RAEA) carried out an annual planned supervision of the SE NRIC to establish common safety methods in relation to the requirements of the SMS according to Directive (EU) 2016/798 no discrepancies were found.

● *Railway undertaking*

In the period from 08/02/2021 to 19/02/2021, the National Safety Authority (RAEA) carried out a scheduled annual audit of the SMS of "BDZ-Passenger Transport" EOOD.

In the period from 22.11.2022 to 09.12.2022, the National Safety Authority (RAEA) conducted an audit under the SMS for the issuance of a unified safety certificate of "BDZ-Passenger Transport" EOOD.

In the period from 23.10.2023 to 03.11.2023, the National Safety Authority (RAEA) carried out a planned annual audit of the SMS of "BDZ-Passenger Transport" EOOD.

4.4.6. Permits, certificates and assessment reports, provided by the National Safety Authority or other Conformity Assessment Bodies:

4.4.6.1. Safety Authorization of the involved infrastructure manager.

● SE NRIC has a Safety Authorization IN EC BG 21/2023/0001, valid from 01/07/2023 to 30/06/2028;

4.4.6.2.Safety certificates of the involved railway undertaking.

●„BDZ-Passenger Transport" EOOD has a Single Safety Certificate with IN EC BG 10 2022 0298, valid from 31/12/2022 to 30/12/2027;

4.4.6.3.Certificate of Assessment body for risk assessment.

"TINSA" Ltd. holds Certificate EIN BG/36/0021/0001 of an assessment body for performing an independent assessment on the implementation of the risk management procedure, valid from 05.02.2021 to 04.02.2026.

4.4.6.4. Authorizations for placing in service of permanently fixed equipment and permits for placing on the market of vehicles.

Non-applicable.

4.4.7.Other system factors.

Non-applicable.

4.5. Previous similar cases.

Previous cases of a similar nature NIB – BG has not investigated.

5. Conclusions

5.1. Summary of the analysis for the event causes.

The Investigation Commission conducted several inspections of the accident site, the control room of the RCI at Sofia station, inspected locomotive No. 98520055057-4 at the accident site and in the Sofia Locomotive Depot.

The commission reviewed the documents and materials in the course of the investigation, analyzed the materials provided by the NIS and the Task Force and established violations of the applicable regulations.

Ordinance No. 58:

Art. 192.

„para. 1, It is prohibited to use locomotives, multiple unit trains and RSPM for train service, isolated movement or shunting activities with:“

„item 32 a malfunctioning, unsealed or sealed with irregular seals vigilance device, with the exception of the RRS, which according to Art. 179, para. 1 is not equipped with a vigilance device;“

Art. 253.

„para. 1 Shunting trains that move from one station to another are provided with a braking mass like a train".

„para. 2 In the cases under para. 1 of the shunting trains, an A test is performed".

TOSAR

Art. 396.

„para. 3 The shunting manager is obliged to:"

„ item 2. to know the plan and method of performing the shunting, to ensure proper distribution and coordination in the activities of all workers who participate in performing the shunting;"

„Art. 412. When performing a shunting, the locomotive crew is obliged to:"

„item 1. to ensure safe performance of the shunting and protection of the rolling stock;"

5.2. Undertaken measures after the event occurrence.

5.2.1. The railway infrastructure manager has taken the following measures after the occurrence of the event:

- An extraordinary briefing was held for the personnel responsible for traffic management and shunting work at Sofia station;
- Additional training was held for the personnel (station dispatchers and traffic managers) working with the QUASAR Q4e RCI with temporary software from the company CAF Signalling at Sofia station;
- A new "Instruction on the relations between the employees and workers of the State Enterprise NRIC Sofia Station and BDZ PP EOOD when performing shunting work, technical inspections and tests of trains" has been prepared, in force from 12.08.2024, which aims to improve safety in ensuring the movement of trains and shunting work.

5.2.2. BDZ PP EOOD has taken the following measures after the occurrence of the event:

- An extraordinary briefing was held for the personnel related to traffic management and shunting work at Sofia Station and Nadezhda Technical Station;
- An alarming safety bulletin was issued on 12.06.2024 for the accident that occurred, with which the personnel related to the management of the traction rolling stock and shunting work were familiarized;
- The locomotive driver who operated the shunting locomotive No. 98520055057-4 on the 2nd shunting on 28.05.2024, who allowed the accident to occur, is currently not working as a locomotive driver at BDZ-PP EOOD.

5.3. Additional findings of the Safety Investigation Commission.

The Safety Investigation Commission at the NAMRATIB was not provided by BDZ PP EOOD with an approved Technology for the work of the personnel and the activities at the Nadezhda Technical Station;

The shunting locomotive No. 98520055057-4, which served the 2-nd shunting on 28.05.2024, was allowed to operate with an inoperative, unsealed vigilance device;

Before departure from the Nadezhda Technical Station to Sofia Station, test A was not performed on the train of the 2nd maneuver with shunting locomotive No. 98520055057-4, pulling a train of three wagons for BV No. 3625;

The shunter did not fulfill his official duties during the movement of the shunting train from the Nadezhda Technical Station to Sofia Station in accordance with the requirements of the regulatory framework.

The investigation commission at the NAMRATIB established violations of the current Instruction between BDZ PP EOOD and SE NRIC on the date of the accident:

- Oral orders of the station dispatcher at Sofia station to the duty traffic controller first person to accept the shunting crew of the 2nd shunting with shunting locomotive No. 98520055057-4 on an occupied track at Sofia station from the crew of FT No. 1621, on which brake test A was currently being performed;

- Oral orders followed by the station dispatcher at Sofia station to the TMWI to perform test A on FT No. 1621, which in turn led to non-registration (exchange) of telephone messages between TMWI and the duty traffic controller) starting test A;

- TMWI started test A on FT No. 1621 before receiving written permission from the duty traffic controller at Sofia station, registered in logbook II-76;

- On 28.05.2024, no registered record of exchange of telephone messages between the TMWI and the duty traffic controller was found in the logbook II-76, Fig. 3.8, 3.9 and 3.10;

The Safety Investigation Commission at the NAMRATIB found in the approved Temporary Instruction of 23.04.2024 by the SE NRIC, concerning the time period of the construction work, passing into "Phase B", inconsistencies and omissions of texts regulating "Performance of technical inspections and full test of trains" of the tracks handed over for operation by the builder.

The Safety Investigation Commission at the NAMRATIB found that in 2017, a GSM-R system was put into operation at Sofia Station by the SE NRIC. The Commission found that at the time of the accident, GSM-R was not used as a means of communication, which violated the "Rules for the use of station shunting digital radio communication from the GSM-R system when performing shunting activities, in force from 01.12.2017".

6. Safety recommendations

In order to improve the safety in the rail transport, the Chairperson of the Investigation Commission at NAMRATIB proposes to the Railway Administration Executive Agency (RAEA) the following safety recommendations adapted to SE NRIC and BDZ PP EOOD.

- Recommendation 1, proposes that SE NRIC and BDZ PP EOOD familiarize the interested personnel with the contents of this report;
- Recommendation 2 proposes that the personnel involved in ensuring train movement and shunting work of the SE NRIC, as well as the personnel involved in performing shunting work of BDZ PP EOOD, performing their duties at Sofia Station, be re-equipped with mobile terminals for using the existing GSM-R radio connection in order to carry out a permanent objective recording of the conversations;
- Recommendation 3 proposes that, until the introduction of the route-computer interlocking at Sofia Station into regular operation, in the daily briefings conducted for the personnel of both enterprises, attention be paid to strict compliance with the Instruction regulating the organization of movement and shunting work, as well as to performing tests of the train brakes of departing trains in order to improve and refresh the knowledge of the personnel;
- Recommendation 4 proposes that BDZ PP EOOD, until the introduction of the route-computer interlocking at Sofia Station into regular operation, turn on and seal the devices for monitoring the vigilance of the shunting locomotives;
- Recommendation 5 proposes that, in order to achieve higher efficiency in shunting work, SE NRIC and BDZ PP EOOD change the shunting arrangements and plans with a view to the simultaneous movement and composition of several trains departing from the same track according to Plan Rev. II -24 at Sofia Station.

With reference to the requirements of art. 24, paragraph 2 of Directive (EU) 2016/798, and art. 91, paragraph 3 of Ordinance No 59 dated 5.12.2006, the member of the Management Board of NAMRATIB on 19.12.2024 provides a final report that contains information on the investigation of the accident with formulated and agreed safety recommendations in order to improve safety in railway transport.

In accordance with Art. 26, paragraph 3 of Directive (EU) 798/2016, the National Safety Authority (RAEA) and other bodies or structures to which the safety recommendations are addressed, to report regularly to the member of the management board of the NAMRATIB on the measures taken or planned as a result (sequence) from the recommendations.

Chairperson:

Dr Eng. Boycho Skrobanski

Deputy President of the NAMRTAIB AB