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#### SPECIALIZED UNIT FOR INVESTIGATIONS OF ACCIDENTS AND INCIDENTS IN RAILWAY TRANSPORT AT MTITC

#### FINAL REPORT

From

**investigation of a railway accident – a collision of a passenger train № 19205 with a car at a guarded level crossing between Krumovo and Asenovgrad stations - on November 12, 2019**



## FINAL REPORT

### Purpose of the investigation and degree of responsibility

The Investigation of serious accidents, accidents and incidents is carried out by an independent investigation authority of the Republic of Bulgaria - "Specialized Unit for Investigation of Accidents and Incidents in Railway Transport" in the "Ministry of Transport, Information Technologies and Communications" (MTITC) and it aims:

To identify the circumstances and the reasons that led to their implementation with a view to improve safety and prevent from others **without seeking personal responsibility and guilty.**

The investigation is carried out in accordance with the requirements of Directive 2004/49 / EC of the European Parliament and of the Council upon safety of the Community's railways transpositioned in the Law for Railways ( LR ), Ordinance № 59 from December 5, 2006 about the management of safety in railway transport, Ordinance № H-32 from September 19, 2007 about the coordination of the actions and the exchange of information during investigations of railway accidents and incidents and the Agreement for interaction during investigations of accidents and incidents in the air, waterway and railway transport between the Prosecutor's Office of the Republic of Bulgaria, Ministry of Interior and MTITC from April 17, 2018.

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## 1. Summary.

### 1.1. Brief description of the event.

On November 12, 2019, the passenger train (PT) № 19205, consisting of an electric-motor-train (EMT) series 31-005 / 006 and four wagons, moves in the direction Plovdiv - Asenovgrad - Plovdiv. At 06:42 hrs the head of traffic on duty at Krumovo station orders by a telephone message the departure of PT № 19205 to the crossing guard at the level crossing s, at kilometer 3 + 784 and at kilometer 8 + 830. After the train leaves Krumovo station at 06: 44 hrs, the head of traffic on duty verbally notifies the crossing guards about the departure of the train. Although the crossing guard at km 8 + 830 has recorded the telephone message, he has not lowered the barrier mechanisms before the passage of PT № 19205. When approaching the level crossing, the locomotive driver gives a "Warning" signal with the whistle of EMT, he sees that the barriers are raised and the crossing guard stands next to the barrier control mechanism. At that moment, a motor vehicle (Opel), model "ASTRA", approaches the level crossing from the left side of the train's movement direction and enters the danger zone. A collision ensues, the car is turned and thrown to the left of the railway, and the train continues to run without stopping.

A driver and two passengers has been traveled in the car, next to the driver, and on the back seat. As a result of the subsequent collision, the passengers in the car receive serious injuries and are taken to Plovdiv for emergency medical treatment. After a four-day stay in the hospital, one of the passengers, the one who has traveled next to the driver, dies and the other two are discharged after a three-day stay. The train driver is not injured. Damage is inflicted on the left side of EMT (Fig. 1) and severe damage to the car (Fig. 2).



Fig. 1

#### Immediate causes of the event:

- The quick stop of the train is undertaken untimely by the motorman in order to avoid or minimize the impact of the vehicle;
- Failure to comply with the rules for safe passage of vehicles through the level crossing;

### Main cause of the accident:

- The on-duty crossing guard at the "8 + 830 km"- level crossing, between Krumovo and Asenovgrad stations has not lowered the manual barrier mechanisms at the level crossing according to the requirements of the Instruction for operation of the level crossing, which resulted in a collision between the passenger train and the crossing car;
- Non-stopping of the car before the crossing to provide an advantage to the incoming train;



**Fig. 2**

### 1.2. Summary of the main recommendations

1. It is proposed that the heads of SE NRIC and BDZ-Passenger Transport EOOD, by a special instruction, to acquaint with the content of this report, the staff directly involved in the operational activity.

2. Proposes to BDZ-Passenger Transport EOOD to issue a driver's certificate indicating the railway infrastructure for which the driver has acquired legal capacity and the rolling stock, which he has the right to drive in accordance with the requirements of Art. 36, para. 1, item 2 of Ordinance № 56 /February 14, 2003.

3. It is proposed taking into account the category and intensity of vehicles passing through the level crossing, and in order to minimize the human factor, NRIC should re-equip the level crossing at km 8 + 830 in the interstation Krumovo - Asenovgrad with an automatic crossing device (ACD) equipped with four automatic barriers' mechanisms and an on-duty crossing guard on shift.

4. It is proposed given the intensity of vehicles passing through the level crossing, NRIC to build 24-hour video surveillance, covering the flow of cars and rolling stock through the level crossing at km 8 + 830 between the stations Krumovo and Asenovgrad.

## **2. Direct facts and circumstances.**

### 2.1. Date and time of the event.

On November 12, 2019, a passenger train (PT) № 19205 consisting of a four-car EMT series 31-005 / 006 "SIEMENS" driven by a locomotive driver from Plovdiv Locomotive Depot, trainmaster and conductor from the Division for " Passenger Transport - Plovdiv " at "BDZ-Passenger Transport" EOOD. The train runs daily according to the train schedule in the section Plovdiv - Krumovo - Asenovgrad and vice versa. The train leaves Plovdiv station at 06:32 hrs and arrives at Krumovo station at 06:41 hrs. The head traffic on duty at Krumovo station orders the on-duty crossing guards at "km 3 + 784" and "km 8 + 830" - level crossings, located in the railway section Krumovo - Asenovgrad, for the forthcoming departure of the train with a written telephone message.

On November 11, 2019, at "km 8 +<sup>830</sup>" level crossing, the guard is called on an overtime night duty by his direct supervisor.

After the departure of PT № 19205 at 06:44 hrs from Krumovo station, the head of traffic on-duty additionally verbally informs the crossing guards at the two level crossings about its departure. At Mavrudovo station the train arrives at 06:48:20 hrs and departs at 06:48:50 hrs. Although the crossing guard at km 8 +<sup>830</sup> has received and has recorded the telephone message in log II-76, he does not lower the manual barrier mechanisms before the train to pass along the level crossing. The train moves at a speed of 76 km/h where the permissible maximal one for the section is 80 km/h. When approaching the crossing, the locomotive driver gives a "Warning" signal with the EMT whistle. He sees that the barriers are raised and the crossing guard is standing next to the barrier control mechanism. At that moment, a motor vehicle - a car "Opel ASTRA" approaches from the left, on the road and enters the danger zone. A collision between the train and the car takes place. The car is thrown to the left of the railway and the train continues its movement.

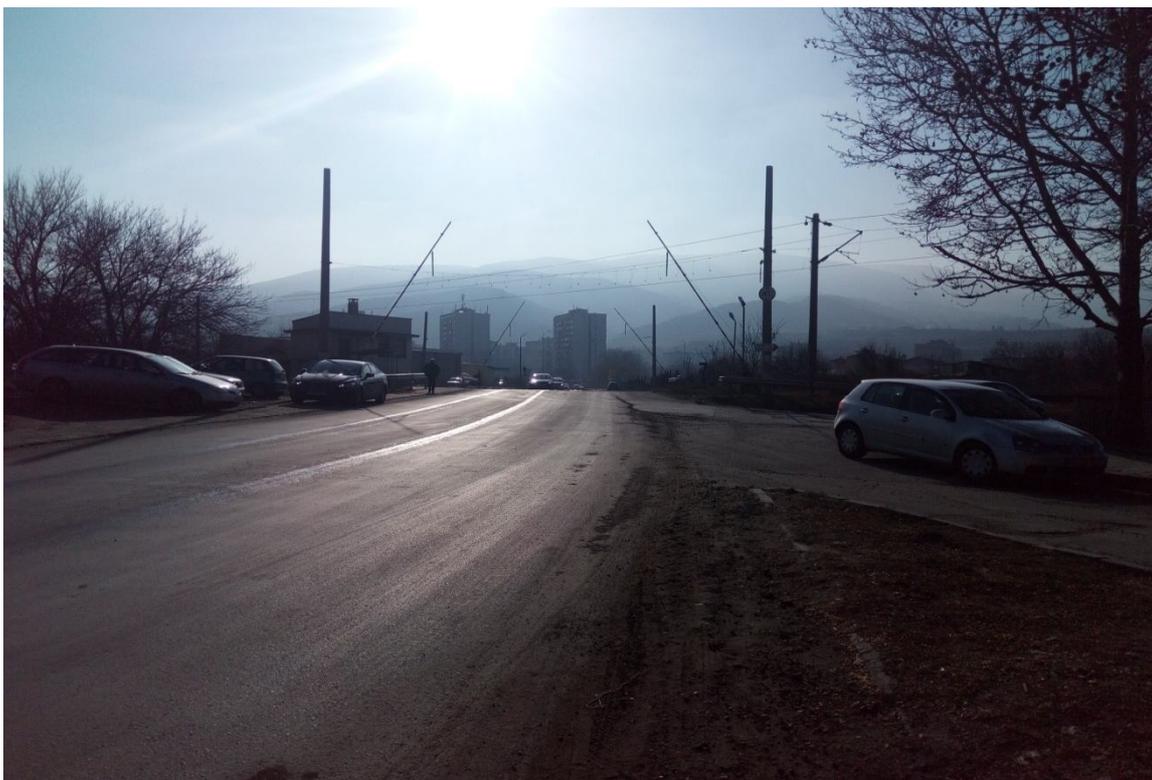
A call to 112 for emergency assistance to the victims is submitted by the on-duty crossing guard at the crossing.

From 07:10 hrs the movement of trains in the section is suspended by an order of the authorities of the Regional Directorate of the Ministry of Interior - Asenovgrad. After the inspections, at 09:47 hrs the trains' movement is restored.

### 2.2. Event's location.

The event takes place in the railway section Krumovo - Asenovgrad at "km 8 +<sup>830</sup>" crossing guarded by guards, at a single electrified railway. The level crossing is a first category one, with an intensity of 5883 motor and road vehicles per day. The crossing partitions the city from the industrial zone of the town of Asenovgrad (Fig. 3).

The railway section is a part of the 19th railway line Krumovo - Asenovgrad.



**Fig. 3**

### 2.3. Event's category.

On November 12, 2019, at 07:00 hrs, in accordance with the requirements of Art. 115k, para. 2 of the Railway Transport Act (RTA) the head of the "Specialized Unit for Investigation of Railway Accidents and Incidents" (SUIRAI) in the "Ministry of Transport, Information Technologies and Communications" (MTITC) is notified by the on-duty staff of NRIC by a mobile phone.

After analyzing the collected operational information and performing an in-situ inspection of the level crossing at km 8 +<sup>830</sup> between the stations Krumovo and Asenovgrad, the head of SUIRAI has

classified the event as a railway accident, in accordance with Art. 19 (2) (a) of Directive 2004/49 / EC, and Art. 68, para. 1, item 2 and para. 2 of Ordinance № 59, for which he has notified the interested parties.

#### 2.4. Consequences of the Event:

- the driver and both passengers in the vehicle have serious injuries;
- the staff servicing passenger train № 19205 is not injured;
- no damages to the railway infrastructure;
- minor damage to EMT;
- serious damage to the vehicle;

#### 2.5. Decision to initiate an investigation:

In accordance with the requirements of Art. 19 (1) (a) of Directive 2004/49 / EC, Art. 115k, para. 1, item 1 of RTA, Art. 76, para 1, item 1 and art. 78, para. 1 of Ordinance № 59 the Head of SUIRAI decides to undertake an investigation of the accident

#### Composition of the commission

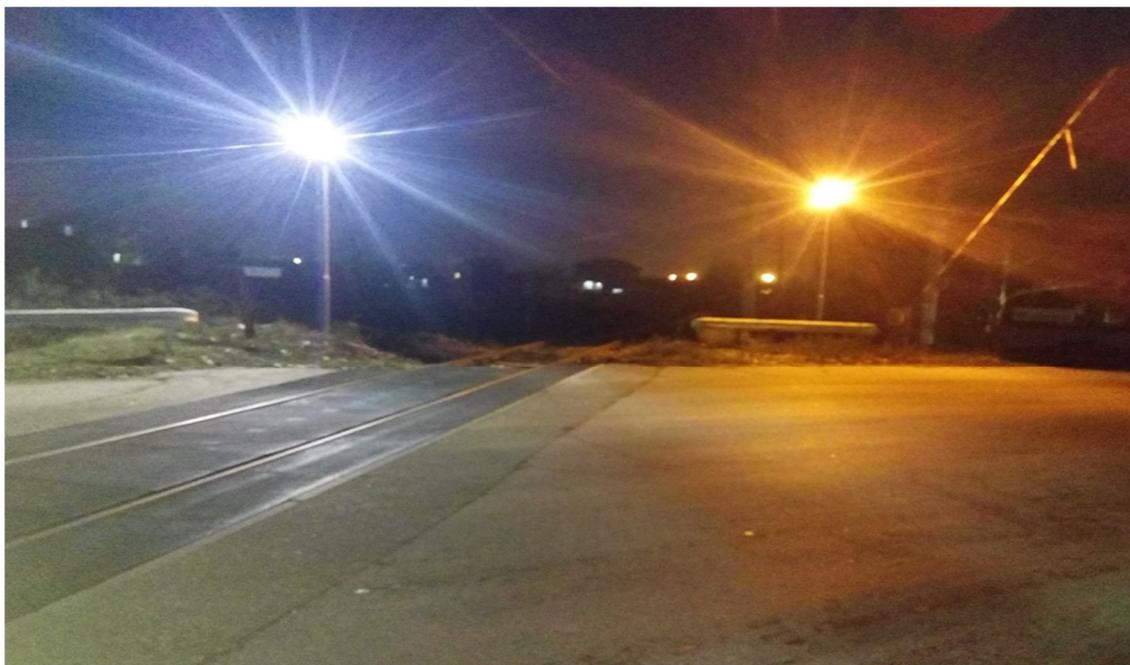
An independent investigation commission is appointed in MTITC. The head of SUIRAI is the Chairman of the commission. The commission consists of external experts with appropriate qualifications and professional relevance to the accident.

#### Investigation

With the written permission of the Chairman of the Commission for Investigation at MTITC, the head of the Operational group appointed in RI "Transport Safety" - Plovdiv is allowed to extend the deadline for submission of the collected materials in order to provide all necessary documents and report in accordance with the requirement of Ordinance № 59.

On December 5, 2019, the Operational group submits in RI "Transport Safety" - Plovdiv the report with the materials to the chairman of the commission at MTITC.

On the same date, the Commission for Investigation conducts an interview with the motorman, the trainmaster and the conductor, who have served the PT № 19205, as well as with the head of the new and old shift at Asenovgrad station. During the interview with the motorman of PT № 19205, the commission repeatedly has asked its questions to him in a high tone so that they could be heard and understood. In view of the established hearing problems during the interview, the motorman is sent for



**Фиг. 4**

a medical re-certification to the NGTH "Tsar Boris III" in accordance with the requirements of Ordinance № 54 / June 02, 2003.

With a Protocol of TCMEC № 65 /February 13, 2020, in NGTH "Tsar Boris III" a re-certification of the motorman who has driven PT № 19205 is carried out with a decision - suitable for



**Fig. 5**



**Fig. 6**

a locomotive driver for a period of one year with corrective glasses.

Subsequently, inspections were carried out in the dark part of the day, around 18:00 hrs at "km 8 + 830" crossing in order to establish the visibility and illumination at the place of the event (Fig. 4).

On December 18, 2019, at the request of the commission for investigation, a speed-braking test of EMT 31-005 / -006 is performed in the railway section Krumovo - Asenovgrad to establish the braking distance of the train from the place of impact (level crossing axis) to the final stop of the train in connection with the witnesses given by the motorman. The test is conducted in the presence of representatives of "BDZ-Passenger Transport" EOOD and NRIC (Fig. 5). An interview is also conducted with the head of Asenovgrad station to clarify additional issues.

On January 13, 2020, with the permission of the District Prosecutor's Office - Plovdiv, the Investigation Commission conducts an interview at the Asenovgrad Regional Department of the Ministry of Interior with the crossing guard on duty in the moment of the railway accident at "km 8 +<sup>830</sup>" crossing in the presence of an investigating police officer from the Asenovgrad Regional Department.

A re-inspection of the facilities and the road signalization from the two approaches of the level crossing is performed (Fig. 6). A meeting is held with the management of RTMSA - Plovdiv regarding the operation of the level crossing and the personnel working at the crossing.

With the permission of the District Prosecutor's Office - Plovdiv, the Investigation Commission receives copies from the Regional Department of the Ministry of Interior - Asenovgrad regarding Meteorological report for the region of Asenovgrad and Chemical expertise prepared in the Specialized Chemical Laboratory at "GHAT - Plovdiv" AD for the presence of alcohol in the blood of "PT № 19205" 's motorman, the driver of the vehicle, the and of the on-duty crossing guard at the level crossing.

NGTH "Tsar Boris III" provides materials from the health file of the "km 8 +<sup>830</sup>" on-duty crossing guard. With a TCMEC Protocol № 522 from November 01, 2018, at NGTH "Tsar Boris III" the on-duty crossing guard is allowed, for a period of one year until November 01, 2019, to work with corrective glasses under Art. 11, item 3 of Ordinance № 54 / June 02, 2003. After the expiration of the term, the same has to appear for repeated medical examination according to the Ordinance.

The Investigation Commission finds out that in the approved schedule for the working hours of the crossing guards at "km 8 +<sup>830</sup>" crossing in November 2019 the guard in question has been enrolled in the schedule for the month and has been on duty seven times till the accident, which is illegal.

#### 2.6. Rescue and emergency-restoration actions:

At 07:00 hrs the on-duty crossing guard gives a signal to 112 for emergency medical assistance to the injured persons in the vehicle as a result of the accident.

At 07:10 am, emergency medical teams arrive at the level crossing. Medical assistance is provided to the injured three persons in the vehicle and they are taken for treatment to UGHAT - Plovdiv.

After examinations in UGHAT - Plovdiv it has been established that:

- the driver of the vehicle has moderate bodily injuries and contusions and after a three days treatment he has been released from the hospital;
- the passenger in the front seat, next to the driver of the vehicle, has severe bodily injuries, and is left for life-threatening treatment and died after a five-day stay in the hospital;
- the passenger traveling in the back has moderate injuries, is left for treatment and after a three-day stay is released from the hospital;

No emergency recovery actions have been taken and carried out.

### **3. General data established during the investigation process.**

#### 3.1. Participating officers

##### NRIC shift personnel

- duty head of traffic at Krumovo station;
- duty head of traffic at Asenovgrad station;
- a duty crossing guard at km 8 +<sup>830</sup> level crossing between Krumovo and Asenovgrad stations;

##### Personnel of BDZ " Passenger transport " EOOD

- motorman of PT № 19205 at Locomotive depot Plovdiv;
- trainmaster of PT № 19205 at Department „ Passenger transport“ – Plovdiv;
- conductor of PT № 19205 at Department „ Passenger transport“ – Plovdiv;

#### 3.2. Data on the carrier

- BDZ " Passenger transport " EOOD is a national railway carrier licenced for passenger transport in the Republic of Bulgaria. It possesses national licence for passenger transport № 151/October 21, 2013;

- It possesses Safety certificate part „A“ BG 11 2017 0009 valid from December 31,2017 till December 30, 2022;

- It possesses Safety certificate part „B“ BG 12 2017 0009 valid from December 31,2017 till December 30, 2022;

- It possesses certificate of an authority, responsible for the maintenance of railway vehicles BGRA/2017/0004 valid from December 31, 2017 till December 30, 2022;

### 3.3. Data on tractive rolling stock

- electric motor train with four wagons - "SIEMENS" series 31-005 / 006 with regular registration in the register of vehicles (Fig. 7);



**Fig. 7**



**Fig. 8**

### 3.4. Train type, number and category

EMV, № 19205, suburban passenger train (CPT);

### 3.5. Railway infrastructure description

- the railway at km 8<sup>+830</sup> level crossing in the section Krumovo - Asenovgrad is on a concrete sleepers grid with sleepers type ST-4 and rails type S 49, with an authoritative slope of 8.6 ‰ uphill to Asenovgrad station. The Permissible speed for the movement of trains in the mentioned interstation is 80 km/h (Fig. 8);

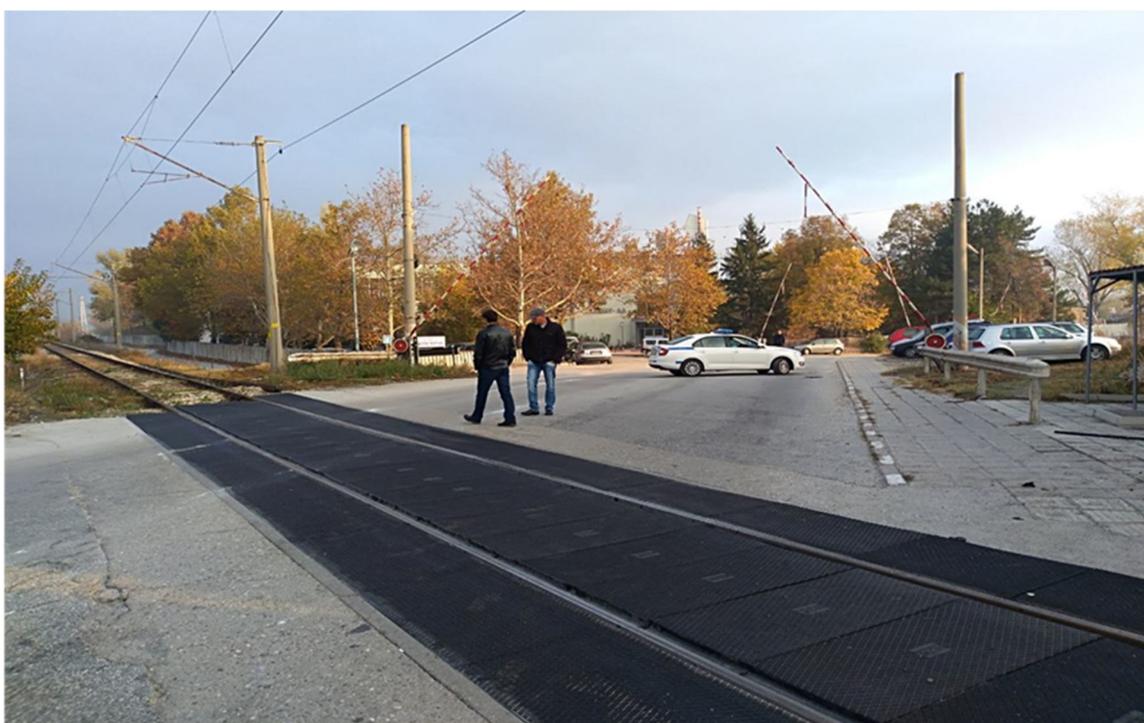
- the level crossing is equipped with four manual barriers, mechanically operated, which cover the entire traffic lane and are serviced by a duty crossing guard (Fig. 9).



**Fig. 9**

The available view of the traffic lane is 420 m.

The normal position of the barrier beams is raised. The visibility for the motorman to the crossing along the mileage is 600 m and back - 750 m. The visibility from the beginning of the danger zone, for the



**Fig. 10**

driver of the vehicle, to the incoming train :  
from the left, along the mileage - 400m; and back - 600 m;  
from the right, along the mileage - 400 m; and back - 600 m;  
The floor of the level crossing is on an elastic rubber base type STRAIL (Fig. 10).

### 3.6. Station safety installations and between-station block system

- Krumovo station is equipped with a Route-computer centralization (RCC) "ELECTRA2";
- Asenovgrad station is equipped with a Relay system with key dependencies (RSKD) (Fig. 11);
- Krumovo – Asenovgrad section is equipped with an automatic blocking and axis counters without duct capacitor signals;

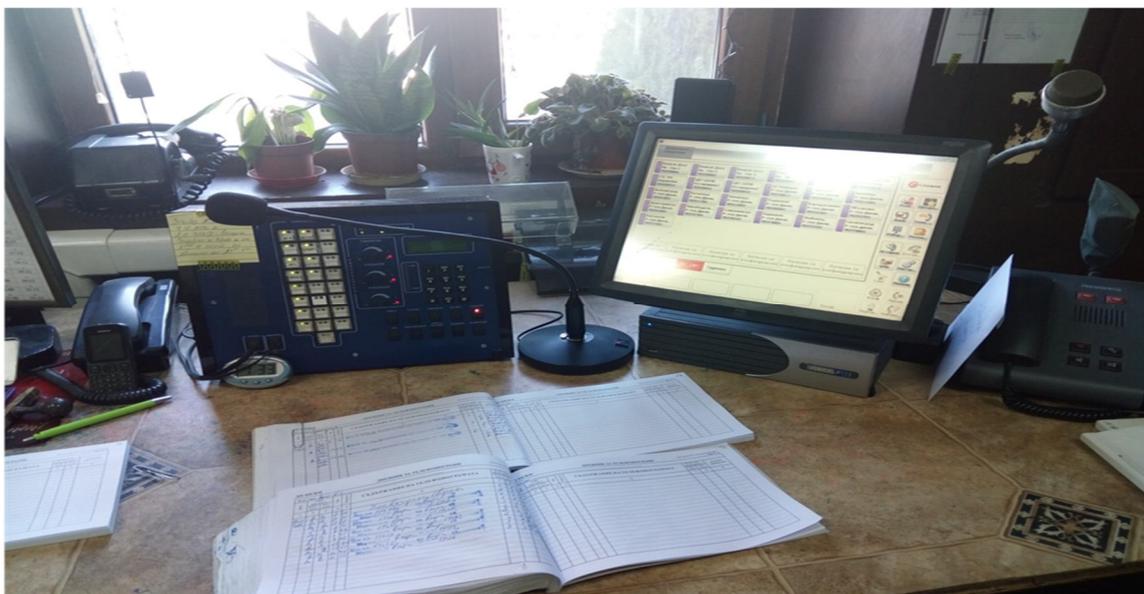


**Fig. 11**

### 3.7. Train protection

- vigilance device;

### 3.8. Communication system



**Fig. 12**

- in Krumovo and Asenovgrad stations - the station and between station connections are performed by systems such as “Dicora” and “Topex” (Fig. 12), in both stations official mobile phones are provided;
- the communications between the level crossing at km 8 + 830 and Krumovo and Asenovgrad stations are carried out bilaterally with a crossing-communication connection type “Topex”;

**4. Deaths, injuries and material damage.**

4.1. Deaths – 1 passenger in the car;

4.2. Injured persons – the driver and one passenger in the car;

4.3. Injured personnel – none;

4.4. Material damage:

- passenger train EMT 31-005 / 006 has damages of 2 pcs. of front spoilers, 4 pcs. of side windows are broken and a tachogenerator cable of the electric train is torn (Fig. 13, 14);



**Fig. 13**



**Fig. 14**

- Vehicle - an Opel "ASTRA" with severe damage (Fig. 15);



**Fig. 15**

#### **5. External circumstances - weather and geographic conditions.**

The meteorological situation for the area of the level crossing at km 8<sup>+830</sup> between the stations Krumovo and Asenovgrad for the period 06: 30 ÷ 07: 00 hours on November 12, 2019, prepared by NIMH - Plovdiv branch:

- air temperature +11°C;
- clouds 1/5;
- wind – none;
- precipitations – none;
- sunrise - 07:08 hrs – dusk 33 min.;
- no fog is registered in the region;

#### **6. Data for railway infrastructure and railway carrier staff related to the accident.**

##### 6.1. Position, place of work, sex and age

##### Personnel of NC „Railway Infrastructure“

- duty head of traffic at Krumovo station – RTMSA, Plovdiv, woman, 33 years;
- duty head of traffic at Asenovgrad station– RTMSA, Plovdiv, man, 59 years;
- duty crossing guard at “km 8<sup>+830</sup> “– crossing to Asenovgrad station – RTMSA, Plovdiv, man, 60 years;

##### Personnel of BDZ " Passenger transport " EOOD

- motorman of PT № 19205 at Locomotive depot Plovdiv, at DPT - Plovdiv, man, 52 years;
- trainmaster of PT № 19205 at DPT - Plovdiv, woman, 58 years;
- conductor of PT № 19205 at DPT - Plovdiv, man, 55 years;

##### 6.2. Position certificate

##### Personnel of NC „Railway Infrastructure“

- duty crossing guard at a level crossing – Certificate № 180/February18, 2008, for the position, switchman/crossing guard;

##### Personnel of BDZ " Passenger transport " EOOD

- motorman of PT № 19205 – Certificate № V-95/February 04, 2013, for occupying the position locomotive motorman;

##### 6.3. Qualification certificate

##### Personnel of NC „Railway Infrastructure“

- duty crossing guard at “km 8<sup>+830</sup> “– level crossing – Qualification certificate № 6489, acquired qualification for crossing guard, conducted training from March 26, till May 08, 2007, teaching structure CPQ at NRIC;

Personnel of BDZ " Passenger transport " EOOD

- motorman of PT № 19205 – Certificate of professional training № 1045-1045/December 03, 2012, acquired qualification for locomotive motorman of EMT series 30.000 and 31.000, conducted training from October 08 till October 29, 2012, teaching structure – VTC at BDZ ”Passenger Transport” EOOD;

Certificate for locomotive driving BG 71 2012 0923 – EARA;

6.4. Document for professional qualification

Personnel of NC „Railway Infrastructure“

- duty crossing guard at “km 8<sup>+830</sup> “– level crossing – Certificate of professional qualification № 764/May 11, 2007, acquired specialty switchman / crossing guard, conducted training from March 26 till May 08, 2007 , teaching structure CPQ at NRIC;

Personnel of BDZ " Passenger transport " EOOD

- motorman of PT № 19205 – Diplom № 23201/August 19, 1989, specialty railway technics, electrical locomotives, issued by HTS „Todor Kableshkov“ Sofia;

6.5. Certificate as per Ordinance № 56 from 2003

Personnel of NC „Railway Infrastructure“

- duty crossing guard at “km 8<sup>+830</sup> “– level crossing – Protocol № XI-22-20/May 21, 2018;

Personnel of BDZ " Passenger transport " EOOD

- motorman of PT № 19205 – Protocol № XI-42-05/April 27, 2018;

6.6. Personnel break duration

Personnel of NC „Railway Infrastructure“

- duty crossing guard at “km 8<sup>+830</sup> “– level crossing – rests from 07:00 hrs on November 10, 2019 till 18:07 hrs on November 11, 2019;

Personnel of BDZ " Passenger transport " EOOD

- motorman of PT № 19205 – intermediate rest from 21:25 hrs on November 11, 2019 till 04:30 hrs on November 12, 2019;

6.7. Work experience

Personnel of NC „Railway Infrastructure“

- duty crossing guard at “km 8<sup>+830</sup> “– level crossing – 2 years;

Personnel of BDZ " Passenger transport " EOOD

- motorman of PT № 19205 – 32 years;

6.8. Shift (travel) briefing

Personnel of NC „Railway Infrastructure“

- The personnel at Asenovgrad station is briefed for duty at 18:45 hrs on November 11, 2019 and they sign in the instruction book stating that they are cheerful, rested and haven’t used an alcohol and other narcotics.

- the duty crossing guard at “km 8<sup>+830</sup> “– level crossing is briefed for duty at 18:07 hrs on November 11, 2019, by the duty head of traffic at Asenovgrad station and he signs in the instruction book stating that he is cheerful, rested and hasn’t used an alcohol and other narcotics;

Personnel of BDZ " Passenger transport " EOOD

- the motorman of PT № 19205 is briefed on November 12, 2019, at 04:30 hrs at EP Dimitrovgrad and with his signature he declares to be cheerful, rested and hasn’t used an alcohol and other narcotics;

**7. Data on other investigations. Summary of testimony**

The Investigation Commission has no testimony.

**8. System of Safety Management (SSM).**

### 8.1. Observing the procedures set out in SSM of NRIC

By letter № 10-22-1 /March 13, 2020, the Investigation Commission at MTITC requests from the Director-General of NRIC to provide the part of the safety management system (SSM) which gives the risk assessment and possible assessed hazards related to it and concerning the operation of level crossings on the territory of the railway infrastructure. From the text of the letter № RI-11484 / March 24, 2020, it is clear that SE NRIC has not submitted the required materials, a risk assessment methodology concerning the safe operation of the level crossings, as well as a register of identified hazards, which explains the regulations and norms for the level crossings operation. It does not contain data on measured indicators for the crossings' safety. In such a case, the Investigation Commission cannot accept the letter as an SSM procedure. In its opinion with № RI 15473 /April 27, 2020, SE NRIC informs the Commission that it has working procedures and safety procedures in which the risks to the safety of level crossings are described and assessed and a register of hazards, which however are not submitted to the Investigation Commission.

Since 2015, the number of passing vehicles has increased by 2709 vehicles, which have directly and indirectly affected the safe operation of the level crossing, guaranteed by the physiology of the duty crossing guard, for which a risk assessment with a proposal to minimize the human factor should be performed. The risk of crossing a railway with a one-level way has always been high one and given the full and accurate risk assessment for each level crossing, this will determine their equipment with the appropriate systems that will ensure the vehicles' safety.

From May 26, 1988, the level crossing at km 8<sup>+830</sup> in the section Krumovo - Asenovgrad is put into operation, on which a Technical Passport is prepared, as the average intensity of the vehicles per day is 3174 and according to the calculation and criteria, it is categorized as Category II, in accordance with Ordinance № 4/1997.

From February 27, 2015, a new Technical Passport is issued for the same level crossing, with changes in the average intensity of the vehicles per day of 5883 units, which comes to show that the traffic through the level crossing has increased significantly (by 46% ) and this has led to a change in its category from Category II to Category I, which has increased the operational risk for passing railway vehicles and road vehicles. This, in turn, should lead to a risk assessment with increasing hazards from the presented statistical results, in which NRIC should make changes in the re-equipment of the level crossing devices in order to minimize the human factor as a cause to accidents.

### 8.2. Observing the procedures set out in SSM of „BDZ – Passenger Transport“ EOOD;

The Investigation Commission got acquainted with the materials on SSM, provided by BDZ PP EOOD. It was established that a "Methodology for analysis and assessment of the risks for the safety in BDZ PP EOOD" has been developed. The "Danger Register", part of SSM, lists the hazards that may occur during the operation of RS and the officials who influence the operational activity (motorman, motorman-assistant, trainmaster, conductor, shunter, switchman maneuver, technician mechanic wagon inspector ). The mentioned register does not assess the risk in case of probability of an accident at a level crossing, as well as the possible consequences that may occur in case of a collision of a railway vehicle with a road vehicle during operation.

## **9. Rules and norms**

### **9.1 Rules broken by the railway personnel:**

#### 9.1.1. Personnel in NRIC:

- art. 19, para. 2 of Ordinance № 58 /August 02, 2006;

"(2) The use of alcohol or other intoxicating substances during working hours, as well as work under the influence of such by the workers and employees of the railway system, shall not be allowed."

- art. 10, para. 1, item 5 and item 6 of the RTM&SA;

"(1) The workers and employees of NRIC, of the railway carriers and all persons, whose work is related to the movement of the trains and the shunting activity, shall be obliged:

5. To carry out exactly the oral and written orders given to them by the duty train dispatcher or head of traffic;

6. Not to use alcohol or other intoxicants during working hours and not to work under the influence of such. "- art. 76, item 2, item 3 and item 5 of Ordinance № 4 /March 27, 1997;

„2. Stops the movement of vehicles through the crossing and lowers the barriers 5 minutes before the passage of a railway vehicle; when the travel time of the fastest railway vehicle from the

station to the crossing is less than 5 minutes, the duty crossing guard lowers the barriers and then gives a receipt number to the duty head of traffic;

3. Follows the schedule for the movement of the railway vehicles and in due time closes the crossing for their passing;

5. Monitors the passing through the crossing and does not allow the stopping of vehicles between the barriers;

#### 9.1.2. Personnel in „BDZ- Passenger Transport“ EOOD:

- art. 250, para. 1, item 1, and item 4, para. 2, item 3 of the RTM&SA;

"(1) When servicing trains, the locomotive brigade shall be obliged:

1. To monitor whether the route is free, to monitor in the zone of visibility the signals and the railway guides, performing their signal indications and to react in due time in case of their change;

4. To stop the train immediately in case of a collision of a person or a road vehicle, to notify the neighboring station or the train dispatcher via TDRC / GSM-R, and when there is no such, via GSM and, if possible, to provide first aid to the victims;

(2) When servicing a train the motorman shall be obliged:

3. To operate the train with increased vigilance and, if necessary, to reduce the speed in case of worsened meteorological and other conditions, which reduce the visibility of the signals ”..

#### 9.2. Non-compliance with the norms by the driver of the vehicle.

- art. 51, para. 1 and para. 2 and Art. 53, para. 1 of the Road Traffic Act (RTA);

"(1) Each participant in the traffic must show special attention when approaching a level crossing and passing through it.

(2) The driver of a road vehicle, when approaching a level crossing, must move at such speed that will allow him to stop in front of the crossing if necessary.

(1) Before passing through the level crossing, each participant in the traffic shall be obliged, regardless of the condition of the barriers, of the light and of the sound signalization, to be convinced that a railway vehicle does not approach the crossing and that the passing through the crossing is safe. “.

- Art. 106, 107 and 109, item 4 of the RARTA;

"Art. 106. When approaching a level crossing, road users shall be obliged to move with caution, and the drivers of road vehicles to move at such a speed which to allow them, if necessary, to stop in front of the level crossing. ”.

„, art. 107. When passing through a level crossing, the road users shall be guided by the instructions of the level crossing guard, by the position of the barriers, by the light and sound signalization and by the road signs. ”

„, art. 109. The stopping of road vehicles in front of a level crossing is obligatory when:

4. The barriers are raised and there is no light or audible signal for a rail vehicle that approaches the level crossing. ”.

## **10. Functional condition of rolling stock and technical facilities of the railway infrastructure.**

### 10.1. Functional condition of the railway infrastructure

#### Rail road:

- operational;

#### Security equipment, communications, radio communications and power supply:

- operational;

#### Condition of crossing devices ( levers and barriers):

- operational;

### 10.2. The rolling stock functional condition

- functional condition of PT № 19205 EMB – serviceable with malfunctions;

## **11. Operational System Documentation.**

### 11.1. Measures taken by staff to regulate train movements

- The train dispatcher from the regional unit Regional

"Operational Dispatching" Unit (RODU) - Plovdiv closes Krumovo - Asenovgrad section at 08:10 hrs for the movement of all trains and vehicles. At 09:47 hrs the train traffic is restored. In this

time interval, passengers traveling between Asenovgrad-Krumovo-Asenovgrad are transported by buses provided by the railway company "BDZ-Passenger Transport" EOOD.

### 11.2. Exchange of Oral Orders and Written Messages.

- After the arrival of PT № 19205 at Krumovo station at 06:41 hrs, the duty head of traffic at Krumovo station orders in writing by telephone the crossings at km 3 + 784 and km 8 + 830 in the section Krumovo - Asenovgrad for the forthcoming departure of the train (fig. 16);

- After the departure of PT № 19205 at 06:44 hrs from Krumovo station, the head of traffic on duty verbally informs the level guards about its departure;

- The train passes along the level crossing at km 8 + 830 at 06:53 hrs when the collision with the vehicle takes place.

ДП НКЖИ  
Към гара: Крумово-Асеновград  
ДНЕВНИК ЗА ТЕЛЕФОНОГРАМИ  
Приложение № 4 към зап. № 1830/2006 г.  
Обр. П - 76

Дата	Гара или пост		Час	Минути	СЪДЪРЖАНИЕ НА ТЕЛЕФОНОГРАМАТА	№ на теле-фигурата		Подпис (фамилия)
	изхо-дяща	вхо-дяща				изхо-дяща	вхо-дяща	
11	Аг	8+830	21	27	Влак 19232 заминава от Аг на 21 <sup>30</sup>	1	5	Церев
12	Кру	8+830	22	38	Влак 19233 заминава от Кру на 22 <sup>42</sup>	5	1	Слабова
14	Аг	8+830	22	57	Влак 19234 заминава от Аг на 23 <sup>00</sup>	2	7	Церев
19	Аг	8+830	23	29	На основание з/д № 209 от 05.12.2018 г. на Директора на ЧДВГД-ПО закривам прелеза на к-м 8+830 за служба по дџи метис	=	=	Церев
=	=	=	=	=	=	=	=	Церев
Аг	8+830	4	29	На основание з/д № 209 от 05.12.2018 г. на Директора на ЧДВГД-ПО откривам прелеза на к-м 8+830 за служба по обичайното	=	=	=	Церев
=	=	=	=	=	=	=	=	Церев
Кру	8+830	5	08	Влак 19201 заминава от Кру на 5 <sup>12</sup>	1	11	Слабова	
Аг	8+830	5	27	Влак 19202 заминава от Аг на 5 <sup>30</sup>	7	6	Церев	
Кру	8+830	6	08	Влак 19271 заминава от Кру на 6 <sup>12</sup>	2	5	Слабова	
Аг	8+830	6	27	Влак 19272 заминава от Аг на 6 <sup>30</sup>	3	9	Церев	
Кру	8+830	6	41	Влак 19205 заминава от Кру на 6 <sup>44</sup>	10	4	Слабова	

Fig. 16

### 11.3. Measures taken to protect and guard the scene of accident.

- After the received signal from phone 112 at 07:10 hrs, the teams for emergency medical care arrive at the crossing to help the injured, also arrive the teams of RS FS&CP, RD MoI - Asenovgrad and the District Prosecutor's Office Asenovgrad.

- From 07:10 hrs the bodies of the Regional Department of the Ministry of Interior - Asenovgrad have restricted the access of external persons to the area of the crossing with the exception of the teams for emergency medical care and RS FS&CP for rendering first aid to the injured persons in the vehicle.

- From 07:10 to 09:40 hrs the investigative bodies of the Regional Department of the Ministry of Interior - Asenovgrad and the District Prosecutor's Office of Asenovgrad carry out procedural-investigative actions under the Criminal Procedure Code (CPC).

- At 09:47 hrs the train traffic is restored.

- The bodies of the Regional Department of the Ministry of Interior - Asenovgrad have performed tests for alcohol use of:

- the locomotive motorman of PT № 19205 - alcohol 0.00 %;
- the driver of the vehicle (car) - alcohol 0.00 %;
- the level crossing guard at km 8 + 830 - alcohol 1.81 %;

### 12. Health and Safety work conditions concerning the personnel.

- With reference to the requirements of Art. 13, para. 1 and Art. 14, para. 1 of Ordinance №50 / December 28, 2001 no violations are observed in the reporting of personnel working hours at NRIC and BDZ- "Passenger Transport" EOOD.

- With reference to the requirements of Art. 20, para. 2 of Ordinance № 54 / June 02, 2003 the officials of NRIC and BDZ- "Passenger Transport" EOOD, related to the accident, have valid certificates for psychological examination.

#### NRIC personnel

- The Investigation Commission found out that the medical certificate for re-certification, issued and based on Protocol № 522 /November 01, 2018, by NGTH "Tsar Boris III", has a valid term until November 01, 2019, In connection with the requirements of Art. 7, para. 1 of Ordinance № 54 /June 02, 2003, on the medical and psychological requirements, the personnel of the first category shall be certified and re-certified for a term of one year, as of the date of the last examination, the term of which has expired.

#### Personnel of „BDZ-Passenger Transport“ EOOD

- With reference to the requirements of Art. 28, para. 1 of Ordinance № 54 / June 02, 2003 for medical examinations of the personnel related to the accident at „BDZ-Passenger Transport“ EOOD, declare in written, that they are cheerful, rested and haven't used an alcohol and other narcotics.

### **13. Accidents of similar nature previously registered.**

1. On May 07, 2014, a suburban passenger train № 10113, moving in the direction Sofia - Plovdiv, at 16:30 hrs departs from Belovo station to Septemvri station. The train consists of a three-car electric train (EMT) series № 30-029 / -030 "SIEMENS" owned by "BDZ-Passenger Transport" EOOD. In the section Belovo - Septemvri along road № 1 the train approaches a level crossing, located at km 101 + 227, equipped with Automatic crossing signalization (ACS), which is in good condition and regularly activated. At a distance of about 600 m before the crossing, the motorman notices a truck (semi-truck) approaching the crossing and repeatedly sounded the "Warning" signal, but the truck enters the dangerous area of the crossing. The motorman undertakes a quick stop with the train brake 114 m in front of the level crossing, but due to the short braking distance and although the train was provided with a brake mass, the passenger train hits the truck at 16:35 hrs at a speed of 62 km/h.

The truck is towed about 50 meters along the railroad until the final stop of the train. The EMT derails with both wheel axes of the first bogie.

During the impact, the load with which the truck is loaded is scattered (metal axles measuring 2000 mm X 120 mm X 160 kg), two of which penetrate through the side windows of the train injuring 5 of the passengers in the first wagon. The driver of the truck is also injured in the collision. As a result of the collision.

1 passenger dies and another 4 passengers are seriously injured.

Serious damage and material damage are inflicted on the electric motor train.

2. On October 09, 2014, at 13:45 hrs by an order of the train dispatcher from the "Regional Operational Dispatching Unit" (RODU) - Sofia train № 10997 is appointed from Kostinbrod station to Poduyane-distribution station in composition, two diesel locomotives № 55078.0 at the head and № 06122.6, with locomotive brigades and a transport brigade - a trainmaster. At Voluyak station, the train is accepted on the third free reception-dispatch track at 14:00 hrs, by the head of traffic on duty, the second person at the station. By an order of the train dispatcher, the diesel locomotive № 06122.6 remains at Voluyak station for servicing freight train № 50502, and locomotive № 55078.0 continues its movement under the same train number to Poduyane-distribution station.

The movement of train № 10997 is provided by a duty head of traffic, first-person at Voluyak station, and a duty head of traffic at Sofia station, western region with manipulations of the security equipment. In the diaries for telephone messages, Form II - 76 at both stations a telephone message for train departure № 10997 is recorded, as the registered hours in columns № 4, № 5 and № 6 do not correspond.

In the diary for telephone messages, Form II - 76 at Voluyak station with a level crossing at Obelya station there is a recorded telephone message for the departure of train № 10997 with exchanged receipt numbers, and there is no such recorded in the log of the crossing.

At 14:02 hrs diesel locomotive № 55078.0, departs from the third receiving-dispatch track at Voluyak station to Sofia station with a regular exit signal and an order given through the command disk by the duty head of traffic, the second person at Voluyak station in normal operation of the insurance technique. The diesel locomotive moves along the left road (Dragoman) between the stations

Voluyak and Sofia. At the level crossings at km 7<sup>+385</sup> in the area of the station and at km 5<sup>+904</sup> in the section between the stations, equipped with automatic level crossing devices (ACD), regularly activated depending on the exit and entry signals of the station, the locomotive motorman gives sound signals "Attention" with the locomotive whistle.

When passing through the guarded level crossing at Obelya station, equipped with barriers electrically driven by a guard on duty, at a speed of 55.2 km/h, the diesel locomotive hits a "Seat Toledo" car, which passes through the crossing at the same time with the barrier beams raised (in vertical position) and non-activated alarms. The locomotive driver immediately takes a quick stop with the automatic locomotive brake. After the impact, the locomotive tows the car for about 130 m until its final stop at km 5<sup>+245</sup>.

The collision kills the passenger sitting next to the driver in the car.

The trainmaster, freight traffic, traveling in the cabin of the locomotive notifies the duty operator on 112 and all interested services.

The investigation finds out the following:

- in the diary for telephone messages Form II - 76 at Sofia station the on-duty head of traffic single-handedly has recorded the time of train № 10997 departure, taken according to the indication on the light board of the station, "Received departure" (RD) of the Semi-automatic interlock, without to exchange the receipt numbers.

- in the diary for telephone messages Form II - 76 at Voluyak station the head of traffic on duty, first person, in Voluyak station has recorded the telephone communication with Sofia station after the accident;

- from the in-depth review, and comparisons and analysis of the enrollments in the diaries for telephone messages Form II - 76 at the stations Voluyak and Sofia on October 09, 2014, a discrepancy of the receipt numbers is found, which leads to the conclusion that they have been written in violation of the regulations.

- in the diary for telephone messages Form II - 76 of Voluyak station with the crossing at Obelya stop there is a recorded telephone message for the departure of train № 10997;

- in the diary for telephone messages Form II - 76 of the crossing of Obelya stop with Voluyak station there is no recorded telephone message for the departure of train № 10997;

- in the protocol for registration of the events from the conference calls of the station concentrator at Voluyak station between the respective subscribers in the period from 13:04:49 hrs to 14:07:32 hrs no search and call is registered between Voluyak station and the crossing at Obelya stop, contrary to the allegations of the first person head of traffic on duty, at Voluyak station.

Causes of the accident.

As a result of the in situ inspections, acquaintance with the report and the findings and additional documents collected by the operational group, the results of inspections, other technical documents and the submitted analysis of the reasons, the Investigation Commission finds that in ensuring train movement 10997 from Voluyak station to Sofia station, the executive staff of SE NRIC (duty heads of traffic ) at Voluyak and Sofia-western region stations have violated the basic requirements of the regulations for traffic safety when receiving and dispatching trains at both stations.

#### **14. Analysis and conclusions.**

##### **14.2. Speed analysis of the motion of PT № 19205.**

Train № 19205 departs from Plovdiv station at 06:32:23 hours, initially develops to 30 km/h, passes 600 meters in 1 minute 20 seconds, then accelerates to 78 km/h, passes 880 meters in 52 seconds. and holds with the train brake, passing 960 meters in 1 minute and 6 seconds in service braking mode. At km 157<sup>+200</sup> at 06:35:36hrs the train stops at WR depot stop, where it stays for 24 seconds. At 06:36:00hrs it departs from WR depot stop, develops up to 77 km/h, and subsequently up to 96 km/h, observing the section speed in the section Plovdiv - RP Krastovishte - Krumovo. At Krumovo station it stops at 06:41:56 hours, where it stays until 06:44:16 hours for 2 minutes and 20 seconds. The train departs from Krumovo station at 06:44:16 hrs, again observing the section speeds and the reductions along the railway to Mavrudovo station. The maximum speed reaches 78 km/h. Stops at Mavrudovo station at 06:48:29 hours, staying for 20 seconds and departs at 06:48:49 hours, develops a speed of up to 77 km/h, then holds with the train brake in official stop mode, the speed decreases to 57 km/h at

06:50:02 hours and ranges between 57 and 59 km/h for 2780 meters in 2 minutes and 54 seconds (a section of the railway where speed is limited to 60 km/h). After passing this section, the motorman accelerates and maintains the speed of the train between 78 and 79 km/h. The train passes the warning signal at Asenovgrad station at 06:53:37 hrs at a speed of 79 km/h (Fig. 17 pos. 1, Fig. 18).

At 06:53:47 hrs at a speed of 78 km/h at km 7 493,400 (according to the EMT kilometer reading ) at km 8<sup>+730</sup> the locomotive motorman applies the train brake in service braking mode (Fig. 17, Item 1, Fig. 18). , Fig. 19, item 1). In this mode, the train passes 100 meters in 4 seconds.

At 06:53:51hrs the train № 19205 passed through the level crossing at km 8<sup>+830</sup> at a speed of 77 km/h (Fig. 17, pos. 2, fig. 18, fig. 19, pos. 2), where a collision with the vehicle follows, after which the recording of the recording device stops and the train continues its movement. From that moment on, the recording of the recording device stops and what are the further actions of the motorman can only be guessed. According to the testimony of the motorman, the trainmaster and the conductor, after holding the train brake in the fast stop position, the train stops 100 meters before the entrance signal at Asenovgrad station. Given that the level crossing is located at km 8<sup>+830</sup>, and the entrance signal at Asenovgrad station is at km 9<sup>+504</sup>, it can be argued that the motorman has not applied the train brake in a fast stop mode, as the train stops approximately at km 9<sup>+400</sup>, i.e. its braking distance is 670 meters, which does not correspond to a fast braking mode, but to a service braking mode.

On December 18, 2019, the Investigation Commission performs a speed-brake test of EMT 31-005 / 006 in the section Plovdiv - Asenovgrad, paying special attention to the section from Mavrudovo stop to Asenovgrad station, where crossing 8<sup>+830</sup> is located (Fig. 20).

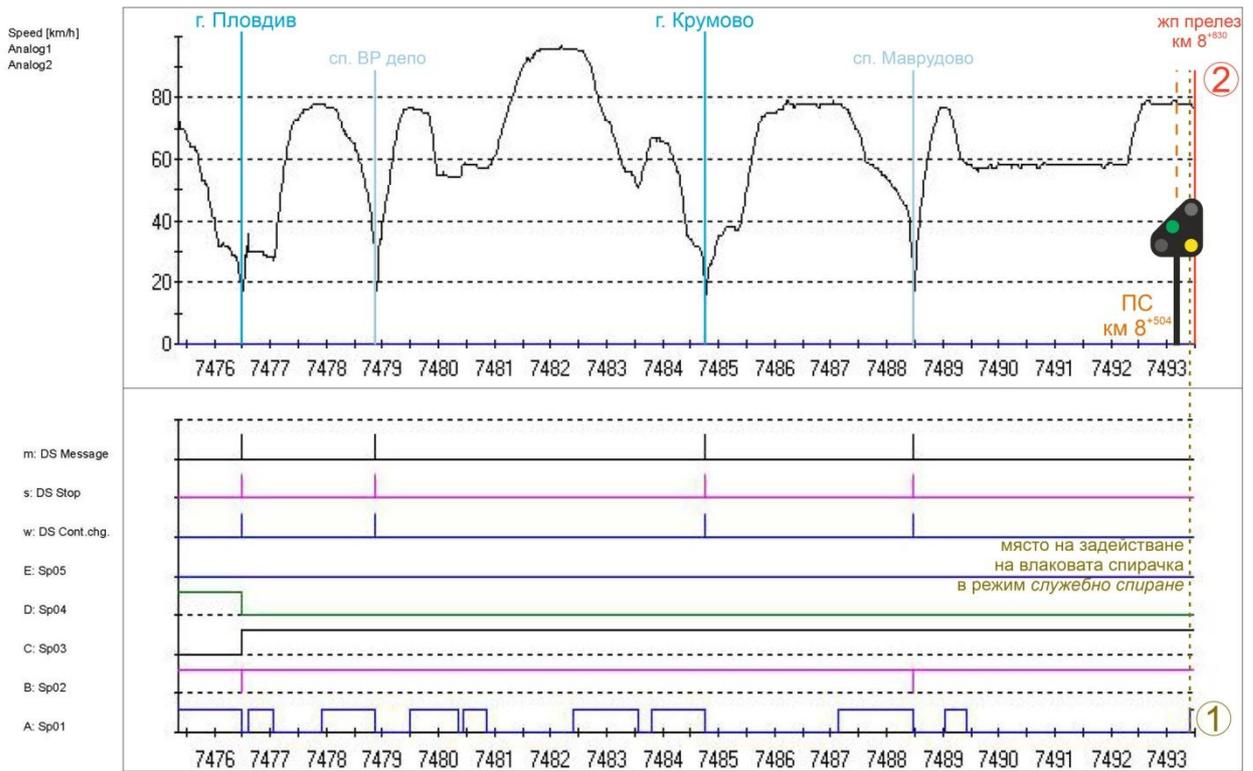


Fig. 17

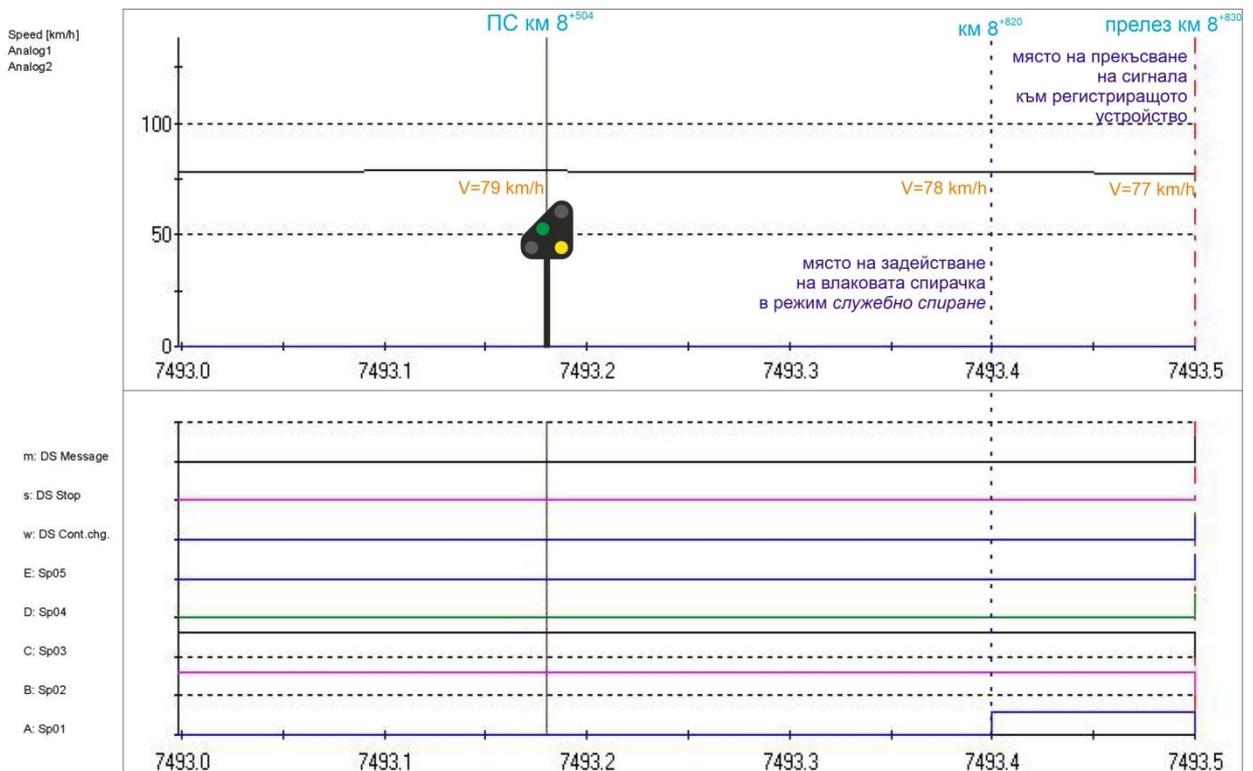


Fig. 18

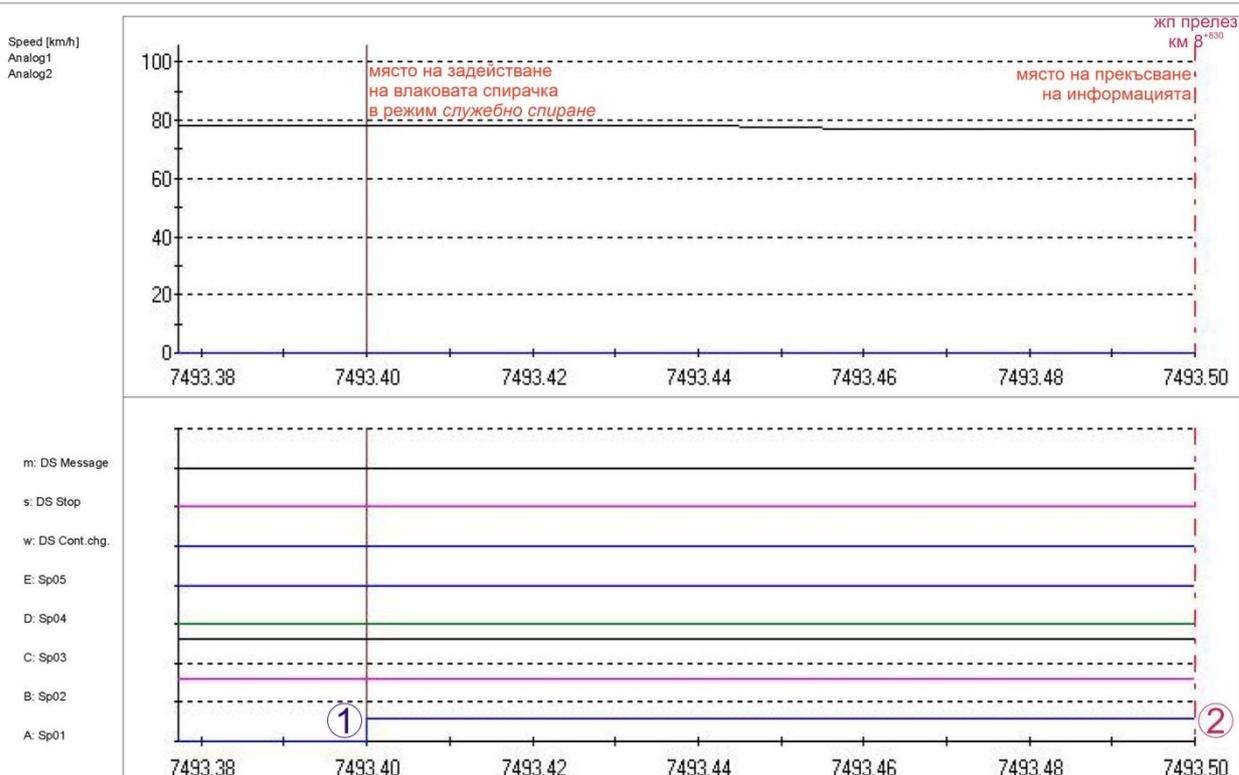
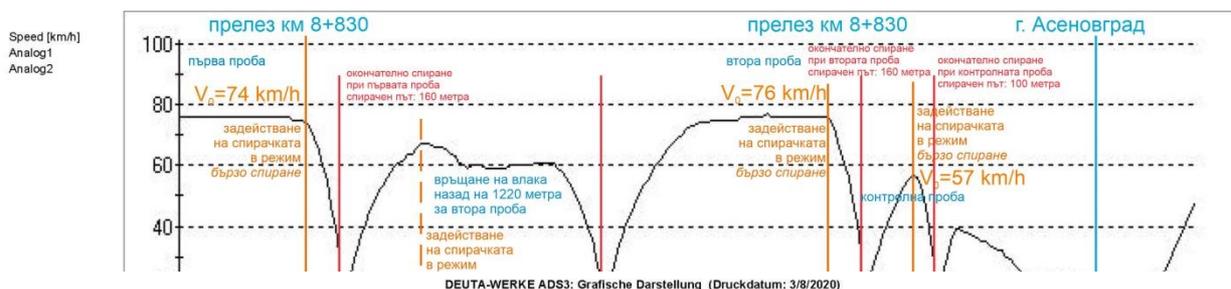


Fig. 19

At the scene of the accident (the axis of the roadway, which intersects with the railway line of the crossing) from a speed of 74 km/h, the brake of EMT 31-005 / 006 is applied in fast stop mode. The brake is applied at 10:47:24 hrs at km 418,040 (according to the EMT mileage), and the train finally stops at km 418,200 (according to the EMT mileage) at 10:47:41hrs, i.e. the stopping time is 17 seconds and the braking distance is 160 meters. The train is returned at a distance of 1220 meters. The stop is made in official stop mode from 10:50:49 hrs to 10:51:51 for 1 minute and 2 seconds with a braking distance of 840 meters. After changing the direction of movement, the EMT is accelerated again. A second stop follows at the same place at a speed of 76 km/h and in the same brake mode (quick stop). The brake is applied at km 420,480 (according to the EMT mileage reading) at 10:54:30 hrs. After the detention, EMT is stopped at km 420,640 (according to the kilometer reading of the EMT) at 10:54:46 hrs, i.e. the stopping time is 16 seconds and the braking distance is again 160 meters. After the departure in the direction of Asenovgrad station, a third, control stop is made in quick stop mode with the indirect train brake (purely pneumatic) from a speed of 57 km/h. The stop is realized in 13 seconds and the braking distance is 100 meters. In all three cases, the braking distance of EMT 31-005 / 006 is reported both under the EMT transcript and under the railway mileage.

From the analysis made in this way it can be concluded that any of the following events has occurred:

- The train has not stopped at the place declared by the train brigade (locomotive motorman, trainmaster and conductor), namely about 100 meters before the entrance signal at Asenovgrad station;
- The train has stopped at the mentioned place (about 100 meters before the entrance signal of Asenovgrad station), but the locomotive motorman has not applied the train brake in quick stop mode, but in service stop mode (Fig. 17, pos. 1, fig. 18, Fig. 19, item 1), with a small degree of retention;
- The train has stopped at the mentioned place (about 100 meters before the entrance signal of Asenovgrad station) and the locomotive motorman has applied the train brake in quick stop mode, but this has happened long after the scene of the accident;

The conclusion that can be made is that the locomotive motorman has applied the train brake on time (100 meters before the scene of the accident), but in service stop mode, due to which the train has stopped long after the accident was realized both by place and by time.

#### 14.3. Conclusions:

The immediate cause of the accident is the collision between passenger train № 19205 and a vehicle passing the crossing at km 8<sup>+830</sup>.

The main reasons for the accident are:

- Non-lowered barriers of "km 8<sup>+830</sup>" level crossing barrier mechanism by the on-duty crossing guard;
- Car passing in front of the oncoming train.

The crossing guard on duty performs his duties under the influence of alcohol, ascertained by the control bodies of the Regional Department of the Ministry of Interior - Asenovgrad, and confirmed by the blood sample examined at UGHAT - Plovdiv. He accepts in writing the telephone message ordered by the duty head of traffic at Krumovo station in due order and gives a control number according to the requirements of the normative documents. After the departure of the train from Krumovo station and after an additional verbal notification from the duty head of traffic at Krumovo station, he confirms that he has understood the instructions. When the train approaches "km 8<sup>+830</sup>" level crossing, he goes to the barrier control mechanism but does not lower them. The non-lowered barriers at the crossing are a prerequisite for the realization of the accident.

The driver of the car approaches the level crossing and sees that the barrier beams are raised and does not take measures for safe passage through the level crossing and continues the movement of the car, entering the danger zone of the level crossing and at that moment the passing train hit them.

The locomotive motorman drives according to the schedule, observing the section speed. When approaching the level crossing at km 8<sup>+830</sup> the motorman sees that the barrier beams are raised and the level guard stands next to the lowering mechanism, he sees that on the left side of the level crossing a car is approaching the level crossing (from the driver's readings).

When the vehicle passes through the level crossing, there is a collision between the passenger train and the car and as a result of that, the passengers in the car are injured, accompanied by material damage to the train and the car.

According to the testimony of the locomotive motorman and the trainmaster, passenger train № 19205 has stopped about 100 meters before the entrance signal of Asenovgrad station. This cannot be proved, as the power cord for the train recorder is broken as a result of the collision between the train and the car, and this has stopped the recording of the train movement information. After stopping at the mentioned place, the locomotive motorman gets off and makes a quick inspection of the damages without going back to the place of the accident to be informed about the consequences. After a short inspection, the motorman gets on the train again and continues its movement to Asenovgrad station without coordinating his actions with the trainmaster.

### **15. Recommendations issued in order to avoid accidents upon the same reasons.**

In accordance with the requirements of Art. 94 para. 1 and para. 3 of Ordinance № 59 from December 5, 2006 in order to improve safety in railway transport, the Investigation Commission proposes to the "Railway Administration" Executive Agency to implement the safety recommendations given to the railway companies "BDZ-Passenger Transport" EOOD and SE NRIC:

Recommendation № 1 proposes the heads of SE NRIC and "BDZ-Passenger Transport" EOOD,

by a special instruction, to get acquainted with the content of this report, the staff directly involved in the safe operational activity in the railway transport.

Recommendation № 2 proposes to BDZ-Passenger Transport EOOD to issue a driver's certificate indicating the railway infrastructure for which the driver has acquired legal capacity and the rolling stock, which he has the right to drive in accordance with the requirements of Art. 36, para. 1, item 2 of Ordinance № 56 /February 14, 2003.

Recommendation № 3 proposes by taking into account the category and intensity of vehicles passing through the level crossing, and in order to minimize the human factor, NRIC should re-equip the level crossing at km 8 +<sup>830</sup> in the interstation Krumovo - Asenovgrad with an automatic crossing device (ACD) equipped with four automatic barriers' mechanisms and an on-duty crossing guard on shift.

Recommendation № 4 proposes given the intensity of vehicles passing through the level crossing, NRIC to build 24-hour video surveillance, covering the flow of cars and rolling stock through the level crossing at km 8 +<sup>830</sup> between the stations Krumovo and Asenovgrad.

With reference to the implementation of Art. 94 para. 4 of Ordinance № 59 from December 5, 2006 for Railway Safety Management, I provide a final report with recommendations attached to it. The addressees under the recommendations to notify in writing the head of SUIRAI in MTITC.

10 April 2020

**Chairman:**

**Dr. Eng. Boycho Skrobanski**

*Deputy President of National*

*Air, Water and Rail Accident*

*Investigation Board of Bulgaria*

Three external independent experts participated in the accident investigation process.