



REPUBLIC OF BULGARIA
NATIONAL AIR, MARITIME AND RAILWAY TRANSPORT, ACCIDENTS
INVESTIGATION BOARD (NAMRTAIB)

9 Dyakon Ignatij str., Sofia 1000
tel. (+359 2) 940 9317
fax: (+3592) 940 9350

bskrobanski@mtc.government.bg
bskrobanski@ntib.bg

FINAL REPORT

of

**Investigation of accident – fire in locomotive № 91520044060-9, serviced fast train № 8650
between the stations Stara Zagora – Kaloyanovets on 01.07.2025**



Sofia 2025

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 No 59 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.

TABLE OF CONTENTS

1. Summary	6
<i>1.1. Brief description of the event.....</i>	<i>6</i>
<i>1.2. Location and time of the event occurrence.....</i>	<i>7</i>
<i>1.3. Factors determining and contributing the event.....</i>	<i>7</i>
<i>1.4. Direct causes and consequences of the event.</i>	<i>7</i>
<i>1.5. Safety recommendations and addressees to which they are addressed.</i>	<i>7</i>
2. Investigation	9
<i>2.1. Decision for starting the investigation.</i>	<i>9</i>
<i>2.2. Motives for the decision to initiate the investigation.....</i>	<i>9</i>
<i>2.3. Scope and restrictions of the investigation.</i>	<i>9</i>
<i>2.4. Competences of the persons, involved in the investigation.</i>	<i>9</i>
<i>2.5. Communication and consultations with the persons and entities, involved in the event.</i>	<i>9</i>
<i>2.6. Extent of cooperation from the participating entities.</i>	<i>9</i>
<i>2.7. Methods and techniques of investigation and analysis.</i>	<i>10</i>
<i>2.8. Difficulties faced during the investigation.....</i>	<i>10</i>
<i>2.9. Interaction with the judicial authorities.</i>	<i>11</i>
<i>2.10. Other important information for the investigation context.....</i>	<i>11</i>
3. Description of the event.....	12
<i>3.1. Information on the event and the context.....</i>	<i>12</i>
<i>3.1.1. Description of the type of event.....</i>	<i>12</i>
<i>3.1.2. Date, punctual time and location of the event.....</i>	<i>14</i>
<i>3.1.3. Description of the event location:</i>	<i>15</i>
<i>3.1.4. Fatalities, injuries and material damages:</i>	<i>15</i>
<i>3.1.5. Description of other consequences, including impact of the event on the usual activity of the participants.</i>	<i>16</i>
<i>3.1.6. Identity of the participants and their functions.</i>	<i>16</i>
<i>3.1.7. Description of the respective parts of infrastructure and signalling:</i>	<i>16</i>
<i>3.1.8. Other information referring the event.</i>	<i>19</i>
<i>3.2. Factual description of the occurred.....</i>	<i>22</i>
<i>3.2.1. Direct sequence of the cases that led to the event:</i>	<i>22</i>
<i>3.2.2. Sequence of the cases from the beginning of the event until the end of the rescue services' activities:</i>	<i>23</i>
4. Analysis of the event.....	Грешка! Показалецът не е дефиниран.
<i>4.1. Participation and responsibilities of the entities, involved in the event</i>	<i>Грешка! Показалецът не е дефиниран.</i>
<i>4.1.1. Railway undertaking.....</i>	<i>Грешка! Показалецът не е дефиниран.</i>
<i>4.1.2. Analysis of the railway infrastructure condition.</i>	<i>36</i>
<i>4.1.3. Entities in charge of the technical maintenance. ..</i>	<i>Грешка! Показалецът не е дефиниран.</i>

4.1.4. Manufacturers or producers of rail rolling stock and railway products.	37
4.1.5. National Safety Authority.....	37
4.1.6. Notified bodies or Risk Assessment bodies.	Грешка! Показалецът не е дефиниран.
4.1.7. Certifying bodies for the entities in charge of the technical maintenance.	37
4.1.8. Persons or entities involved in the event, documented in the respective SMS or indicated in a register.	Грешка! Показалецът не е дефиниран.
4.2. Rolling stock and technical facilities	Грешка! Показалецът не е дефиниран.
4.2.1. Factors, deriving from the design of rolling stock, railway infrastructure or their facilities.	37
4.2.2. Factors, deriving from the installation and placing into service of the rolling stock, railway infrastructure, and technical facilities.	37
4.2.3. Factors resulted from the producers and providers of railway products.	37
4.2.4. Factors deriving from the technical maintenance and/or modification of the rolling stock or technical facilities.	377
4.2.5. Factors deriving from the entity in charge of the technical maintenance, workshops for the technical maintenance and other providers of services on the technical maintenance.	377
4.2.6. Other factors or consequences referring the investigation's targets.	Грешка! Показалецът не е дефиниран.
4.3. Human factor	38
4.3.1. Individual human characteristics:.....	Грешка! Показалецът не е дефиниран.
4.3.2. Work related factors:.....	Грешка! Показалецът не е дефиниран.
4.3.3. Organizational factors and tasks:	42
4.3.4. Environmental factors:	44
4.3.5. Other important factors related to the investigation.	44
4.4. Feedback and control mechanisms, including risk and safety management as well as monitoring processes.	Грешка! Показалецът не е дефиниран.
4.4.1. Regulatory framework conditions.	444
4.4.2. Processes, methods and results from the activities on the risk assessment and monitoring performed by the involved entities:.....	Грешка! Показалецът не е дефиниран.
4.4.3. Safety Management system of the involved entities:	455
4.4.4. Safety Management system of the entities in charge for the technical maintenance.	455
4.4.5. Results from the supervision performed by the national safety authority.	46
4.4.6. Permits, certificates and reports for assessment, provided by the national safety authority or other conformity assessment body:	Грешка! Показалецът не е дефиниран.
4.4.7. Other system factors.	466
4.5. Previous similar cases.	466
5. Conclusions.....	Грешка! Показалецът не е дефиниран.
5.1. Summary of the analysis for the event causes.	Грешка! Показалецът не е дефиниран.
5.2. Undertaken measures after the event occurrence.	Грешка! Показалецът не е дефиниран.
5.3. Additional findings.	477
6. Safety recommendations	48

ABBREVIATIONS, USED IN THE REPORT

TDRC – Train Dispatching Radio Connection
HTS – Higher Transport School „Todor Kableshkov“ – Sofia
MAS – Main Air Switch of the locomotive
TOS – Train Operation Schedule
BDZ PP EOOD – “BDZ Passenger Transport” EOOD-State enterprise for passenger transport
SE NRIC – State enterprise „National railway Infrastructure Company “(railway infrastructure manager)
RS – Railway section – Division at the railway infrastructure manager
RTA – Railway Transport Act
TOU – Traffic organization unit at the Railway Infrastructure Manager
km – kilometer on the rail track
OCL – Overhead contact line (catenary)
SPR – Small periodical repair
FT – Fast train
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)
NSA RAEA– Railway Administration Executive Agency, National Safety Authority in the rail transport of the Republic of Bulgaria
TF – Task Force assigned from the railway infrastructure manager
SE – Signalling equipment
SABS – Semi-automatic block system
RTOSART – Rules for the train operation and shunting activity in the rail transport
RRS – Rail Rolling Stock
FEI – Fire-extinguishing installation
FWI – Fire-warning installation
TOMS – Train Operation Management System
REDU – Regional Electrical Distribution System
RD MoI – Regional Division at the Ministry of Interior
RS FSaCP – Regional Service Fire Safety and Civil Protection
ECM – Entity in charge of maintenance
EMC – Emergency Medical Care
SMS – Safety Management System
TI – Technical Inspection of a locomotive
TOSAMD – Train operation and station activity management Division (division of SE NRIC)
DCCM – Device for communications, connections and messages in stations
PQC – Professional qualification center at Holding BDZ EAD
PQC – Professional qualification center at SE NRIC

1. Summary

1.1. Brief description of the event.

On 01.07.2025, FT No. 8650 departed from Varna station at 09:00 a.m. The train consisted of 3 wagons, 12 axles, 153 tons, 78 meters, served by electric locomotive No. 91520044060-9. The train run daily according to the train schedule in the direction Varna - Karnobat - Plovdiv - Sofia. The locomotive crew, locomotive driver, assistant locomotive driver and the transport crew, train chief and conductor and the rolling stock of FT No. 8650 are part of the railway undertaking "BDZ-Passenger Transport" EOOD. FT No. 8650 arrives at Stara Zagora station at 13:00 p.m. with a 5-minute delay and departed for Kaloyanovets station at 13:01 p.m. with a 5-minute delay.

During the movement of FT No. 8650 along the Stara Zagora - Kaloyanovets interstation route No. 2 before the Elenino halt; the driver stopped quickly the train with the train brake, due to a person crossing the railway track in front of the train. After the person stands at a safe distance, the locomotive driver begins to accelerate until reaching the maximum permissible speed for the section. During the acceleration of the train, the locomotive driver and assistant driver felt and noticed smoke in the engine compartment. The locomotive driver looked back and saw smoke under the locomotive body shell. He turned off immediately the MAS and started to stop the train. After the train stopped, the locomotive driver activated the fire extinguishing system from the first cab of the locomotive, and he and the assistant locomotive driver saw a fire in the second under-carriage fan.

The train conductor of FT No. 8650, after coordination with the locomotive driver, called the national emergency number 112 and reported the fire in the locomotive. He contacted the dispatcher in Sofia at BDZ-Passenger Transport EOOD and informed about the fire that had broken out in the locomotive.

The locomotive driver and the assistant locomotive driver uncoupled the locomotive from the carriages, but were unable to separate it from them due to the voltage being cut off in the overhead contact line. Four portable fire extinguishers from the locomotive and two portable fire extinguishers from the train were used to extinguish the fire.

At around 13:15 p.m., the traffic controller on duty at Stara Zagora station was notified by the train dispatcher on the Plovdiv - Stara Zagora - Dimitrovgrad - Mihaylovo section that a fire had broken out in the locomotive of FT No. 8650.

At around 13:20 p.m., an employee from the RS FSaCP Stara Zagora requested the voltage to be turned off in the catenary between the Stara Zagora - Kaloyanovets lines No. 1 and No. 2 to extinguish the fire in the locomotive.

At 13:24 p.m. the voltage was turned off along the Stara Zagora station section and along the Stara Zagora - Kaloyanovets interstation, track No. 1 and track No. 2, Kaloyanovets station and along the Kaloyanovets - Mihaylovo interstation, track No. 1 and track No. 2.

At 13:33 p.m. two fire- extinguishing vehicles of the Stara Zagora Fire Safety and Civil Protection Service and vehicles of the Ministry of Interior, and the Bulgarian Emergency Medical Care arrived at the place of the accident.

The passengers from the train were evacuated to a safe place and subsequently taken from the interstation by bus No. 8690 to Sofia station.

At 13:42 p.m. the fire in the locomotive was localized and extinguished by the teams of the Stara Zagora Fire Safety and Civil Protection Service.

At 17:28 p.m. the train dispatcher in Plovdiv Railway Station ordered the restoration of the movement of all trains and vehicles along the Stara Zagora - Kaloyanovets interstation, track No. 2, to travel as per the scheduled speed.

Because of the accident fire in locomotive № 91520044060-9 no staff or passengers from the train were injured. Damage was caused only to the locomotive.

The traffic along the Stara Zagora - Kaloyanovets interstation track №1 and track №2 was interrupted from 14:10 p.m. to 17:28 p.m. on 01.07.2025.



Fig. 1.1. Fired locomotive № 91520044060-9, serviced FT № 8650

1.2. Location and time of the event occurrence.

Between the stations Stara Zagora - Kaloyanovets track No. 2 at 13:10 p.m., a fire was detected in electric locomotive No. 91520044060-9, serving FT No. 8650. The train was stopped by the locomotive driver in the interstation at km 97+280, in front of the Hristiyanovo halt to extinguish the locomotive.

1.3. Factors determining and contributing the event.

A determining factor for the occurrence of the accident was the prolonged movement of the locomotive in braking mode with the direct locomotive brake applied, which led to the separation of hot shavings from the brake pads, which fell on the housing of the under-body shell horizontal fan, where accumulated oily dust particles ignited.

A contributing factor for the occurrence of the accident was the intensive application of the direct locomotive brake due to the sudden appearance of a person on the railway track.

1.4. Direct causes and consequences of the event.

The probable cause of the fire during movement in locomotive No. 91520044060-9, serving FT No. 8650, was the ingress of hot shavings from the locomotive's pads onto the housing of the horizontal under-body shell fan, which led to the ignition of the cables. The consequences of the event were the burning of the horizontal under-body shell fans, the batteries and the connecting cables in the passageway.

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

In order to prevent other similar accidents, the Investigation Chair at the NAMRTAIB proposes to the National Safety Authority RAEA safety recommendations related to the railway undertaking SE NRIC and "BDZ-Passenger Transport" EOOD.

- Recommendation 1 proposes that SE NRIC and BDZ-Passenger Transport EOOD familiarize the interested personnel with the content of the report;

- Recommendation 2 proposes that SE NRIC make changes to RTOSART, part five "Organization of work at stations", chapter one "Providing trains with brake mass", section one "General provisions", art. 289, para. 2 and para. 3 regarding the provision of trains with brake mass and the inclusion of the service and brake mass of locomotives in it;
- Recommendation 3 proposes that BDZ PP EOOD hold talks with locomotive drivers to competently and correctly operate trains in brake mode in order to prevent thermal overloading of the friction units, both of the coaches and locomotives;
- Recommendation 4 proposes that BDZ PP EOOD restore the electrodynamic brake of the locomotives of series 44 and 45 in order to reduce the use of friction brakes;
- Recommendation 5 proposes that BDZ PP EOOD retrofit the traction rolling stock with composite or sintered brake pads in order to prevent sparks, which leads to a reduction in harmful emissions into the air and noise during movement;
- Recommendation 6 proposes that BDZ PP EOOD place the power cables for supplying the under-carriage motor fans in metal corrugated pipes;
- Recommendation 7 proposes that BDZ PP EOOD regularly clean the deposits under the traction transformer and the locomotive body shell during locomotive repairs.

2. Investigation

2.1. Decision for starting the investigation.

The decision to initiate the safety investigation was taken by the member of the Management Board of the NAMRTAIB in the Republic of Bulgaria, leading the investigation of railway accidents and incidents in accordance with art. 22, paragraph 3 of Directive (EU) 2016/798 of the European Parliament and of the Council. Given the severity of the accident and its impact on railway transport safety, the investigation is mainly focused on the finding of the causes and analysis, which aims to improve the safety, and to prevent other accidents (fire in locomotives series 44 and 45.00).

2.2. Motives for the decision to initiate the investigation.

The member of the Management Board of the NAMRTAIB, leading the railway unit took the decision to initiate the investigation based on art. 20, paragraph 2 (a) and (c) of Directive (EU) 2016/798, art. 115к, paragraph 1, item 2 of RTA, and art. 76, par. 1, item 2 of Ordinance No 59 dated 5.12.2006.

The investigation was undertaken considering the circumstances and risks endangering the life and health of the personnel and the passengers in the train from the fire occurred in electric locomotive No. 91520044060-9 servicing FT No. 8650 on 01.07.2025 during the movement of the train along interstation Stara Zagora – Kaloyanovets.

2.3. Scope and restrictions of the investigation.

The scope of the investigation included and analyzed the organizational and human factors, the Safety Management System related to repair and maintenance, including the risk assessment with registered hazards of the traction rolling stock in the railway undertaking "BDZ-Passenger Transport" EOOD and the normative acts to it.

Restrictions and delays during the investigation were not allowed, due to the rapid establishment of the causes of the fire in the locomotive.

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

The member of the Management Board of the NAMRTAIB, head of railway transport field heads the Investigation Commission as per art. 22, paragraph 1 of Directive 2016/798. The members of the Commission are external independent experts - habilitated persons from the higher transport institutions and experts with qualification and professional orientation in fields of activity – human and organizational factor, railway infrastructure, rail rolling stock.

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 was appointed by the railway infrastructure manager. Its composition includes the heads of divisions and transport safety bodies of the two entities (BDZ PP EOOD and SE NRIC). The Task Force collected all documents and samples, written statements of the personnel of the entities, records from the recording device of locomotive No. 91520044060-9, which served FT No. 8650 on 01.07.2025. The materials and documents were provided to the head of the investigation commission in connection with safety at the NAMRTAIB. The Investigation Commission conducted an interview with the train personnel (locomotive driver, assistant locomotive driver, the head of the train and the conductor) and the management of the Plovdiv PTD, in whose structure the Plovdiv Locomotive Depot is also located. It got acquainted with the statements of the persons involved in the accident. Additional information was requested and provided from BDZ PP EOOD on the repairs and maintenance of the locomotive. Interviews were conducted with the safety authorities of both entities, with the management of the railway enterprise BDZ PP EOOD and SE NRIC.

2.6. Extent of cooperation from the participating entities

During the investigation, the participating entities BDZ PP EOOD and SE NRIC provided full cooperation and the necessary materials and documents. Full access was provided to the burned locomotive No. 91520044060-9 at the Plovdiv Locomotive Depot for inspections, measurements and expert assessments.

2.7. Methods and techniques of investigation and analysis.

On 01.07.2025 at 13:22 p.m., the member of the Board of the NAMRATIB with competence to investigate railway accidents received a verbal notification on the mobile phone from the duty dispatcher of BDZ PP EOOD about a fire in locomotive No. 91520044060-9, servicing FT No. 8650 on the Stara Zagora - Kaloyanovets interstation.

At 13:34 p.m., a written notification followed by SMS on the mobile phone from the duty senior dispatcher in the Central Dispatch of the Railway Infrastructure Manager (SE NRIC) with the following text:

„Train No. 8650 BDZ-PP occupies the Stara Zagora - Kaloyanovets interstation track 2 from 13:00 p.m. due to a fire in the locomotive 44-060. Fire safety called. “

Following the instructions given by the member of the Board of the NAMRATIB with competence to investigate railway accidents to the representatives of BDZ PP EOOD and SE NRIC presented, they organized and conducted inspections with representatives of the pre-trial investigation from the Ministry of Interior Stara Zagora. Protocols of the inspections were drawn up.

On 02.07.2025, the senior train dispatcher at the TOU Plovdiv by order assigned a work-service train (TSV) No. 10392 to remove the burned locomotive No. 91520044060-9 in an inoperable condition, which departed at 19:30 p.m. from Stara Zagora station and arrived at Plovdiv station at 23:01 p.m.

On 01.07.2025 at 17:00 p.m., the investigative body of the Ministry of Interior Stara Zagora gave written permission to carry out emergency recovery activities and release the burned locomotive for travel to the Plovdiv Locomotive Depot (place of residence).

From 08.07. to 11.07.2025, the Safety Investigation Commission from the NAMRATIB went to the Plovdiv Locomotive Depot, where it carried out the first inspections of the burned locomotive No. 91520044060-9 and received the speedometer tape removed from the locomotive's recording device.

The Commission conducted an interview with the locomotive driver and the assistant locomotive driver who operated locomotive No. 91520044060-9 on 01.07.2025.

The Commission conducted an interview with the train chief and the conductor who served FT No. 8650 on 01.07.2025.

In the period 29÷31.08.2025, the Investigation Commission at the NAMRATIB carried out repeated inspections of the burned locomotive No. 91520044060-9 at the Plovdiv Locomotive Depot. Together with the managers of the Plovdiv Locomotive Depot, actions were taken to establish the circumstances and causes of the fire. Comprehensive inspections were carried out in the engine compartment of the burned locomotive. The burned units were dismantled and removed from the engine compartment, on which additional inspections and measurements were carried out to establish their technical condition. Data on the types of repairs carried out on the locomotive were downloaded from the locomotive passport.

In the presence of the Task Force at the TOSAMD Plovdiv, the Investigation Commission at the NAMRATIB received the collected documents and materials regarding the fire that occurred during movement in locomotive No. 91520044060-9, serving FT No. 8650 on 01.07.2025.

An external expert, a member of the Investigation Commission at the NAMRATIB, deciphered the data from the speedometer tape for the movement of the locomotive, respectively the train before and during the fire.

The Investigation Commission at the NAMRATIB continued the investigation of the accident until the causes were established and a final report was prepared.

2.8. Difficulties faced during the investigation.

During the investigation, the Investigation Commission of the NAMRATIB did not encounter any difficulties. The representatives of the Task Force and the safety authorities of the Railway Infrastructure Manager and the Railway Undertaking provided full cooperation to the safety Investigation Commission.

2.9. Interaction with the judicial authorities.

In accordance with the effective Agreement in force from 11.04.2023 on Interaction between the bodies of the pre-trial proceedings and NAMRATIB, the pre-trial proceeding from MoI – Stara Zagora, did not initiate a pre-trial proceeding for the accident.

2.10. Other important information for the investigation context.

During the movement of FT No. 8650, served by locomotive No. 91520044060-9 on 01.07.2025 in the Stara Zagora - Kaloyanovets interstation, the locomotive driver, after noticing a sudden appearance of a person near the front of the train, initiated an emergency stop with the train brake. The scheduled speed in the section is 130 km/h. The speed of the train before the emergency stop was 120 km/h and was reduced to 19 km/h.

3. Description of the event

3.1. Information on the event and the context.

3.1.1. Description of the event type.

On 01.07.2025, FT No. 8650 in a composition, 3 coaches, 12 axles, 153 tons, 78 meters, with electric locomotive No. 91520044060-9, serviced by a locomotive driver and an assistant locomotive driver. A transport crew, a train chief and a conductor serviced the train. The train departed from Varna station at 09:00 a.m. The train, according to the TOS, runs daily on the route Varna - Karnobat - Plovdiv - Sofia (Fig. 3.1, 3.2, 3.3). Rolling stock and personnel of the railway enterprise „BDZ-Passenger Transport“ EOOD serviced the train. During the train's movement, it increased its travel time, increasing the detour to Velichkovo station by 6 minutes due to constant speed reductions on the railway line in the Syndel - Yunak - Velichkovo section, and staying at Konyovo station for 6 minutes due to a meeting with a late FT No. 8611. FT No. 8650 arrived at Stara Zagora station at 13:00 p.m. with a 5-minute delay and departed to Kaloyanovets station on track No. 2 at 13:01 p.m. with a 5-minute delay.

During the movement of FT No. 8650, before the Elenino halt in the Stara Zagora - Kaloyanovets

БВ 8650 300т 115% лок44						БДЖ-ПП	
3.2	80	ВАРНА ТОВ. ПАРК	4	:	-	09:20	20163
6.0		ТОПОЛИТЕ	5	:	-	:24	
3.8	90	ВЕЗЕРОВО	3	:	-	:29	
5.7	80	БЕЛОСЛАВ	5	09:37	1	:38	
5.6	100	ПОВЕЛЯНОВО	4	:	-	:42	

БВ 8650						БДЖ-ПП	
3.5	100	РАЗДЕЛНА	2	:	-	09:44	
6.1		СИНДЕЛ	5	09:49	1	:50	
4.9	80	ЮНАК	5	:	-	:55	
17.0	100	ВЕЛИЧКОВО	11	:	-	10:06	
8.7		ДЪЛГОПОЛ	6	10:12	1	:13	
9.0		КОМЪНАРИ	7	:20	1	:21	
3.3	80	АСПАРУХОВО	3	:	-	:24	
8.6	100	СТРУЯ_РП	5	:	-	:29	
3.8	80	ТЪРНАК	3	:	-	:32	48120
10.1	60	ДЪСКОТНА	11	:	-	:43	
11.3	85	ДЪЛЯКОВО РП	8	:	-	:51	
6.0	80	ЗАВЕТ	5	:	-	:56	
5.9	100	КМ.34+770	4	:	-	11:00	
5.0	60	ПРИЛЕП_РП	7	:	-	:07	
4.9	85	ПОДВИС	7	:	-	:11	
7.6	80	ПОЗАРЕВО	4	:	-	:18	
17.2		КАРНОБАТ	14	11:32	1	:33	
13.1	130	ЦЕРКОВСКИ	7	:	-	:40	
13.3		СТРАЛДЖА	7	:47	1	:48	
7.5	125	ВИВЕНЦА	6	:54	1	:55	8611
6.5		ЗАВОЙ	5	:	-	12:00	
8.7	100	ЯМБОЛ	7	12:07	2	:09	
11.6	130	БЕЗМЕР	7	:	-	:16	
11.4		КЕРМЕН	6	:	-	:22	
9.5	110	КОНЬОВО	5	:	-	:27	
12.0	125	НОВА ЗАГОРА	7	:34	4	:38	80103
14.8	130	ХАН АСПАРУХ	8	:	-	:46	
9.6		КАЛИТИНОВО	5	:	-	:51	
8.7		СТАРА ЗАГОРА	6	:57	2	:59	
13.2		КАЛОЯНОВЕЦ	8	:	-	13:07	
9.2		МИХАЙЛОВО	5	13:12	2	:14	40253, 40950
12.6	80	СВОВОДА	14	:	-	:28	
11.5	50	ЧИРПАН	17	:45	13	:58	8651
3.0	70	КМ.56+576	4	:	-	14:02	
13.1	100	ОРИЗОВО	12	:	-	:14	
10.9	125	БЕЛОЗЕМ	7	14:21	1	:22	80603
10.5	120	МАНОЛЕ	6	:	-	:28	
6.1		СКЪТАРЕ	4	:	-	:32	
8.2	125	ТРАКИЯ	5	:37	1	:38	
3.4	40	ПОР ИЗТОК	7	:	-	:45	
2.8	80	ПЛОВДИВ	5	:50	8	:58	40833
8.8	130	ТОДОР КАВЛЕШКОВ	6	:	-	15:04	
8.6		СТАМБОЛИЙСКИ	4	:	-	:08	

- 80 -

-->

Fig. 3.2. Schedule for the movement of FT № 8650

Издание: 01.07.2025	
ДП "НК ЖЕЛЕЗНИЧНА ИНФРАСТРУКТУРА"	
РАЗПИСАНИЕ	
ЗА ДВИЖЕНИЕ НА	
МЕЖДУНАРОДНИ И БЪРЗИ ВЛАКОВЕ	
ПО ЖЕЛЕЗНИЧНАТА МРЕЖА	
НА РЕПУБЛИКА БЪЛГАРИЯ	
А и Б	
8 сина	
от 15.12.2024 г. до 13.12.2025 г.	

Fig. 3.1. Schedule for movement of the international and fast trains – cover page.

БВ 8650						БДЖ-ПП	
10.2	130	ОГНЯНОВО	5	:	-	15:13	
9.0		ПАЗАРДЖИК	5	15:18	1	:19	
16.2		СЕПТЕМВРИ	9	:28	1	:29	
9.8	80	БЕЛОВО	11	:40	1	:41	
3.9		МОМ. КЛИСУРА	5	:46	1	:47	
4.0		СЕСТРИМО	5	:	-	:52	
3.4	60	БОЙКА	4	:56	1	:57	
7.3		КОСТЕНЕЦ	9	16:06	3	16:09	10603
8.7	50	НЕМИРОВО	11	:	-	:20	
9.2	60	ИКТУМАН	11	:31	2	:33	1613
8.3	80	БЕРИНСКО	8	:	-	:41	
8.9		ВАКАРЕЛ	7	:	-	:48	
9.3	65	ПОВИТ КАМЪК	9	:	-	:57	
6.3	80	ЕЛИН ПЕЛИН	6	17:03	1	17:04	
9.3	60	КАЗИЧЕНЕ	10	:14	1	:15	
5.0	80	ИСКЪР	5	:	-	:20	
0.9	50	ИСКЪРСКО ШОСЕ	2	:22	1	:23	
5.1		ПОДУЯНЕ ПЪТН.	9	:32	1	:33	10113
3.3	40	СОФИЯ	7	17:40			
544.0			446		54		8ч.20мин.
СП-ИХ по път 1, ИК-ПДП по път 1, ПДП-СФ по път 3							

Fig. 3.3. Schedule for the movement of FT № 8650 – following page

interstation on track No. 2, the driver stopped the train with the emergency brake due to a person suddenly appearing in front of the train. After the person stopped at a safe distance, the locomotive driver released the train brake and began to accelerate until reaching the maximum permissible speed for the section. During the acceleration of the train, the locomotive driver and the assistant locomotive driver felt and noticed smoke in the engine compartment. The locomotive driver looked back through the side window

and saw smoke under the locomotive body shell. He immediately turned off the MAS and started stopping the train in a suitable place for extinguishing the fire by the FSaCP authorities. After the train stopped, the driver activated the fire extinguishing system from the first cabin of the locomotive, and he and the assistant locomotive driver saw a fire in the second under-carriage fan.

The train conductor of FT No. 8650, after coordinating the actions with the locomotive driver, called the national emergency number 112 and reported the fire. He contacted the train dispatcher in Sofia at BDZ-Passenger Transport EOOD and informed about the fire that has occurred in the locomotive.

The locomotive driver and the assistant locomotive driver uncoupled the locomotive from the coaches, but were unable to separate it due to the voltage in the catenary being switched off. Four portable fire extinguishers from the locomotive and two portable fire extinguishers from the train were used to extinguish the fire.

At around 13:15 p.m., the traffic controller on duty at Stara Zagora station was notified by the train dispatcher on the Plovdiv - Stara Zagora - Dimitrovgrad - Mihaylovo section that a fire had broken out in the locomotive of FT No. 8650.

At 13:17 p.m. on 01.07.2025, the RS FSaCP Stara Zagora operational center received a report of a fire in a locomotive near the village of Hristiyanovo, Stara Zagora municipality.

At around 13:20 p.m., an employee from the RS FSaCP Stara Zagora contacted the duty traffic manager at the Stara Zagora station and requested that the voltage be turned off in the catenary between the Stara Zagora - Kaloyanovets track No. 1 and track No. 2 to extinguish the locomotive. The duty power dispatcher turned off the voltage at the Stara Zagora station and in the Stara Zagora - Kaloyanovets track No. 1 and track No. 2 interstation, Kaloyanovets station and in the Kaloyanovets - Mihaylovo track No. 1 and track No. 2 interstation.

At 13:33 p.m., two fire engines and two light operational vehicles from the RS FSaCP Stara Zagora arrived at the scene of the accident. Vehicles from the Ministry of Interior and the EMC also arrived.

The evacuation of passengers was completed by the arrival of the RS FSaCP Stara Zagora teams.

At 13:42 p.m., the fire was localized and extinguished by the RS FSaCP Stara Zagora teams.

At 14:02 p.m. the power dispatcher applied voltage to the overhead contact network at Stara Zagora station.

At 14:06 p.m. the train conductor of FT No. 8650 sent a request by telephone from the Stara Zagora - Kaloyanovets track No. 2 interstation to the traffic controller on duty at Stara Zagora station to remove the FT No. 8650 train from the interstation to Stara Zagora station.

At 14:10 p.m. the train dispatcher ordered the stop of all trains and vehicles from the Stara Zagora - Kaloyanovets interstation on track No. 2, with the exception of auxiliary vehicles.

At 14:26 p.m. locomotive No. 92520006069-5 departed from the first track at Stara Zagora station to the interstation to withdraw FT No. 8650 from the interstation to Stara Zagora station.

At 15:28 p.m., the employee from the RS FSaCP Stara Zagora notified the energy dispatcher that the fire had been extinguished and voltage could be applied to the contact network.

At 15:28 p.m., after the switching operations were performed, voltage was applied to the Stara Zagora - Kaloyanovets section on track No. 1, Kaloyanovets station, Kaloyanovets - Mihaylovo track No. 1 and No. 2 and Mihaylovo station.

At 15:50 p.m., by order of the train dispatcher, FT No. 8690, which departed from Stara Zagora station, stopped at km 97+351 in the Stara Zagora - Kaloyanovets interstation to pick up passengers from FT No. 8650 and continued its movement in the direction of Sofia station.

At 17:05 p.m., FT No. 8650 was taken by locomotive No. 92520006069-5 to Stara Zagora station.

At 17:12 p.m., an electrical systems technician entered in the dispatch order log at Stara Zagora station that the overhead contact network was operational.

At 17:15 p.m., the dispatcher from the Stara Zagora railway section entered in the dispatch order log at Kaloyanovets station that the railway track at km 97+280, track No. 2, was operational and that train movement was to be ensured at the scheduled speed.

At 17:28 p.m., the train dispatcher at the Plovdiv TOU opened the Stara Zagora - Kaloyanovets track No. 2 interstation with an order for the movement of all trains and vehicles at the scheduled speed.

At 07:20 a.m. on 02.07.2025, the senior train dispatcher at the Plovdiv TOU by order assigned TSV No. 10392 to remove the burned locomotive No. 91520044060-9 in an inoperable condition, which departed from Stara Zagora station at 19:30 p.m. and arrived at Plovdiv station at 23:01 p.m.

The route of movement of FT № 8650 is on main lines 2, 3, 8 and 1 Varna – Karnobat – Stara Zagora – Plovdiv – Sofia (fig. 3.1).

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

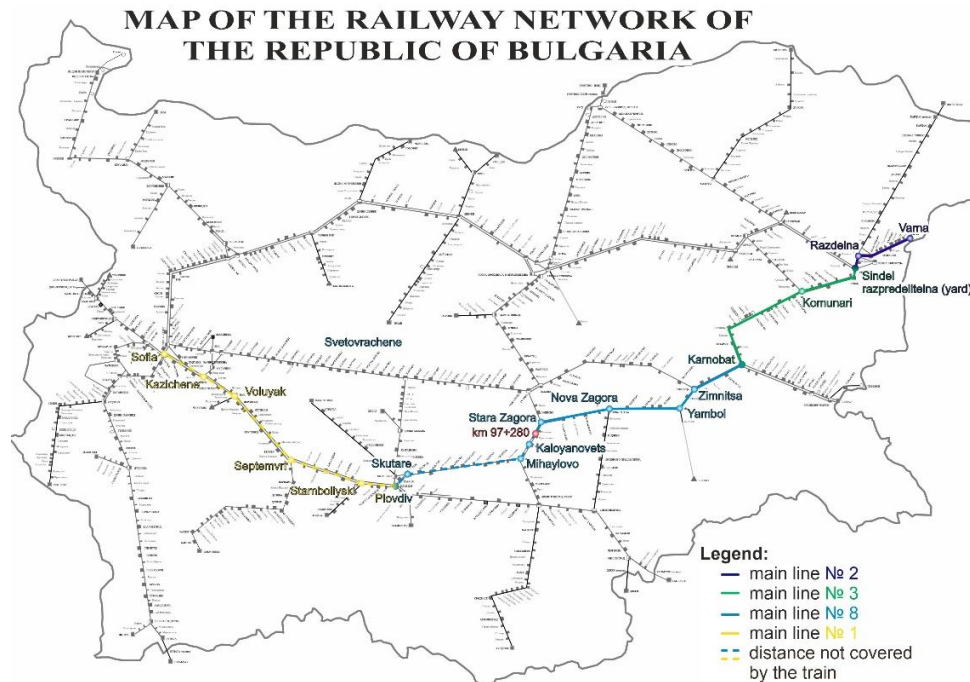


Fig. 3.1. Map of the route of movement of FT № 8650



Fig. 3.2. Route of FT № 8650 and place of the accident

- - Origin station of FT № 8650 (Varna);
- - Main stations along the train alignment;
- - Final station of FT № 8650 (Sofia);
- 🔥 - Location of the accident (km 97+280);
- - Track, which FT № 8650 has passed;
- - Track, which FT № 8650 was about to pass;

On 01.07.2025 at 13:09 p.m. FT № 8650 run along the Stara Zagora – Kaloyanovets on track No 2 in Sofia direction. At 13:10 p.m. the engine driver after seeing fire and smoke in the under body shell fan of the locomotive undertook stop of the train in the interstation at km 97+280 (fig. 3.2).

3.1.3. Description of the event location:

3.1.3.1. Location of the place of the accident (fig. 3.3).

Geographic width: 42°20'41.50"N

Geographic length: 25°35'38.88"E

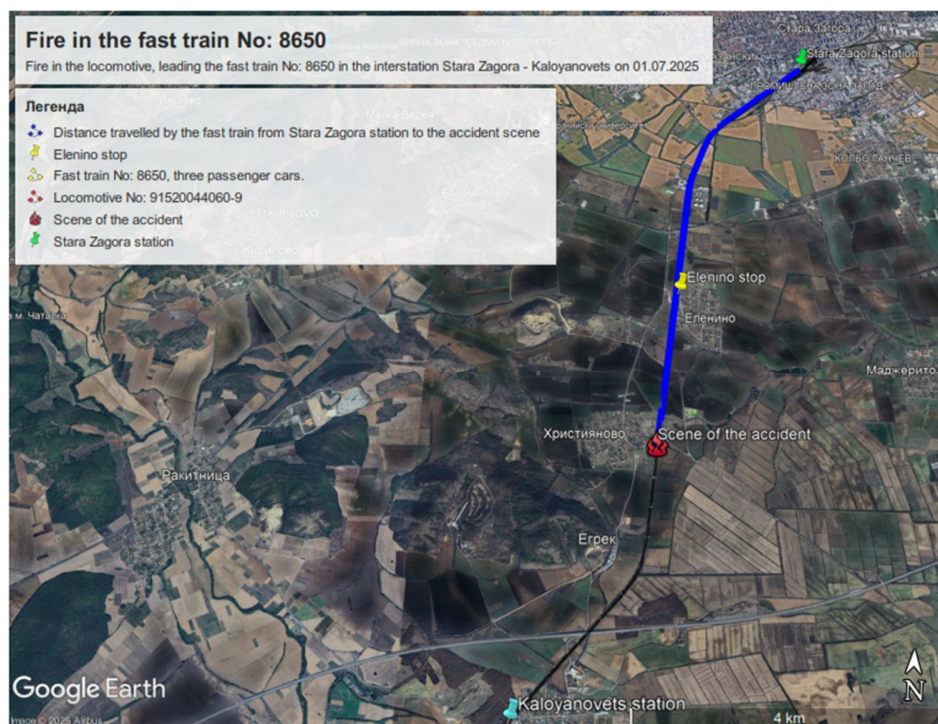


Fig. 3.3 GPS location of the accident at km 97+280 along Stara Zagora – Kaloyanovets interstation

3.1.3.2. Meteorological and geographical condition at the time of the event on 01.07.2025

- In the light part of the day – 13:10 p.m. (under data of the recording device of the locomotive);
- Air temperature: 28°C;
- Wind speed and direction around 22 km/h from Northeast;
- Weather – clear with slight cloudiness;
- Average relative humidity 48 %;
- There are no registered rains.

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

In the Stara Zagora - Kaloyanovets interstation before and during the occurrence of the accident (fire in locomotive No. 91520044060-9), no construction work was carried out at the site and in its vicinity.

3.1.4. Fatalities, injuries and material damages:

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

None.

3.1.4.2. Other persons officially connected with the location of the event.

None.

3.1.4.3. Passengers.

None.

3.1.4.4. External persons.

None.

3.1.4.5. Cargo, luggage or other property.

None.

3.1.4.6. Rolling stock, infrastructure and environment.

- Damages caused to locomotive № 91520044060-9 – burnt engine compartment;
- Damages caused to passenger coaches – none;
- Amount for caused damage to locomotive № 91520044060-9 to 27 602,00 BGN;
- Damages caused to the rail track – none;
- Damages caused to the catenary – none;
- Damages caused to the signalling equipment – none;
- Damages caused to the environment – none;

Total caused damages: 27 602,00 BGN.

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

In the period from 14:10 p.m. to 17:28 p.m. on 01.07.2025, 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 railway undertakings – none;
- Cancelled trains – 4 units – 1048.50 BGN;
- Scheduled trains of railway undertakings – none;
- Delayed passenger trains – 2 units – 647.50 BGN;
- Delayed freight trains – 1 unit – 200.20 BGN;
- Costs for restoration funds – none;

Total other costs: 1896.20 BGN.

Total damages and costs: 29,498.20 BGN.

3.1.6. Identity of the participants and their functions.

Infrastructure manager:

SE "National Railway Infrastructure Company" holds a valid safety authorization, which guarantees safe operation and maintenance of the railway infrastructure and adjacent facilities. It ensures equal and non-discriminatory access to all licensed and certified railway undertakings for the transport of passengers and freight on the railway infrastructure of the Republic of Bulgaria.

SE NRIC personnel involved in the accident:

- Duty traffic manager at Stara Zagora station;
- Duty traffic manager at Kaloyanovets station;
- Train dispatcher at Plovdiv TOU.

Railway undertaking:

- BDZ PP EOOD holds a valid license and a single safety certificate, which guarantees the provision of safe railway services for the transport of passengers on the railway network of the Republic of Bulgaria. BDZ PP EOOD is a national carrier, under a contract with the state for the provision of passenger transport.

Personnel at BDZ PP EOOD involved in the accident:

- Locomotive driver of locomotive No. 91520044060-9 of FT No. 8650;
- Assistant locomotive driver of locomotive No. 91520044060-9 of FT No. 8650;
- Trainmaster of FT No. 8650.

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

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

In the traffic direction of FT № 8650 the mileage decreases, the track is in a straight line with rails type S 49, sleepers ST 6, fastening SKL 14 with inclination 4,8 ‰ in a downhill.

Stara Zagora station is a junction station with 18 acceptance-deviation tracks and 5 tracks for shunting activities (fig. 3.4).



Fig. 3.4. Scheme of Stara Zagora station

Kaloyanovets station is an interim station with 4 acceptance-deviation tracks, 1 track loading-unloading and 2 protection tracks (fig. 3.5).

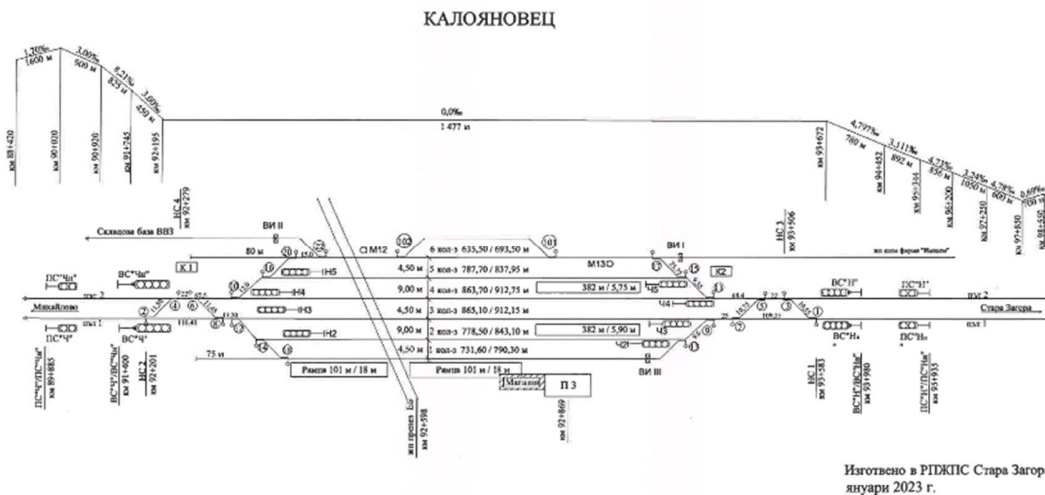


Fig. 3.5. Scheme of Kaloyanovets station

3.1.7.2. Interstation block system, station installation, type of signalling.

Interstation block system

The interstation Stara Zagora – Kaloyanovets is equipped with automatic block system (ABS) without transit signals with axle counters – functioning;

Station interlocking

Stara Zagora station is equipped with RRI type, Russian block with route shunting” – functioning (fig. 3.6);



Fig. 3.6 RRI Stara Zagora station with type, Russian block with route shunting

Kaloyanovets station is equipped with RCI – functioning (fig. 3.7).

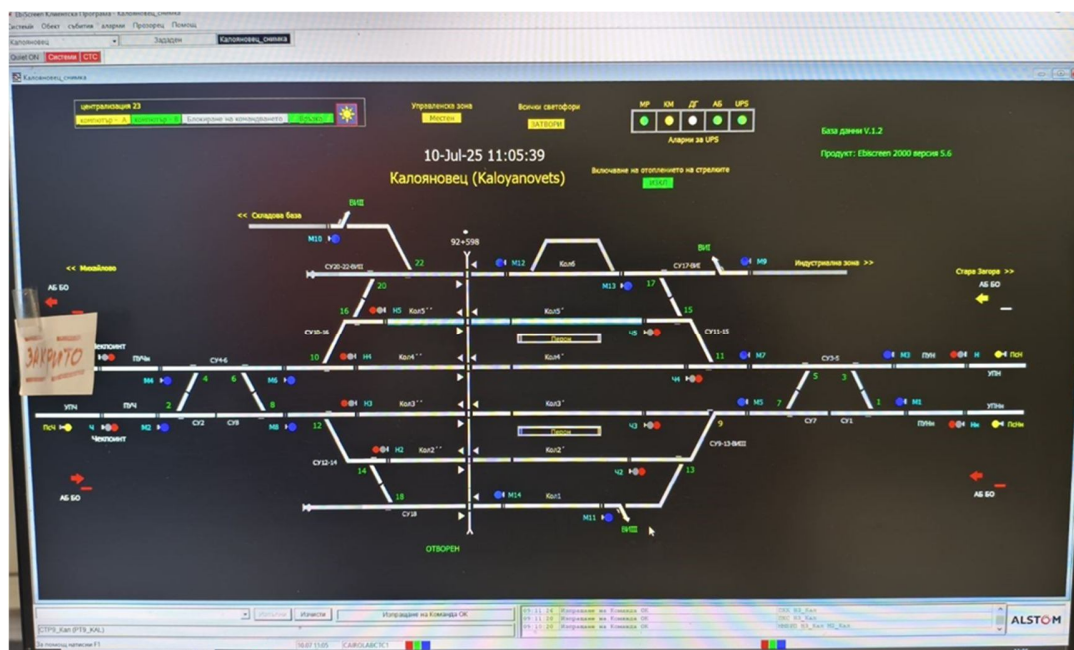


Fig. 3.7. RCI in Kaloyanovets station

Type of signalling

The entrance and exit semaphores in both stations are under the speed signalling - functioning;

Communication means.

The communication connections in Stara Zagora and in Kaloyanovets station are performed via UKSS-8 in both stations are ensured official GSM apparatuses for emergency necessities.



Fig. 3.8. Communication means type UKSS-8

In both cabins of the locomotive, TDRC devices are installed for radio communication between the locomotive driver and the traffic controller on duty at the respective station or with the train dispatcher. The operating personnel working on shifts at the State Enterprise NRIC and BDZ PP EOOD are provided with official mobile phones for quick communication.

Train protection systems.

The Stara Zagora and Kaloyanovets stations in the section of the eighth main railway line do not have train protection systems. The stations in the section are equipped with a train dispatching radio connection (TDRC), with the help of which radio connections are established between the locomotive driver - the traffic controller on duty - train dispatcher - individual stations - the trains in the respective railway section - in working order.

3.1.8. Other information referring the event.

3.1.8.1. Train documents of FT № 8650 in „BDZ-Passenger Transport“ EOOD.

The train documents „Waybill of locomotive № 91520044060-9“, „Brake mass certificate “and „Accompanying sheet“ (fig. 3.6 ÷ 3.11) are as per the downloaded data from the locomotive recording device.

СПУЖБА **ВАРНА** ПЪТЕН ЛИСТ № **1607** ЛОКОМОТИВ № **44 069** ОБР. РС 001 - 0/01

1 2 3 4 5

ЛОКОМОТИВНА БРИГАДА				ЯВЯВАНЕ				ОСВОБОЖДАВАНЕ				ПЪТУВАНЕ БЕЗ СЛУЖБА			
пункт	име, презиме, фамилия	шифр	пункт	час, мин.	пункт	час, мин.	пункт	час, мин.	пункт	час, мин.	пункт	час, мин.	пункт	час, мин.	
822	И. С. СТОЯЧОВ	01	БР	08:00	823	20:00									
1049	Г. Д. СТАНЧЕВ	02	БР	08:00	823	20:00									

ПРИЕМАНЕ И ПРЕДАВАНЕ НА ЛОКОМОТИВА				ДОПЪЛНИТЕЛНО ПОЛУЧЕНО ГОРИВО ИЛИ МАСЛО			
пункт	пункт	пункт	пункт	пункт	пункт	пункт	пункт
ВА	ГОРЕН	05:46:36	08:00	823	20:00		
02		05:49:28					

ИНСТРУКТОР / ИНСПЕКТОР				СТАРШИ КОНДУКТОР				СВЕРКА НА ЧАСОВНИЦИТЕ			
пункт	пункт	пункт	пункт	пункт	пункт	пункт	пункт	пункт	пункт	пункт	пункт
				8650	ВА						

ОБСЛУЖВАНЕ НА ВЛАКОВЕ И МАНЕВРЕНА РАБОТА				ДАННИ ЗА СЪСТАВА НА ВЛАКОВЕТЕ			
№ на влак	гара км.	пункт	пункт	пункт	пункт	пункт	пункт
8650	ВА	08:00	08:00	08:00	08:00	08:00	08:00

Върно с оригинала на 16. Кривошев

Fig. 3.9. Waybill of locomotive № 91520044060-9.

„БДЖ - ПП, ЕООД“ НАТУРЕН ЛИСТ НА ВЛАК № **8650** Форма ДП-1

Превозвач: **Варна** Крайна гара: **Сопот**

Гара на съставяне на влака: **Варна** Дата и час на пристигане: **01.07.2025 г. 19:00**

Дата и час на тръгване: **01.07.2025 г.**

№ на ряд	Вагонът взет от гара	№	сери	разм на осовна	вазони-стражи	оса	Вис на спирамата	Колко тона дърво спирамата	Гара	Нето	Бруто	Дължина в метри	Отправна гара (по документи)	Получаваща гара (по документ)	Вид на товара	Получател	Вагонът оставен в гара
1	Ва	22970574	B	61	52	4	a		45	6	51	26	Варна	Сопот	18т. цим.		
2	Ва	22970573	B	61	52	4	a		45	6	51	26	Варна	Сопот	18т. цим.		
3	Ва	22970570	B	61	52	4	a		45	6	51	26	Варна	Сопот	18т. цим.		
									135	18	153						

Вярно с оригинала

Ориг. Кривошев

Коп. ПМС-Варна

Варна 18т. цим. + 18т. цим. = 36т.

Fig. 3.10. Nature sheet of FT № 8650

Приложение № 10

Обр. II-21

ПРИДРУЖИТЕЛЕН ЛИСТ НА ВЛАК № 8650

Превозвач: БДЖ - ПТНЕСКИ ПРЕВОЗИ, ЕООД

Начална гара: Варна

Дата: 01.07.2025 г.

Час на тръгване: 09:00

Крайна гара: София

Дата: 01.07.2025 г.

Час на пристигане: 18:17

ПРЕВОЗНА СЪСТАВ: ВАРНА

П.Х. 9000

Делна № 8

Гари и спирки	Пристига		Престоя		Тръгва	Закрепване	Престой в повече и причини	Състав и тежина на влака					спирален процент	необходима спирална маса	налична спирална маса
	час	мин.	час	мин.				вагона	оси	гара	нето	бруто			
Варна					09:00			3	12	135	18	153	115	176	115
Белослав	09:12	1	09:13												
Синдел	09:29	1	09:30												
Валтица	09:57	1	09:58	15	всичко нах										
Ванчарци	10:06	1	10:07	15											
Картоса	11:26	1	11:27	30	нагостина 5										
Св.Влаха	11:47	1	11:48												
Зимичево	11:57	1	11:58												
Ячовца	12:05	1	12:07												
Канчево	12:16	5	12:31	14	+4 по в. ВС11										
Нова Загора	12:39	1	12:40	14											
Стара Загора	13:00	1	13:01	15	+1 по нах										
КЧ 97 + 350	13:13			15											

1. Състояние на спиралката на локомотива/моторен-вагон изправна и скоростомера регистрира

2. Постоянно подаване на напрежение ДА НС

3. Часовниците сверени

Дата: 01.07.2025 г. Деж. р-л: [подпис] Н-к влак: [подпис] Маш.: [подпис]

Час: 12 Мин. 56

Дата: _____ г. Деж. р-л: [подпис] Н-к влак: [подпис] Маш.: [подпис]

Час: _____ Мин. _____

Дата: _____ г. Деж. р-л: [подпис] Н-к влак: [подпис] Маш.: [подпис]

Час: _____ Мин. _____

Fig. 3.11. Accompanying sheet of FT № 8650

Препис

БДЖ - ПТНЕСКИ ПРЕВОЗИ, ЕООД

УДОСТОВЕРЕНИЕ ЗА СПИРАЧНАТА МАСА

Гара: Варна

Дата: 01.07.2025 г.

Влак №: 8650

Маса на влака: 153 t

Спирален процент: 115 %

Необходима спирална маса: 176 t

Мг	оси	АВС*	рр**	Оси	Забележка
Н	12				
Р					
Г					
Начална / Останала маса/оси	213	12			БГЧ
Допълнителна маса/оси					
Всичко: налична спирална маса/оси	213	12			

Неплътност на локомотива: 0,1 bar/min

Неплътност на влака: 0,1 bar/min (bar/0-5 min)

Влакът натегнат/ненатегнат: R-855

Дежурен ръководител движение: Извършил пробата на спиралките:

Асанов Дончев

Забележки: Неужикато се зачертава

* Автоматична влакова спиралка

** Ръчна спиралка

Fig. 3.12. Brake mass certificate of FT № 8650 – front

№ на вагон	Спир. Маса	№ на вагон	Спир. Маса
615222994057-1	71		
615222994015-9	71		
615222994029-0	71		
3/12	213 t		

Варна с оригинал

Н-к БДЖ-Варна

инж. Х. Ганев

Fig. 3.13. Brake mass certificate of FT № 8650 – rear

3.2. Factual description of the occurred.

3.2.1. Direct sequence of events that led to the event, including:

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

At around 13:05 p.m. during the movement of FT No. 8650 with locomotive No. 91520044060-9, driven by the first cab of the locomotive in the Sara Zagora - Kaloyanovets interstation, before the Elenino halt, he saw a person crossing in front of the train and took a quick stop of the train with the train brake. The speed of the train was 120 km/h at the time of taking a quick stop of the train. After the person passed, the locomotive driver began to accelerate the train to the section speed. With the assistant locomotive driver, they smelled smoke, the locomotive driver saw through the side window of the locomotive that smoke and fire were coming out of the second horizontal under-body shell fan of the locomotive. He turned off the locomotive's MAS, the train continued to move by inertia. At that time, the locomotive driver was looking for a convenient place to stop in order to ensure access for the specialized vehicles of the Stara Zagora FSaCP. At 13:09 p.m. the locomotive driver stopped FT No. 8650 in the inter-station area at km 97+280. The locomotive driver activated the fire extinguishing installation from the locomotive's control cabin No. 1. Actions were taken to extinguish the locomotive with the four portable fire extinguishers. The transport crew delivered two more fire extinguishers from the coaches, which were also used, but without success.

The head of train, after coordinating the actions with the locomotive driver, contacted the national emergency number 112 and provided information about the burning locomotive. The train commander also notified the dispatcher in Sofia at BDZ PP EOOD about the fire that had broken out in the locomotive.

The head of train and the conductor informed and took the passengers traveling in FT No. 8650 to a safe place.

At around 13:15 p.m., the traffic controller on duty at Stara Zagora station was notified by the train dispatcher on the Plovdiv - Stara Zagora section about the fire that had broken out in the locomotive of FT No. 8650.

At 13:17 p.m. on 01.07.2025, the RS FSaCP Stara Zagora operational center received a message about a fire that had broken out in a locomotive near the village of Hristiyanovo, Stara Zagora municipality.

At around 13:20 p.m., an employee of RS FSaCP Stara Zagora contacted the traffic controller on duty at Stara Zagora station and requested the voltage to be turned off in the catenary in Stara Zagora - Kaloyanovets interstation, track No. 1 and track No. 2 to extinguish the locomotive. The power dispatcher on duty turned off the voltage at Stara Zagora station and in Stara Zagora - Kaloyanovets interstation track No. 1 and track No. 2, Kaloyanovets station and in Kaloyanovets - Mihaylovo interstation track No. 1 and track No. 2.

At 13:33, two fire engines and two light operational vehicles from the RS FSaCP Stara Zagora arrived at the scene of the accident. Vehicles from the Ministry of Internal Affairs and the SMP also arrived.

The evacuation of passengers was completed by the arrival of the RS FSaCP Stara Zagora teams.

At 13:42 p.m., the fire was localized and extinguished by the RS FSaCP Stara Zagora teams.

At 14:02 p.m., the energy dispatcher applied voltage to the catenary at the Stara Zagora station.

At 14:06 p.m., the head of train of FT No. 8650 sent a request by telephone from the Stara Zagora - Kaloyanovets track No. 2 interstation to the traffic controller on duty at the Stara Zagora station to transport the FT No. 8650 train from the interstation to the Stara Zagora station.

At 14:10 p.m., the train dispatcher ordered the stop of all trains and vehicles on the Stara Zagora - Kaloyanovets interstation on track No. 2, except for auxiliary vehicles.

At 14:26 p.m., locomotive No. 92520006069-5 departed from the first track of Stara Zagora station to the interstation to pull FT No. 8650 from the interstation to Stara Zagora station.

At 15:28 p.m., the employee of the RS FSaCP Stara Zagora notified the power dispatcher that the fire had been extinguished and voltage could be applied to the overhead contact line.

At 15:28 p.m., after the switching operations were performed, the voltage was applied to the Stara Zagora - Kaloyanovets section on track No. 1, Kaloyanovets station, Kaloyanovets - Mihaylovo track No. 1 and No. 2 and Mihaylovo station.

At 15:50 p.m., by order of the train dispatcher, FT No. 8690, which departed from Stara Zagora station, stopped at km 97+351 in the Stara Zagora - Kaloyanovets interstation to pick up passengers from FT No. 8650 and continued its movement in the direction of Sofia station.

At 17:05 p.m., FT No. 8650 was driven by locomotive No. 92520006069-5 to Stara Zagora station.

At 17:12 p.m., an electrical systems technician entered in the dispatch order log at Stara Zagora station that the catenary was in working order.

At 17:15 p.m., the TRG from the Stara Zagora railway section entered in the dispatch order log at Kaloyanovets station that the railway track at km 97+280 track No. 2 was in working order and that the movement of trains should be ensured at the speed according to the schedule.

At 17:28 p.m., the train dispatcher at the Plovdiv Railway Station by order opened the Stara Zagora - Kaloyanovets track No. 2 interstation for the movement of all trains and vehicles at the scheduled speed.

At 07:20 a.m. on 02.07.2025, the senior train dispatcher at the Plovdiv Railway Station by order assigned TSV No. 10392 to remove the burned locomotive No. 91520044060-9 in an inoperable condition, which departed from Stara Zagora station at 19:30 p.m. and arrived at Plovdiv station at 23:01 p.m.

3.2.1.2. Rolling stock and technical facilities functioning.

During the service of FT No. 8650 from Varna station, the locomotive crew of locomotive No. 91520044060-9 did not detect any failures or damage that could have caused a fire in the locomotive. The locomotive is regularly registered in the European Vehicle Register (EVR).

Until the time of the accident, the rolling stock of FT No. 8650 (the locomotive and three coaches) was technically functioning.

At Stara Zagora station, the traffic controller on duty, through the RRC, ordered a route to receive FT No. 8650 with a stop at the station. FT No. 8650 left for Kaloyanovets station with an ordered route and exit of the RRC from Stara Zagora station.

3.2.1.3. Operational system functioning.

The operational system for train traffic control on main railway line No. 8 was in good condition and functioning normally before the accident. Train traffic on the Stara Zagora - Kaloyanovets interstation is carried out on a double-electrified railway line.

The operational system for the train traffic control between the two stations is provided with AB without passing signals and axle counters.

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 1:33 p.m., vehicles from the Ministry of Interior and the EMC arrived at the scene of the accident and after clarifying the situation, the area was restricted to outsiders. The authorities of the EMC, Stara Zagora Police Station and the interested officials of both entities were allowed on the site.

3.2.2.2. Actions of the emergency rescue services.

At 13:33 p.m., two fire vehicles and two light operational vehicles from the RS PBiZN Stara Zagora arrived at the scene of the accident. Vehicles from the Ministry of Internal Affairs and the SMP also arrived.

The evacuation of passengers was completed by the arrival of the RS PBiZN Stara Zagora teams.

At 13:42 p.m., the fire was localized and extinguished by the RS FSaCP Stara Zagora teams.

At 14:02 p.m., the energy dispatcher applied voltage to the overhead contact line at the Stara Zagora station.

At 14:06 p.m., the head of train of FT No. 8650 sent a request by telephone from the Stara Zagora - Kaloyanovets track No. 2 interstation to the traffic controller on duty at the Stara Zagora station to transport FT No. 8650 from the interstation to the Stara Zagora station.

At 14:10 p.m., the train dispatcher ordered the traffic to stop in the Stara Zagora - Kaloyanovets interstation on track No. 2 of all trains and vehicles, with the exception of auxiliary vehicles. At 15:28 p.m., the employee from the RS FSaCP Stara Zagora notified the energy dispatcher that the fire had been extinguished and the voltage could be applied to the catenary.

3.2.2.3. Actions of the emergency rehabilitation services

At 14:26 p.m., diesel locomotive No. 92520006069-5 departed from the first track of Stara Zagora station for the interstation area to pull FT No. 8650 from the interstation area to Stara Zagora station.

At 15:28 p.m., after the switching operations, voltage was applied to the Stara Zagora - Kaloyanovets section on track No. 1, Kaloyanovets station, Kaloyanovets - Mihaylovo track No. 1 and No. 2 and Mihaylovo station.

At 15:50 p.m., by order of the train dispatcher, FT No. 8690, which departed from Stara Zagora station, stopped at km 97+351 at the Stara Zagora - Kaloyanovets interstation area to pick up passengers from FT No. 8650 and continued its movement in the direction of Sofia station.

At 17:05 p.m., the train of FT No. 8650 was taken by locomotive No. 92520006069-5 to Stara Zagora station.

At 17:12 p.m., an electrical systems technician entered in the dispatch order log at Stara Zagora station that the catenary was in working order.

At 17:15 p.m., the TRG from the Stara Zagora railway section entered in the dispatch order log at Kaloyanovets station that the railway at km 97+280, track No. 2, was in working order and that the train movement should be ensured at the scheduled speed.

At 14:26 p.m., locomotive No. 92520006069-5 departed from the first track at Stara Zagora station to the interstation area to pull FT No. 8650 from the interstation area to Stara Zagora station.

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

On 01.07.2025 at 17:00 p.m., after the completion of the procedural and investigative actions by the investigative bodies of the Ministry of Interior of Stara Zagora, a written permission was given to carry out emergency and recovery activities and move the locomotive to the Plovdiv Locomotive Depot.

At 17:28 p.m., the train dispatcher at the Plovdiv Railway Station opened the Stara Zagora - Kaloyanovets track No. 2 interstation for the movement of all trains and vehicles at scheduled speed.

At 07:20 a.m. on 02.07.2025, the senior train dispatcher at the Plovdiv TOU by order assigned TSV No. 10392 to remove the burned locomotive No. 91520044060-9 in an inoperable condition, which departed from Stara Zagora station at 19:30 p.m. and arrived at Plovdiv station at 23:01 p.m.

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 FT № 8650

The recordings were downloaded from the recording device, registered on the speedometer tape of locomotive No. 91520044060-9, which served FT No. 8650 on 01.07.2025.

FT No. 8650 departed from Varna station on schedule at 9:00 a.m., observed section speeds and reductions on the railway track, as a result of which it is often necessary to use the automatic train brake to regulate the speed of the train.

The analysis of the movement of FT No. 8650 was made from Nova Zagora station to the scene of the accident - km 97+280 on the Stara Zagora - Kaloyanovets interstation route.

The decoding was made based on the data recorded on the speedometer tape of locomotive No91520044060-9, at the head of FT No. 8650 on 01.07.2025.

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

- Track speed (V-S);
- Astronomical time through graphics and printing on the tape, as well as travel and stopover time (T diagram);
- Distance traveled for individual track sections (through perforations on the tape – 2.5 mm = 0.5 km);
- On the speedometer tape for RT9 type devices (such as those on locomotive No. 91520044060-9), the following additional parameters can be registered:
- Pressure in the main air duct;
- Direction of travel;
- Activation of the rheostat brake;
- Activation of the automatic brake (pneumatic registration);
- The speedometer tape is checked to establish:
- Whether the prescribed maximum speed of the train has been observed;
- Whether the speed is limited to the prescribed one when passing a section that must be passed at a limited speed;
- Has the duration of movement at reduced speed been observed, i.e. to cover a distance equal to the length of the reduction plus the length of the entire train;
- Are there any unforeseen stops at the station;
- Are there any slippages of the locomotive noted;
- Has a decrease in pressure in the main air duct of the air brake been registered during the various tests;
- How was the automatic air brake of the train used and how was the rheostat brake used;
- • Availability of additional registrations in accordance with those provided for each series of TRRS (traction rolling stock);
- • Availability of all records for the relevant TRRS.
- Speedometer control tapes can be also used for other clarifications in the movement of trains, namely:
- • Delays in departure and arrival;
- • Stopping at closed signals and stations;
- • When calculating energy consumption, etc.

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

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



Fig. 4.1 Tape tachograph



Fig. 4.2 Tachometer

Locomotive No. 91520044060-9 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 variable frequency, depending on the speed of movement, drives the mechanical speedometer synchronous electric motors mounted to it. One speedometer is installed in each of the locomotive's cabs: the recording device (tape tachograph) RT9 in cab No. 1 (Fig. 4.1) and the non-recording device (tachometer) A16 in cab No. 2 (Fig. 4.2). The two speedometers have a range of 0÷150 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 strip tachograph shows, without the distance traveled and without recording the information. It is electrically connected to the tachograph and in the event of a power cable interruption, both devices stop recording the speed of movement.
- The recording devices of the RT9 tachograph record the following main parameters:
- Track speed in km/h;
- Astronomical time, as well as travel and stopping time;
- Distance traveled for individual track sections;
- Other parameters for the movement of the locomotive.
- The recording (speedometer) tape is made of waxed paper. It has linear fields for recording the information transmitted by the tape tachograph (Fig. 4.3). The speedometer tape is a valuable objective source of data for the accurate determination of the beginning, course and end of processes related to the movement.

- The speedometer tape records:
- Track speed in km/h;
- Astronomical time;
- Travel time;
- Stop time;
- Distance traveled for individual track sections;
- Air pressure in the main air duct (MAD);
- Other data (optional)

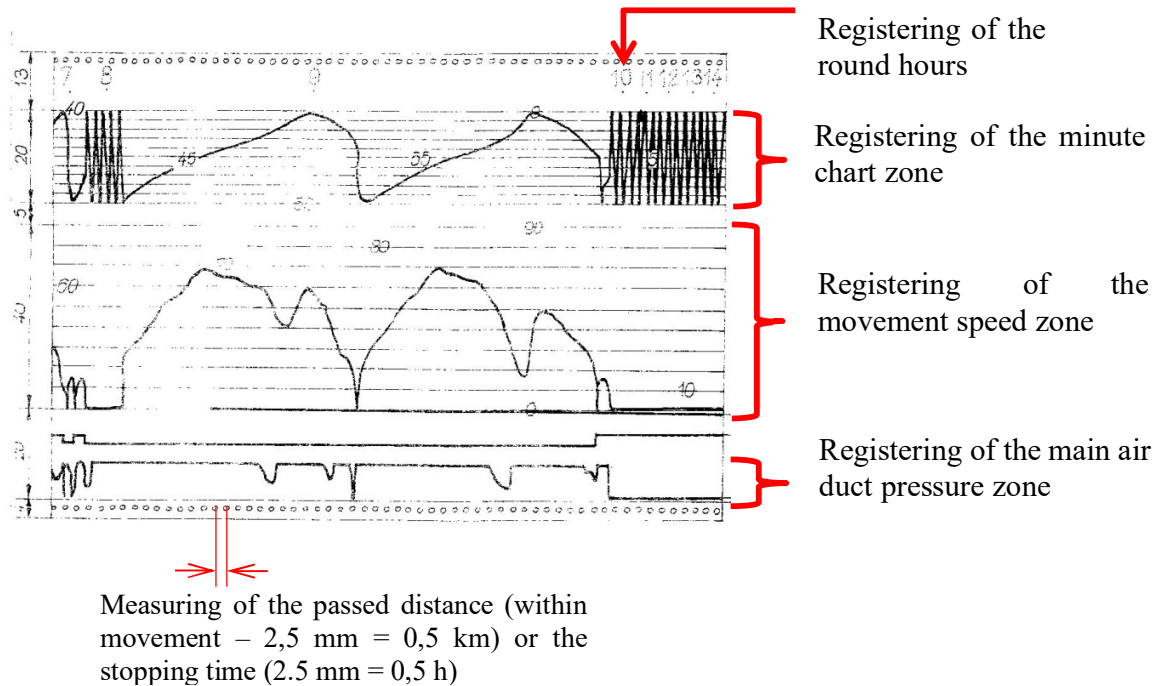


Fig. 4.3

The train arrived at Nova Zagora station at 12:40 p.m. after the locomotive driver activated the automatic train brake several times, performing service stops (Fig. 4.4): once from a speed of 122 km/h to 80 km/h (Fig. 4.4, pos. 1), then made a complete release; a second time from a speed of 80 km/h to 40 km/h (Fig. 4.4, pos. 2), followed by a gradual release and a third time from a speed of 17-18 km/h to a complete stop of the train (Fig. 4.4, pos. 3).

FT No. 8650 stayed at Nova Zagora station for about 30 seconds (Fig. 4.4, pos. 4). It departed at 12:40:30 p.m., accelerated to 98 km/h, covering about 1.2 km in 1.40 minutes, after which the speed decreased to 86 km/h in 1.1 km in 1 minute without the use of the train brake, i.e. from the natural resistance of the train (Fig. 4.4, pos. 5). At 12:44:10 p.m. the train accelerated again and reached a speed of 126 km/h after 1.7 km (Fig. 4.4, pos. 6). From that moment until 12:50:30 p.m. for 6.20 minutes it maintained a speed between 126 and 118 km/h, covering 14.1 km (Fig. 4.4, pos. 7). At 12:50:30 p.m. the locomotive driver switched off the traction mode and the speed started to decrease to 108 km/h over 1.3 km in 40 seconds (Fig. 4.4, pos. 8). The locomotive driver switched on the traction mode, the speed started to increase and after 30 seconds reached 125 km/h, having traveled another 1.1 km (Fig. 4.4, pos. 9), after which he switched off the traction mode and the train continued its movement by inertia for 1 km in 30 seconds (Fig. 4.4, pos. 10). At 12:52:05 p.m., after having traveled 23 km from the departure from Nova Zagora station, at a speed of 120 km/h, the locomotive driver activated the automatic train brake, reducing the pressure in the main air duct by 1.2 bar (Fig. 4.4, pos. 11). The train travelled 120 meters in 15 seconds and the speed began to decrease at a higher rate due to the activation of the automatic train brake (Fig. 4.4, pos. 12). The process continued for 35 seconds until 12:52:40 p.m., at which time the train travelled 880 meters and the speed decreased to 68 km/h (Fig. 4.4, pos. 13). The release process lasted 12 seconds, during which the train travelled 120 meters, and the speed continued to decrease,

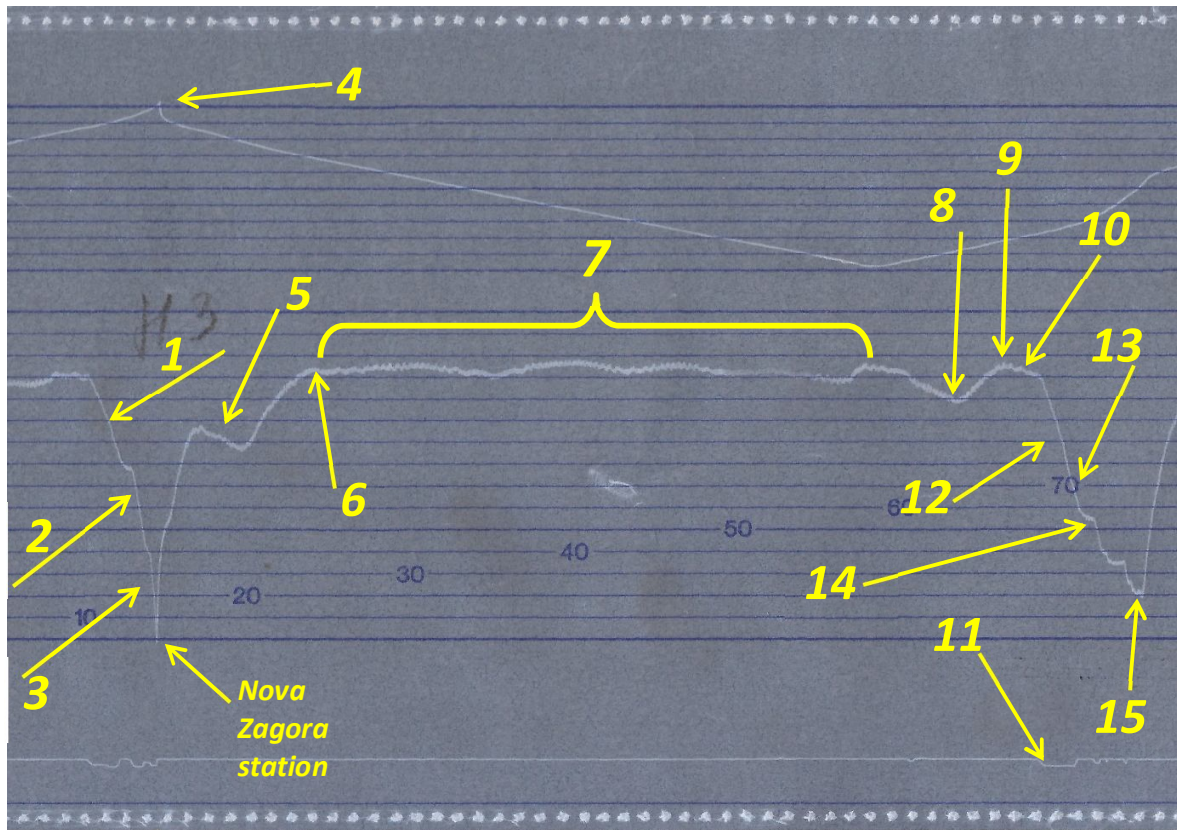


Fig. 4.4

reaching 58 km/h (Fig. 4.4, pos. 14). The locomotive driver performed a gradual reduction in the speed of movement through several gradual holds and then completely released of the automatic train brake, and ultimately at 12:55:00 the speed reaches 19 km/h, immediately after which it begins to increase, reaching a value of 125 km/h after 1.9 km at 12:56:40 p.m., 1.40 minutes after the start of acceleration (Fig. 4.5, pos. 1). After reaching a speed of 125 km/h, the train moved in traction mode from 12:56:40 p.m. to 12:57:00 p.m. for 1.20 minutes and travelled 2.8 km (Fig. 4.5, item 2). At 12:57:00 p.m., the locomotive driver switched off the traction mode, the locomotive run by inertia and the speed started to decrease (Fig. 4.5, item 3). At a speed of 108 km/h, the driver activated the automatic train brake, reducing the pressure in the main air duct by about 0.8 bar and the speed started to decrease at a faster rate, reaching 88 km/h in 500 meters for 20 seconds (Fig. 4.5, item 4). That was followed by a full release, in which the speed was maintained at 88 km/h and a new gradual hold after 10 seconds with a duration of 20 seconds, with the train traveling another 450 meters with a speed reduction to 70 km/h (Fig. 4.5, pos. 5). That was followed again by a full release of the automatic train brake, in which the train travelled 500 meters with a speed of 71 km/h (Fig. 4.5, pos. 6). At 12:59:30 p.m. the locomotive driver initiated a new hold with the automatic train brake, that time the speed from 70 km/h decreased to 0 km/h in 20 seconds, traveling 500 meters (Fig. 4.5, pos. 7). The automatic train brake was released after the train stopped and arrived at Stara Zagora station at 13:00:20 p.m. (Fig. 4.5, pos. 8).

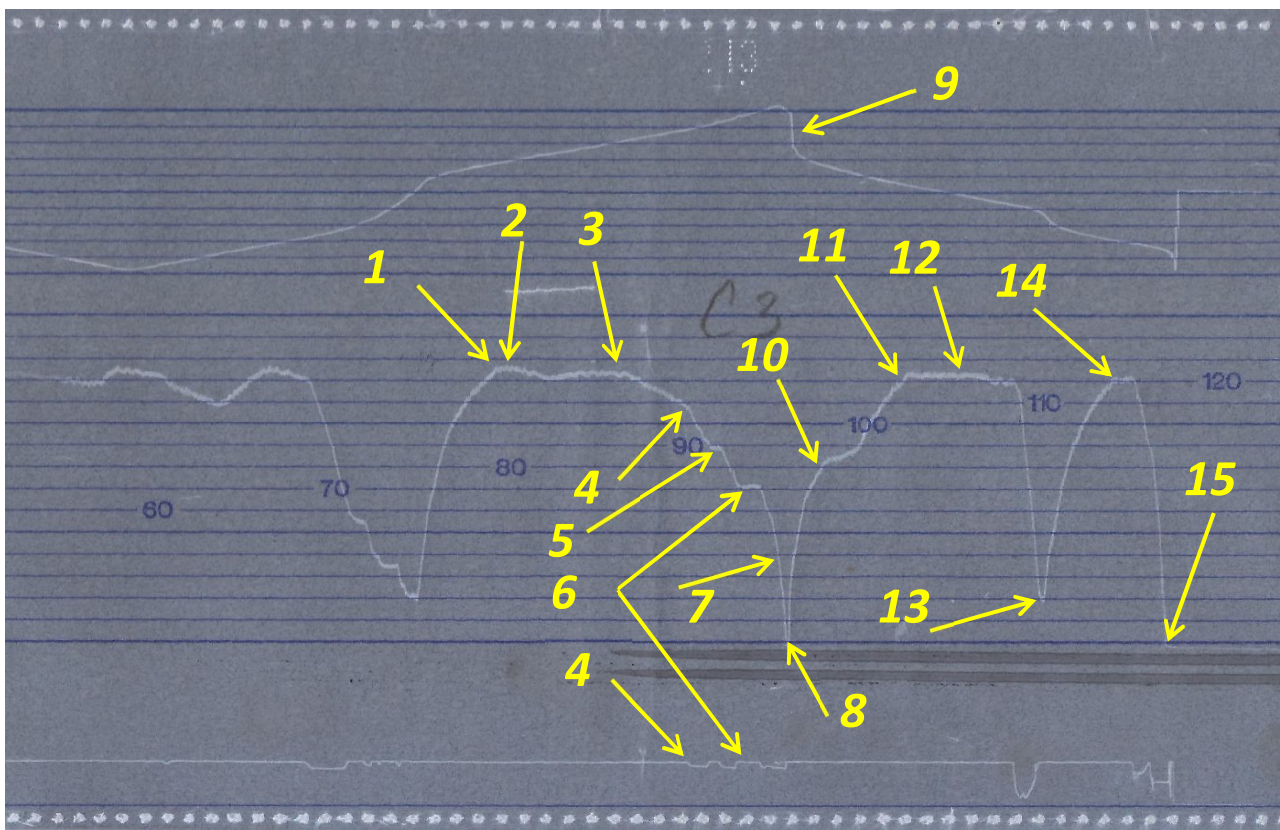


Fig. 4.5

FT No. 8650 stayed at Stara Zagora station for 2.05 minutes from 13:00:20 p.m. to 13:02:25 p.m. (Fig. 4.5, pos. 9). It departed from Stara Zagora station at 13:02:25 p.m., accelerated to 82 km/h in 55 seconds for 820 meters (Fig. 4.5, pos. 10). That was followed by acceleration, but at a lower rate from 82 to 88 km/h for 700 meters for 30 seconds and again increasing the acceleration rate from 88 to 122 km/h for 1.2 km for 40 seconds (Fig. 4.5, pos. 11). After reaching a speed of 122 km/h at 13:04:40 p.m., the train moved at an almost uniform speed for 1.8 km in 55 seconds (Fig. 4.5, pos. 12). At 13:05:30 p.m., a two-fold change in the speed between 120 and 116 km/h was registered, after which at 13:05:50 p.m. the locomotive driver activated the automatic brake to the quick hold position and the speed began to decrease sharply over 600 meters in 30 seconds and at 13:06:20 p.m. it reached 18 km/h (Fig. 4.5, pos. 13). At 13:06:00 p.m., the driver released completely with the brake valve the automatic train brake and switched the locomotive to traction mode, as a result of which the speed at 13:06:30 p.m. began to increase, and at 13:08:00 p.m., after 1,570 km in 1.5 minutes, it reached 120 km/h (Fig. 4.5, pos. 14).

FT No. 8650 moved at a speed of 120 km/h for 500 meters in 10 seconds, after which the locomotive driver performed a quick stop by reducing the pressure in the main air duct to 2.0 bar, complete release and immediately after that a quick stop again with the automatic train brake, during which the train speed sharply decreased from 120 km/h to 0 km/h for 750 meters in 30 seconds and at 13:09:50 p.m. the train settled at km 97+280 in the Stara Zagora - Kaloyanovets interstation (Fig. 4.5, pos. 15).

Analyses of the causes for the fire occurrence.

In the period from 02.07.2025 to 05.07.2025, the Investigation Commission at the NAMRTAIB conducted several inspections of locomotive No. 91520044060-9 at the Plovdiv Locomotive Depot (Fig. 4.5). The Commission questioned the locomotive driver. The train was moving with the first cabin in the direction of travel.

During the inspection of the locomotive at the Plovdiv Locomotive Depot, the Investigation Commission found the following:

The Investigation commission visited the Plovdiv locomotive depot several times and carried out detailed inspections of the self-ignited locomotive. A thorough and detailed analysis of its condition and its individual systems, as well as the operational and repair documentation, was carried out.

During the inspection was found, that the burnt middle part of the right longitudinal side of the



Fig. 4.6



Fig. 4.7



Fig. 4.8

locomotive on travelling direction above the battery cabinet (Fig. 4.6). The fire spread to the engine compartment passageway, burning the floor covers and the operating cables located underneath them (Fig. 4.7). Cables connected to the traction transformer (Fig. 4.8) were burned, as were devices from the rectifier unit of the first traction group (Fig. 4.9). The greatest damage was caused under the locomotive frame, in the area of the under-body shell horizontal fan. According to the marks left by the fire, it was evident that the highest temperature developed in the area of the fan housing, the terminal box and the floor metal sheet through which the cable bundles passed into the engine compartment (Fig. 4.10). During the inspection, it was found that the burns on the cables were due to an external fire and the cause of the

ignition could not be found in them (Fig. 4.11). Then the attention was focused onto the mechanical part of the brake system and in particular to the brake pads of the locomotive.

The brake pads of these locomotives are made of spheroidal phosphor cast iron and are designed to create a friction force between them and the rolling surface of the wheel against which they are pressed. As a result, a force appears that is designed to provide braking or reduce the speed of the locomotive. Because of the applied friction force between the cast iron pad and the surface of the corresponding wheel, a large amount of heat was released, which led to heating of the wheel and the pad. Due to the specifics of the material from which the pads are made, they wear out faster (this is done intentionally) and hot pieces of cast iron broke off from them (Fig. 4.12). In the vast majority of cases, these shavings hit the frame of the bogie and other elements of its structure, and fall to the ground. Sometimes, however, they fly out and get stuck in other parts located under the locomotive frame. Dust, oil and other flammable materials are often collected in these parts, which can be ignited by such flying hot particles (Fig. 4.13).

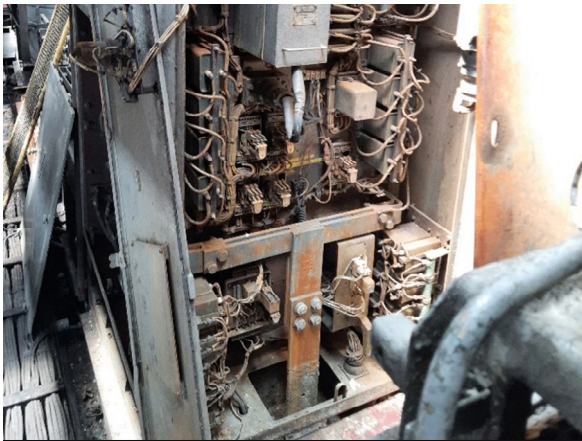


Fig. 4.9



Fig. 4.10



Fig. 4.11

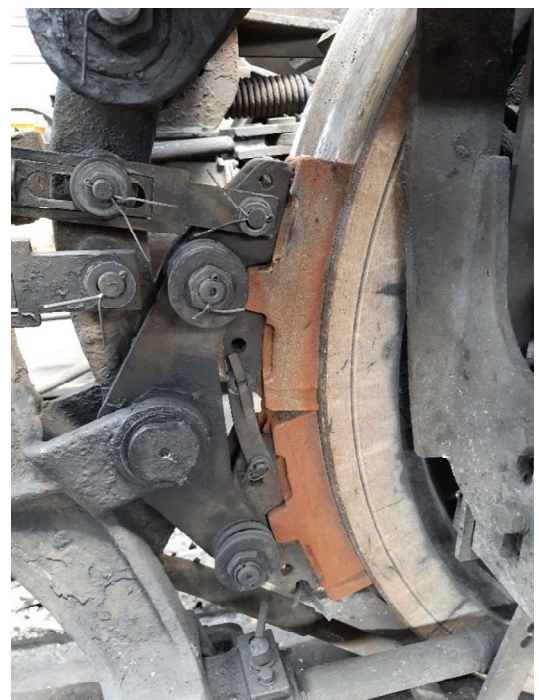


Fig. 4.12

When operating a locomotive in a train, locomotive drivers usually operate the train in braking mode, using the automatic train brake of the coaches included in the train and releasing the automatic brake of the locomotive. According to the provisions of Art. 289, para. 2 of the RTOSART: “the service mass of locomotives in working condition is not included in the mass of the train.” Also, according to the provisions of Art. 289, para. 3 of the RTOSART: “the brake mass of locomotives serving trains is not included in the available brake mass of the train.” From what has been said so far, it can be seen that in practice the locomotive does not participate in the braking process. From the issued Certificate for the brake mass of FT No. 8650 it can be seen that the train is provided with brake mass (Fig. 3.12): train mass: 153 tons; braking rate: 115%, whereby the required brake mass is 176 tons.

$$B = \frac{m \cdot \lambda}{100} = \frac{153 \cdot 115}{100} = 176 \text{ t}$$

where:

B – necessary brake mass, t;

m – gross train mass (in that case that was the mass of the coaches in the train composition), t;

λ – brake percentage (as per the normative requirements, fig. 4.15)

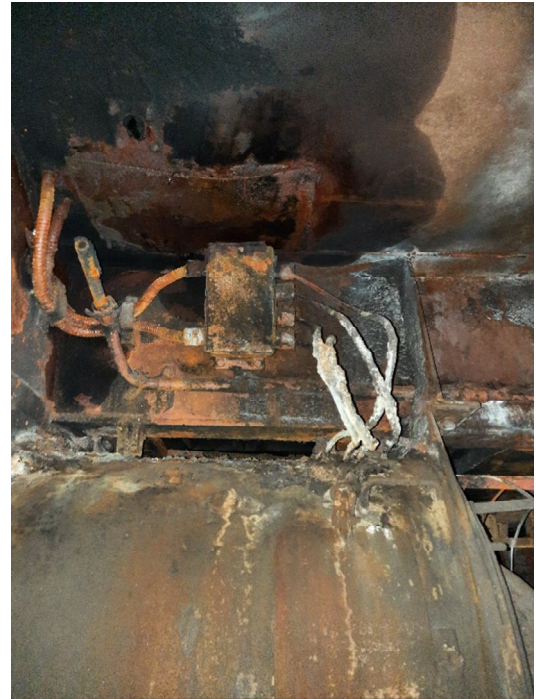


Fig. 4.13

БВ 8650 300т 115% лок44							БДЖ-ПП	
		ВАРНА				09:20		
3.2	80	ВАРНА ТОВ. ПАРК	4	:	–	:24	20163	
6.0		ТОПОЛИТЕ	5	:	–	:29		
3.8	90	ЕЗЕРОВО	3	:	–	:32		
5.7	80	БЕЛОСЛАВ	5	09:37	1	:38		
5.6	100	ПОВЕЛЯНОВО	4	:	–	:42		

Fig. 4.14

The available brake mass (the sum of the brake masses of the switched on and working brake systems of the coaches in the train) is 213 tons (3 wagons with 71 tons of brake mass on each coach – Fig. 3.13). In practice, however, the actual mass of the train was the sum of the masses of the coaches in the train (153 tons), to which the service mass of the locomotive (87 tons) must be added, which was not added for the reasons mentioned above. Then the gross mass of the train would change and would be:

$$m_{coach} + m_{loc} = m_{train} \Rightarrow 153 + 87 = 240 \text{ tons}$$

where:

m_{coach} – mass of the coaches in the train composition, t;

m_{loc} – mass of the locomotive, t;

From its side, the necessary brake mass also changed:

$$B = \frac{m_{train} \cdot \lambda}{100} = \frac{240 \cdot 115}{100} = 276 \text{ tons}$$

Where:

B – necessary brake mass, t;

M_{train} – gross train mass (in that case was the mass of the coaches in the train composition), t;

λ – brake percentage (as per the normative requirements, fig. 4.14).

In case of an available brake mass of 213 tons (the brake mass of the locomotive is not included in the available brake mass of the train – fig. 3.12) the train instead of being ensured with the required 115% brake percentage, was ensured with only 88%.

$$\lambda_{avail..} = \frac{B_{avail..} \cdot 100}{m} = \frac{213 \cdot 100}{240} = 88,75\% \approx 88\%$$

where:

$\lambda_{avail..}$ – actual (available) brake percentage;

$B_{avail..}$ – available brake mass as per the brake mass certificate;

M_{train} – actual gross mass of the train with added service mass of the locomotive.

Consequently, as a final result:

$$B_{aval.} = 213t < B = 276t$$

It is obvious that the available brake mass is lower than the necessary, which contradicts to art. 289, par. 1 of RTOSART: „One train is considered for ensured with brake mass, when the available equal or higher than the necessary brake mass.“ All the thoughts lead to the conclusion that, in order to be able to stop at the required braking distance, i.e. to ensure the necessary braking distance, the locomotive driver must regularly activate the direct brake of the locomotive. His action is regulated in the "Instructions for the operation of the locomotive crew during normal operation", art. 53, para. 2: "in order to prevent temperature overload of the friction units of the coaches during long downhill service of short-unit trains, in which the mass of the locomotive/locomotives is more than 25% of the mass of the train, the locomotive driver must also use the direct brake of the locomotive." In the case under consideration, the mass of the locomotive is over 40% of the mass of the train, therefore the actions of the driver are correct and regulated by law.

On the other hand, however, the friction units of the locomotive are thermally overloaded, which was established during the inspection of the burned locomotive (Fig. 4.12). It was from the thermally overloaded blocks that pieces began to break off, which were swirled by the air during the movement of the locomotive and fell on the housing of the under-body shell fan, where they initially ignited the dirt accumulated on it, and subsequently the cables located in the immediate vicinity. Further development of the fire was a matter of time for the fire to pass into the engine compartment and spread there as well.



Fig. 4.15. Burnt conductor 873

From the performed inspections, findings and explanations, the most probable causes for the fire occurrence in electrical locomotive № 91520044060-9 could be the following:

1. Occurrence of a short circuit of low voltage cables in a piano type multiple unit system in the first locomotive control cabin. When checking the terminal board of the multiple unit system, a burnt

cable was found on conductor 873 and its connections with conductor 869 for powering the battery shown in Fig. 4.15.

The figure shows that the short is in the conductor itself and there is no broken insulation of the other conductors of the multiple unit system. It was found that there was no blown fuse.

2. Occurrence of a short circuit in wire 870 – the main positive wire of the locomotive. As it can be seen from Fig. 4.16 there are burnt cables but not to the copper core. That was unlikely to be a possible cause of the locomotive fire. From the interrogation of the locomotive crew and the readings of the ammeter on the charger, the operating current was about 40A. The ammeter remained in that state. It was too large to power the locomotive's operational circuits with a voltage of 48V.

3. Occurrence of a fault in the power cables of the fan motor 231.



Fig. 4.16. Burnt cables on conductor 870

Figure 4.17 and 4.18 shows completely burnt insulation of the power cables which, through a terminal box, supply power to the under-basket fan motor 231 for cooling the rectifier unit.

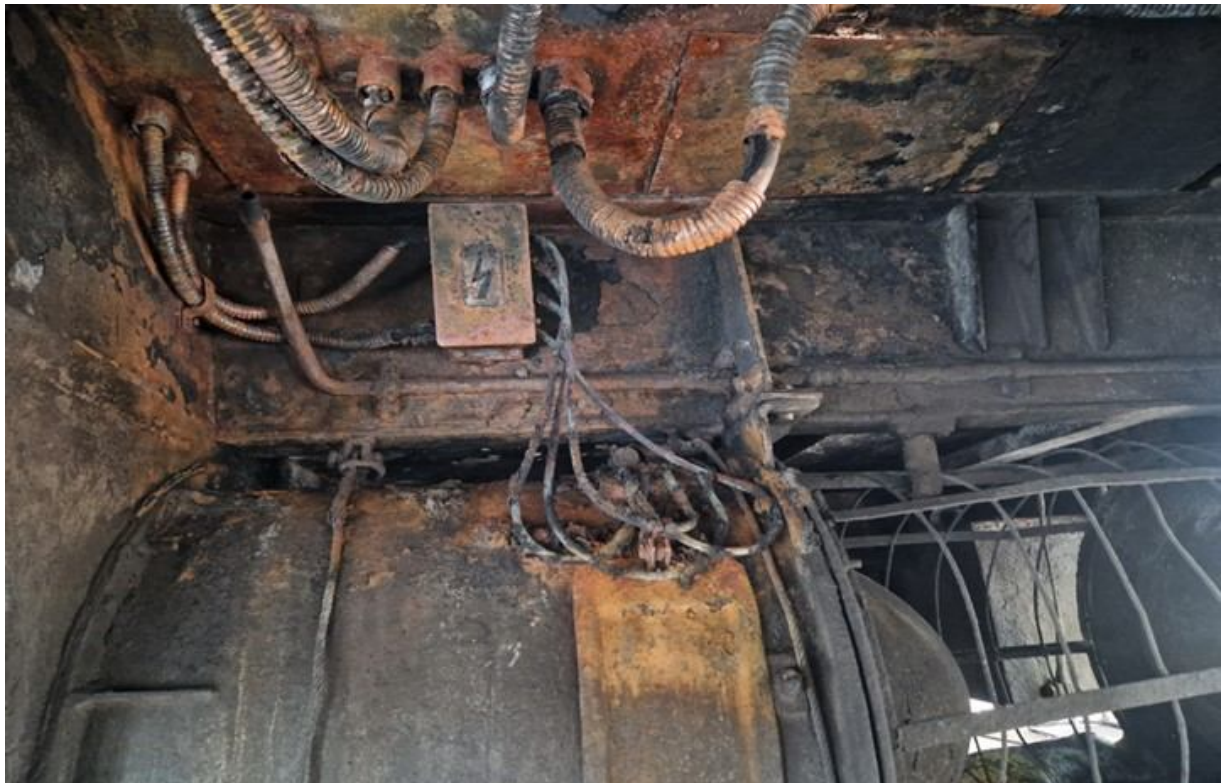


Fig. 4.17. Power supplying cables on the engine-fan, supplied by the terminal box



Fig. 4.18. Power supplying cables of first under body shell engine fan

Possible causes of ignition of the power cables of the under-body shell fan motor can be:

- Short circuit in the circuit of the horizontal under-body shell fan motor;
- External ignition of the fan motor cables.

In the first possible cause, relay B10 will activate for hp over 330 A and will block the operation of the power converter, but this will not cause a spark and ignition of the power cables.

The second cause is more likely. When the locomotive was moving by inertia, it stopped with its pads, as seen in Fig. 4.19. They were slightly gray. As it can be seen from the figure, the bluing is in the middle, which makes it possible to assume that the pad did not contact the entire surface. Most likely, it sparked.

On the ceiling of the locomotive's body shell, dust often accumulates, and under the transformer and around the under-carriage fans with an admixture of oil. It is highly flammable. As it can be seen from Fig. 4.19, the power cables were not placed in a metal corrugated pipe, the power cables to the box were placed in metal corrugated pipes. As a result of sparking of the pads when the locomotive stopped, it led to the ignition of the accumulated oil dust. The power cables of the first undercarriage engine fan have collected enough oil dust. As the driver explained, he saw a flame from there. Thanks to their intervention and the quick arrival of the fire truck, the damage to the locomotive is minor.



Fig. 4.19. Condition of the locomotive pad

4.1.2. Analysis of the condition of the railway infrastructure.

- The place of stopping for extinguishing the locomotive is at km 97+280 – the beginning of the locomotive in the direction of movement in the Stara Zagora – Kaloyanovets interstation.
- railway crossing at km 97 + 630
- Hristiyanovo halt at km 98 + 132
- Stara Zagora station at km 106 + 066
- Kaloyanovets station at km 92 + 869
- Elenino halt at km 100 + 132
- Rail track slope 4.7 ‰ – descent.
- Rail track rails, type 49 kg/m
- sleepers, Reinforced concrete – ST-6
- SKL-14 fastening
- Continuously welded railway track – in a straight line speed of 130 km/h on track 1 and 2 in the Stara Zagora – Kaloyanovets interstation

4.1.3. Entities in charge of the technical maintenance.

Railway undertaking

"BDZ-Passenger Transport" EOOD owns an ECM Certificate with EIN No. BG/31/0024/ 0003, valid from 09.12.2024 until 18.04.2026;

Infrastructure manager

SE NRIC owns an ECM Certificate with EIN BC/31/0023/0001, valid from 22.03.2023 until 21.03.2028. Scope of activities of entity in charge of maintenance, Category vehicles: freight wagons, passenger coaches and RSPSM, property of SE NRIC;

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

Not applicable.

4.1.5. National Safety Authority.

Railway Administration Executive Agency is the National Safety Authority of the Republic of Bulgaria.

4.1.6. Notified bodies or Risk assessment authorities.

Not applicable.

4.1.7. Certifying bodies of the entities in charge of 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.

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

- BDZ PP EOOD implements Quality Procedure P-2-15 "Safety Management of Passenger Transportation. Monitoring and information" from 25.03.2024 and Methodology for assessing the safety risk in BDZ PP EOOD from 23.02.2012.

4.2. Rolling stock and technical facilities:

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

Not applicable.

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

Not applicable.

4.2.3. Factors deriving from manufacturers or other supplier of railway products.

Not applicable.

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

Not applicable.

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

Not applicable.

4.2.6. Other factors or consequences considered as involved within the investigation objectives.
Not 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 locomotive No. 91520044060-9:

Certificate of competence No. 23105 acquired qualification for "Locomotive driver", training conducted in the period 23.09.2020÷03.02.2021, training institution PQC at BDZ, issued by the Railway Administration Executive Agency;

Locomotive driving certificate BG 71 2022 0056, issued by the Railway Administration Executive Agency;

Certificate No. VII-1450 for holding the position of "Locomotive Driver" in BDZ PP EOOD from 11.03.2025;

Additional certificate No. 71 2022 0056 from BDZ PP EOOD for rolling stock for which the driver is allowed to drive - series 43, 44, 45,000 and 80,000 from 06.01.2024 to 05.12.2027 on the national railway infrastructure of the Republic of Bulgaria.

- Assistant locomotive driver of locomotive No. 91520044060-9:

Certificate of competence No. 26622 acquired competence for "Assistant locomotive driver", training conducted in the period 30.09.2024÷07.03.2025, training institution PQC at BDZ, issued by the Railway Administration Executive Agency;

Certificate No. VII-1480 for holding the position of "Assistant Locomotive Driver" in BDZ PP EOOD from 30.05.2025;

- Head of Train, Passenger Traffic on FT No. 8650:

Certificate of Competence No. 20395 acquired qualification for "Head of Train", training conducted in the period 30.10.2017 ÷ 12.01.2018, training institution PQC at BDZ, issued by the Railway Administration Executive Agency;

Certificate No. VI-390 for holding the position of "Head of Train, Passenger Traffic" in BDZ PP EOOD from 01.04.2020.

Infrastructure manager

- Traffic Manager at Stara Zagora Station:

Certificate of Competence No. 10797, acquired qualification for "Traffic Manager and Commercial Operation", training conducted in the period 23.01. ÷ 22.12.1989, training institution PQC at F BDZ;

Certificate No. 1415 for holding the position of Traffic Manager at TOSAMD- Plovdiv from 10.12.2021

- Traffic Manager at Kaloyanovets Station:

Diploma No. 21906 acquired qualification for "Traffic Manager", training conducted in the period 1983÷1986, training institution VNVTU - "Todor Kableshev";

Certificate No. 1170 for holding the position of "Traffic Manager" at TOSAMD - Plovdiv from 21.04.2023

- Manager traffic/train dispatcher in TOU Plovdiv:

Certificate of competence No. 20146, acquired competence for "Traffic Manager", training conducted in the period 15.02÷26.08.2016, training institution PQC at SE NRIC;

Certificate No. 4170 for holding the position of "Traffic Manager/train dispatcher" in TOSAMD - Plovdiv from 28.05.2024.

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

Railway undertaking:

- Engine driver of locomotive № 91520044060-9:

Periodic medical examination card dated 04.10.2024, issued by the Gorna Oryahovitsa Multi-Profile Transport Hospital;

Conclusion: fit for a locomotive driver.

Psychological certificate No. 9533/02.09.2023, issued by the Psychological Laboratory at the Gorna Oryahovitsa Multi-Profile Transport Hospital for a locomotive driver.

Conclusion: admitted for a period of 5 years.

- Assistant locomotive driver of locomotive No. 91520044060-9:

Preliminary medical examination card dated 28.04.2025, issued by the Gorna Oryahovitsa Multi-Profile Transport Hospital;

Conclusion: fit for Assistant locomotive driver.

Psychological certificate No. 507/19.05.2025, issued by the Psychological Laboratory at the Multidisciplinary Transport Hospital Gorna Oryahovitsa for an assistant locomotive driver.

Conclusion: admitted for a period of 5 years.

- Trainmaster, passenger traffic on FT No. 8650:

Periodic medical examination card dated 10.07.2024, issued by the Multidisciplinary Transport Hospital Gorna Oryahovitsa.

Conclusion: fit for a trainmaster, passenger traffic.

Psychological certificate No. 1087/12.10.2022, issued by the Psychological Laboratory at the Multidisciplinary Transport Hospital Gorna Oryahovitsa for a trainmaster.

Conclusion: admitted for a period of 5 years.

Railway infrastructure

- Traffic controller at Stara Zagora station:

Single health information file dated 04.06.2025, issued by the Multi-Profile Transport Hospital - Plovdiv.

Conclusion - fit for traffic controller.

Psychological certificate No. 724/28.05.2024, issued by the Psychological Laboratory - Railway Transport Plovdiv at the Multi-Profile Transport Hospital Plovdiv for traffic controller.

Conclusion: admitted for a period of 3 years.

- Traffic controller at Kaloyanovets station:

Single health information file dated 26.07.2024, issued by the Occupational Health Service at the State Enterprise NRIC;

Conclusion: fit for traffic controller.

Psychological certificate No. 72/17.01.2023, issued by the Psychological Laboratory - Railway Transport Plovdiv at the Multi-Profile Transport Hospital Plovdiv for traffic controller.

Conclusion: admitted for a period of 3 years.

- Traffic Manager/Train Dispatcher in Plovdiv Railway Station:

Single Health Information File dated 09.04.2025, issued by the Occupational Health Service at the State Enterprise NRIC;

Conclusion: fit for Traffic Manager.

Psychological Certificate No. 41/12.01.2021, issued by the Psychological Laboratory - Railway Transport Plovdiv at the Multi-Profile Transport Hospital Plovdiv for Traffic Manager.

Conclusion: admitted for a period of 5 years.

4.3.1.3. Fatigue

Railway undertaking:

- Locomotive driver of locomotive No. 91520044060-9:

Break: from 30.06.2025 hour 08 minutes 00 to 01.07.2025 hour 08 minutes 00

Started work: 01.07.2025 hour 08 minutes 00 – (24 hours and 00 minutes)

- Assistant locomotive driver of locomotive No. 91520044060-9:

Break: from 29.06.2025 hour 23 minutes 55 to 01.07.2025 hour 08 minutes 00

Started work: 01.07.2025 hour 08 minutes 00 – (48 hours and 05 minutes)

- Train manager, passenger traffic on FT No. 8650:
Break: from 30.06.2025 at 07:17 to 01.07.2025 at 08:20
Returned to work: 01.07.2025 at 08:20 – (25 hours and 03 minutes)

Railway infrastructure

- Traffic Manager Stara Zagora Station:
Break: from 28.06.2025 hour 07 minutes 00 to date 01.07.2025 hour 07 minutes 00
Started work: 01.07.2025 hour 07 minutes 00 – (72 hours and 00 minutes)
- Traffic Manager Kaloyanovets Station:
Break: from 30.06.2025 hour 07 minutes 00 to date 01.07.2025 hour 06 minutes 00
Started work: 01.07.2025 hour 06 minutes 00 (23 hours and 00 minutes)
- Traffic Manager/Train Dispatcher at Plovdiv Railway Station:
Break: from 26.06.2025 hour 07 minutes 00 to date 01.07.2025 hour 07 minutes 00
Started work: 01.07.2025 hour 07 minutes 00 (120 hours and 00 minutes)

4.3.1.4. Motivation and attitudes related to the human factor

Not applicable

4.3.2. Work related factors:

4.3.2.1. Tasks planning.

Railway infrastructure

• SE NRIC – railway infrastructure manager carries out maintenance, repair and operation of the railway infrastructure. Prepares year-round schedule 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. Performs ongoing maintenance of the railway infrastructure and facilities with regulated "operational windows".

Railway undertaking

• BDZ PP EOOD is a sole proprietorship with limited liability, established under the Commercial Act. The company consists of a Central Office and three Passenger Transport Divisions – Sofia, Plovdiv and Gorna Oryahovitsa. The company is managed by a manager, the passenger transport divisions by directors. The subject of activity of BDZ PP EOOD is the provision of passenger rail transport by diesel and electric traction in domestic and/or international traffic, including maintenance and repair of rolling stock (locomotives and coaches). To carry out its activities, the company has a license and a safety certificate, as well as a structure responsible for maintenance. The company annually develops and approves a plan for composing passenger trains in accordance with the train schedule.

• „BDZ-Passenger Transport“ EOOD is a national railway carrier that carries out passenger transport according to an approved Train Schedule and Train Composition Plan under a passenger transport contract with the state.

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

4.3.2.3. Communication means

Railway infrastructure

The communication links between the traffic controllers on duty at the stations on the Stara Zagora - Kaloyanovets section, as well as with the train dispatcher of the dispatch interlocking are carried out through the DCCM-8 direct connection system (conversations are recorded).

At each station on the Stara Zagora - Kaloyanovets section, a service mobile phone is provided for emergency and urgent communication of the traffic controller on duty (conversations are recorded).

The stations on the Stara Zagora - Kaloyanovets section are equipped with TDRC for quick connection of the train dispatcher on the section with the traffic controller on duty at the respective station and with the locomotive driver of the train on the section (conversations are recorded).

Railway undertaking

BDZ PP EOOD communication between the personnel working in operation is carried out with official mobile phones and in the mainline locomotives it is carried out with TDRC.

4.3.2.4. Practices and processes.

Not 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 a 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 applies national and departmental regulations that are part of the SMS in the Integrated Management System from 25.03.2024, which includes:

- Procedure P-2-8 – Repair and maintenance of traction rolling stock;

- Procedure P-2-6 – Management of transport activities;

- Procedure P-2-10 – Control and operation of rolling stock;

- Procedure P-2-11 – Control of repairs. Report and inclusion in operation of rolling stock and passenger coaches;

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

- Instructions for the procedure and method of performing operational inspections of rolling stock MV;

- Regulations for the inter-repair runs and the cyclist and scheduled inspections and repairs of rolling stock 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 Labor Code:

The personnel of SE NRIC, who participated in the accident, work on a shift basis, 12-hour work shifts for which a summed calculation of working hours is applied (intermediate breaks are observed).

The personnel of BDZ PP EOOD, who participated in the accident work on a shift basis, 12-hour work shifts for which a summed calculation of working hours is applied (intermediate breaks are observed). Labor Code and Ordinance No. 50 of 28.12.2001.

4.3.2.7. Risk treatment practices.

Railway infrastructure

- SE NRIC applies safety procedure PB 2.09 "Methodology for determining, assessing and managing risks" version 06 in force from 01.09.2021, part of the SMS;

- SE NRIC applies a Program for carrying out a risk assessment for the health and safety of workers and employees in force from 09.09.2024, part of the SMS;

- SE NRIC applies a Methodology for quantitative risk assessment in force from 02.09.2024, part of the SMS;

- SE NRIC applies Instructions, Rules and Orders in relation to assigned work of employees in the operating divisions, as well as work performed by External Contractors under specific circumstances and hazards, consistent with the specific requirements for repair and maintenance of the railway infrastructure, part of the SMS.

Railway undertaking

- "BDZ-Passenger Transport" EOOD applies the "Integrated Management System Procedure" P-2-15. "Passenger Transport Safety Management. Monitoring and Volume of Information" dated 25.03.2024 and "Methodology for Safety Risk Assessment in BDZ PP EOOD" dated 23.02.2012. Register of Hazards in Operation, Repair and Maintenance of Passenger Transport in BDZ PP EOOD.

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

Not applicable.

4.3.3. Organizational factors and tasks:

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

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

4.3.3.2. Communications, information and teamwork

Not 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 approved "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 HSLC, Ecology, and organization of the activity of STM.

The entity's personnel is 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 the management of human resources 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 personnel database;
- Creating a system of selection techniques;
- 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

Not 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;
 - Determining and changing 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.

Railway infrastructure

- SE NRIC has approved "Internal rules for wages" in force since 01.09.2014, which regulate issues related to the wages of the company's personnel:

- General provisions for the organization of the salary in the enterprise;
- 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.

Not applicable.

4.3.3.7. Organizational culture.

Not applicable.

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

Not 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.

Railway infrastructure.

- 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. Labor conditions (noise, illumination, vibrations).

Not applicable for SE NRIC and BDZ PP EOOD.

4.3.4.2. Meteorological and geographic conditions.

The Stara Zagora and Kaloyanovets stations are located in the southern part of the railway network;

Described in detail in section 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. Other important factors related to the investigation.

Not 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 authorization 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:

Railway undertaking.

- "BDZ-Passenger Transport" EOOD implements the Quality Management System PK 2-15 "Passenger Transportation Safety Management. Monitoring and exchange of information". 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. Complex audits are conducted once a year on 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 undertaking BDZ PP EOOD has not prepared and submitted monthly reports for the current year, as well as a complex (annual) audit previous year's risk monitoring report.

Railway infrastructure.

- SE NRIC implements safety procedure PB 2.09 "Methodology for risk identification, assessment and management" version 06 in force from 01.09.2021, part of the SMS;

- SE NRIC implements Methodology for quantitative risk assessment in force from 02.09.2024, part of the SMS;

- SE NRIC implements Program for minimization of risk for safety and health,

at work in force from 16.08.2024, part of the SMS;

- SE NRIC implements Program for assessment of workplaces and occupational risks in force from 16.08.2024, part of the SMS;
- SE NRIC implements the "Safety Rules for Current Railway Maintenance" in force from 2021; SE NRIC has approved regulatory acts, instructions and rules that describe risk assessment management, but the control over the implementation by the safety structures in the company is formal. and risk management" version 05 in force 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 is a certified ECM with Certificate No. BG/31/0024/0003 valid from December 9 2024 until April 18, 2026;

Railway infrastructure.

- SE NRIC holds a Certificate of a structure responsible for maintenance with EIN VS/31/0023/0001, valid from 22.03.2023 to 21.03.2028. Scope of activities of a structure responsible for maintenance, Vehicle category: freight wagons, passenger coaches and RSPSM;
- SE NRIC holds a Safety Authorization IN EC BG 21 2023 0001, valid from 01.07.2023 to 30.06.2028.

4.4.2.2. Manufacturers and all other participants.

Not 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 infrastructure managers and railway undertakings have established their own safety management systems that ensure that the railway system meets the minimum common safety criteria and complies with the national safety rules and the safety requirements formulated in the TSIs and implemented in parts of the CSM. The safety management systems are adapted to the type, scope and areas of activities and ensure control of the risks of the railway infrastructure manager or railway undertaking. Existing national and European safety rules, the safety management system takes into account the risks arising from the activities of other participants in the transport process.

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 safety procedure PB 2.09 "Methodology for determining, evaluating and managing 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.

The safety management system also includes a system for certification of the structures (entities) responsible for the technical maintenance of the vehicles of the SE NRIC and the railway undertakings in accordance with the requirements of Commission Implementing Regulation (EU) 2019/779 of 16 May 2019 establishing detailed provisions on a system for certification of the structures responsible for the maintenance of vehicles in accordance with Directive (EU) 2016/798 of the European Parliament and of the Council and repealing Commission Regulation (EU) 445/2011, transposed into national legislation.

Railway infrastructure.

- SE NRIC holds a Certificate of a structure responsible for maintenance with EIN VS/31/0023/0001, valid from 22.03.2023 to 21.03.2028. Scope of activities of a structure responsible for maintenance, Vehicle category: freight wagons, passenger wagons and RSPSM;
- SE NRIC holds a Safety Certificate IN EC BG 21 2023 0001, valid from 01.07.2023 to 30.06.2028.

Railway undertaking.

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

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, Ordinance No. 56 and Ordinance No. 59 to meet 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 the SMS and can fulfil the requirements provided for in the relevant legal acts.

Railway infrastructure

1. In the period from 22.04.2024 to 23.12.2024, the National Safety Authority (RAEA) carried out an annual planned supervision of SE NRIC to establish common safety methods in relation to the SMS requirements under Directive (EU) 2016/798. No non-compliances were found.

2. In the period from 07.12.2024 to 23.12.2024, the National Safety Authority (RAEA) carried out an extraordinary safety inspection of SE NRIC in relation to the implementation of the SMS requirements under Directive (EU) 2016/798, in view of the serious accidents that occurred in the company.

Railway undertaking

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

2. In the period from 23.10.2023 to 03.11.2023, the National Safety Authority (RAEA) conducted a scheduled 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 certificates of the involved railway infrastructure manager

SE NRIC holds Safety Authorization No IN EC BG 21 2023 0001, valid from 01.07.2023 until 30.06.2028.

4.4.6.2 Safety certificates of the involved railway undertaking.

"BDZ-Passenger Transport" EOOD holds a Single Safety Certificate with IN EU BG 10 2022 0298, valid from 31.12.2022 to 30.12.2027;

4.4.6.3. Authorizations for placing in service of permanently fixed facilities and authorizations for placing vehicles on the market.

Not applicable.

4.4.7 Other system factors.

Not applicable.

4.5 Previous similar cases.

In the period from 2009 to 2025, NIB – BG has investigated 17 accidents of a similar nature, a fire occurred in electric locomotives series 43, 44 and 45. In accordance with the requirements of Art. 24, paragraph 2 of Directive (EU) 2016/798, all investigations have been concluded with final reports and in accordance with Art. 26, safety recommendations have been issued to the National Safety Authority (RAEA) and to the interested entities and other parties to the accident.

5 Conclusions

5.4 Summary of the analysis for the event causes.

The investigation commission conducted several inspections of the burned locomotive No 91520044060-9 at the Plovdiv Locomotive Depot, reviewed the documentation provided on the technical condition (operation and repairs carried out) of the locomotive before the accident. It interviewed the personnel, the operation and repair managers at the Plovdiv Locomotive Depot and the statements given by them. It reviewed and analyzed the documentation related to the operation and maintenance of the locomotive.

The analysis of the report examined several possible causes of the fire. From the inspections, measurements and findings made, the Investigation Commission established that the most likely cause of the fire in locomotive No. 91520044060-9, serving FT No. 8650, was the prolonged movement of the locomotive in braking mode with the direct locomotive brake held, which led to the separation of hot shavings from the brake pads, which fell on the housing of the under-body shell horizontal fan, where it ignited accumulated oily dust particles.

5.5 Undertaken measures after the event occurrence.

The railway infrastructure manager, SE NRIC, promptly organized and took action to restore the schedule and capacity of the railway infrastructure, through inspections and measurements of the railway track and the catenary. Traffic was restored at 17:28 p.m. on 01.07.2025 according to schedule.

After the accident, FT No. 8650 was canceled by the MAD, and its passengers were taken on FT No. 8690 along the train route to Sofia station.

At 07:20 a.m. the senior train dispatcher at the TOU by order assigned a work-service train (TSV) No.10392 to transport the burned locomotive No. 91520044060-9 in an inoperative condition, which departed at 19:30 from Stara Zagora station and at 23:01 arrived at Plovdiv station - Plovdiv Locomotive Depot (place of residence).

The investigation commission at the NAMRTAIB initiated an investigation into the accident regarding the ignition of the locomotive after its movement to the Plovdiv Locomotive Depot.

5.6 Additional findings.

Due to the provisions of Art. 289, para. 2 and para. 3 of the RTOSART, the service mass and brake mass of the locomotives are not included in the gross mass and the available mass of the train, respectively, which led to a decrease in the actual brake percentage and insufficient braking effect in the passenger trains of BDZ PP EOOD. As it can be seen from the plan for composing the passenger trains of BDZ PP EOOD, the trains of the fast and passenger trains have a reduced number of passenger coaches, whereby the service mass of the locomotive constitutes a larger share of the total mass of the train set and this led to a decrease in the available braking rate of the train.

The locomotives of series 43, 44 and 45 of BDZ PP EOOD in operation, which have not been overhauled, their technical condition often leads to a risk of fires during servicing of passenger trains in motion.

As a result of the fires that occurred in locomotives during operation, there was a prolonged suspension of train traffic and a limitation of the capacity of the railway infrastructure, which worsened the train schedule in the affected section.

6 Safety recommendations

In order to improve the safety in the rail transport, the Chairperson of the Investigation Commission at the NAMRTAIB proposes the following safety recommendations to the National Safety Authority (RAEA), related to SE NRIC and "BDZ Passenger Transport" EOOD.

- Recommendation 1 proposes that SE NRIC and BDZ-Passenger Transport EOOD familiarize the interested personnel with the content of the report;

- Recommendation 2 proposes that SE NRIC make changes to RTOSART, part five "Organization of work at stations", chapter one "Providing trains with brake mass", section one "General provisions", art. 289, para. 2 and para. 3 regarding the provision of trains with brake mass and the inclusion of the service and brake mass of locomotives in it;

- Recommendation 3 proposes that BDZ PP EOOD hold talks with locomotive drivers to competently and correctly operate trains in brake mode in order to prevent thermal overloading of the friction units, both of the coaches and locomotives;

- Recommendation 4 proposes that BDZ PP EOOD restore the electrodynamic brake of the locomotives of series 44 and 45 in order to reduce the use of friction brakes;

- Recommendation 5 proposes that BDZ PP EOOD retrofit the traction rolling stock with composite or sintered brake pads in order to prevent sparks, which leads to a reduction in harmful emissions into the air and noise during movement;

- Recommendation 6 proposes that BDZ PP EOOD place the power cables for supplying the under-carriage motor fans in metal corrugated pipes;

- Recommendation 7 proposes that BDZ PP EOOD regularly clean the deposits under the traction transformer and the locomotive bodysheath during locomotive repairs.

In accordance with the requirements of Art. 24 (2) of Directive (EU) 798/2016 and Art. 91, para. 3 Ordinance № 59 of 5.12.2006, the member of the MB in NAMRTAIB on 29.09.2025, provides a final report containing information on the circumstances and causes that led to the accident with formulated safety recommendations in order to improve the railway transport safety.

Chairperson:

Dr Eng. Boycho Skrobanski

Deputy President of the NAMRTAIB AB T