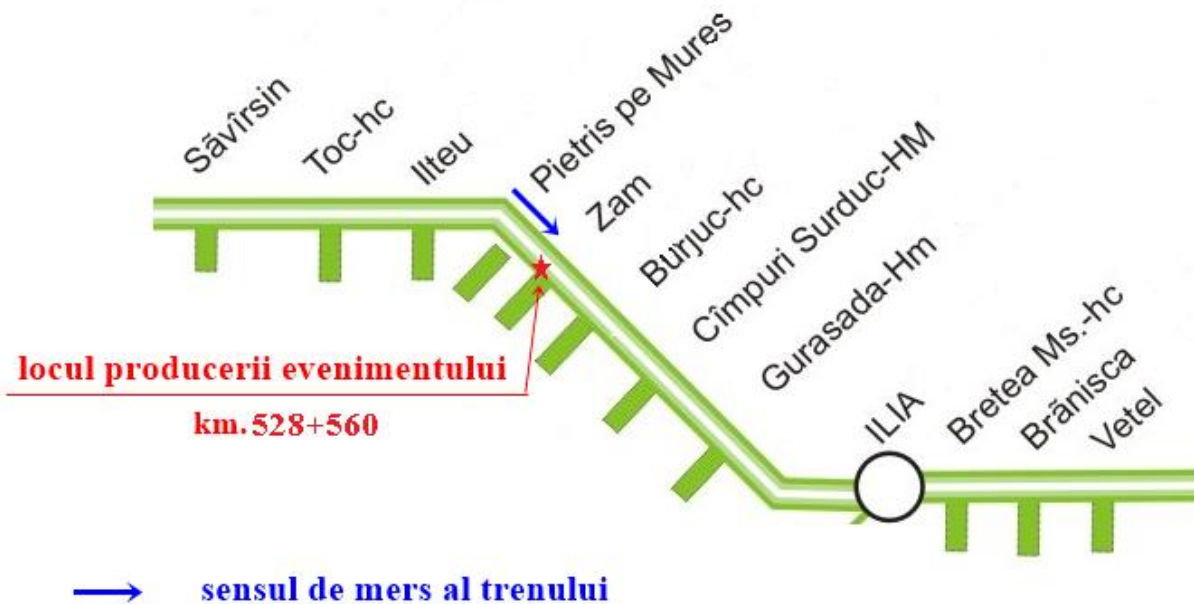




NOTE

on the fall of 4 brake shoes and their keys from the wagon no.31817853504-7, being the 14th one within the freight train no.70926, these parts leading to the derailment of both axles of the first bogie (in the running direction)

On the **11th November 2018**, at about 11:10 o'clock, in the **railway county Timișoara**, interoperable track section Deva - Radna, electrified double-track line, on the track II, between the railway stations Ilteu and Zam, km 528+560 (*drawing no.1*), in the running of the freight train no.70926, got by the railway undertaking MMV Rail România, the first bogie, in the train running direction, (axles 3 and 4) from the wagon no.31817853504-7 derailed, following the fall of 4 brake shoe and their keys.



Drawing no.1 – incident site

It was notified and preliminarily classified by the Regional Safety Inspectorate of the regional county Timișoara like incident, in accordance with the art.8.3.12 („fall of parts of the railway vehicles..., from trains, that affect the railway safety”), from the *Regulations for the accidents and incident investigation, for the development and improvement of Romanian railway and metro safety*, approved through the Government Decision no.117/2010 (hereinafter referred to as *Investigation Regulations*).

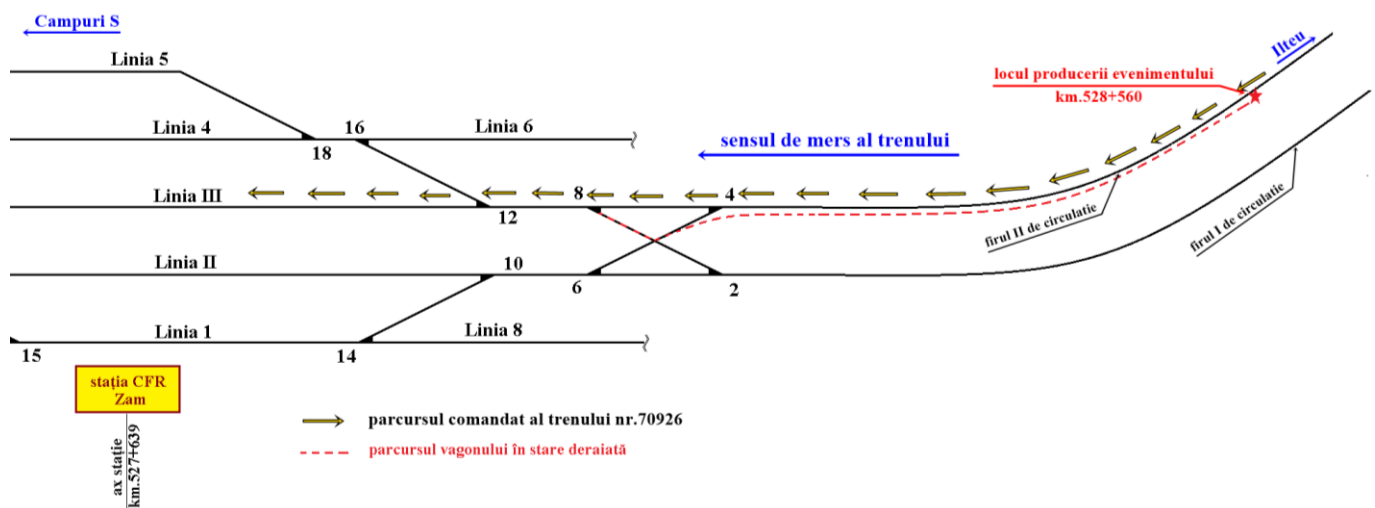
Taking into account these above mentioned, according to art.19, paragraph (1) from the *Law no.55/2006 on the railway safety*, corroborated with art.49 from the *Investigation Regulations*, Romanian Railway Investigation Agency appointed an investigation commission for the collection and analysis of the technical information, setting of the conditions, including the setting of the causes and, if case, issuing of some safety recommendations for the prevention of some similar incidents and improvement of railway safety.

Presentation of the incident occurrence

From the analysis of the train and of its running resulted that the freight train no.70926, having like destination Vințu de Jos railway station, was composed in Jimbolia railway station, consisting in 27 wagons series Zas, 108 loaded axles (methanol), gross tonnage 1896 tons, nett tonnage 1169 tons and length 456 m. The necessary tonnage for braking - 248 tons automatically/190 tons hand braking, and the actual tonnage braked 1426 tons automatically/619 tons for hand braking, all the wagons being with the automatic brake in service. Up to Ronaț Triaj railway station the train was hauled with the diesel electric locomotive DA 1564, and from Ronaț Triaj railway station with the electric locomotive EA 002. The train left Jimbolia railway station on the 10th November 2018, at 15:50 o'clock, having the next stops: Cărpiniș between the hours 16:12 – 17:00, Timișoara Nord between the hours 17:30 – 20:03; Ronaț Triaj between the hours 20:20 – 04:50, Orțișoara between the hours 05:19 – 05:21; Glogovăț between the hours 06:25 – 07:10, Păuliș between the hours 07:47 – 08:04, the last stop before the incident, in Milova railway station, between the hours 08:37 – 09:03.

On the 11th November 2018, at 10:35 o'clock, the movements inspector (IDM), from Zam railway station, received the departure approval for the freight train no.70926, then he did the passing route for the train through the railway station on the direct line III. At the visual inspection of the train, the movements inspector has seen that after the locomotive overtook the movements inspector office, the train was quickly braked. Because the train quick brake did not happen following a braking applied from the locomotive, the train manager went to the train finding that the coupling was broken between the 13th and the 14th wagons, and the 14th wagon was still on rails, it had derailment traces on the running surfaces of the wheels from the first bogie, in the train running direction.

The findings at the train showed that the axles from the first bogie in the train running direction (axles 3 and 4) from the 14th wagon after the locomotive (no.31817853504-7), derailed at km.528+560, between Iteu and Zam railway stations, on a curve, with right deviation. From this point, on 660 m, one could see traces of wheel running on the track bed (*drawing no.2*).



Drawing no.2 – route of the derailed train

Analysing the traces left by the derailed wheels, one can state that the both axles of the bogie derailed on the same cross track section (*photo no.1*), falling with the wheels on the vertical screws of the system for the fastening of the rails on sleepers. The left wheels, having like reference the train running direction, (that ran on the exterior rail of the curve), fell outside the track, and the right wheels inside the track. There were not identified traces of rail climbing, only traces of left wheel coming down on the field face of the left rail, in the train running direction (on 10 cm), and (on the same track section), traces of the right wheel coming down on the field side of the right rail, in the train running direction.

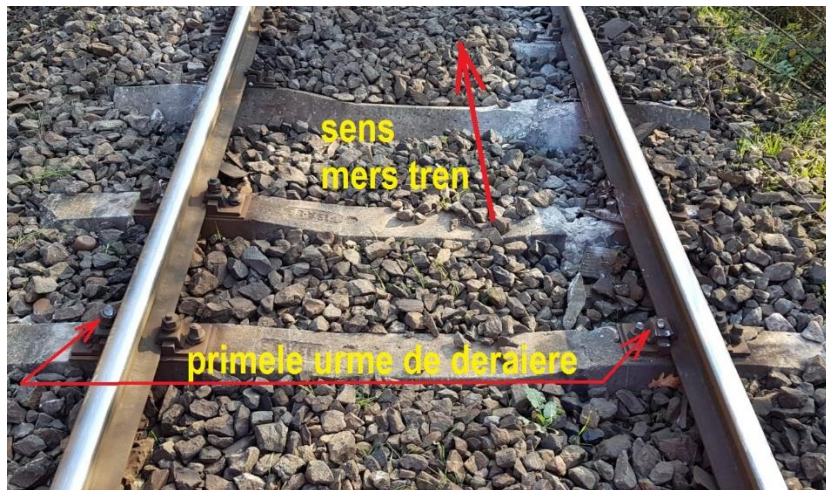


Photo no.1

The wagon with the first bogie derailed ran in this condition on about 660 m (*drawing no.2*), then the left wheels hit and climbed the double frog of the cross-over 2-4-6-8 (situated to the running line), running then on the track bed (on the centre of the cross-over rhomb), and at the double frog (situated to the centre of the railway station) came on the rails of the diverging track of the switch no.8. The right wheels of the derailed bogie ran on the track bed, and at the double frog they climbed on the right rail (in the running direction) of the diverging tracks of the switch no.8. The wagon with the first bogie derailed stopped with the first axle at 2,5 m from the point rail tip of the switch no.8. Following the derailment dynamic, the switch no.8 has changed the position by the derailed axles.

During the checking on site, on the area affected by the derailment, one found four brake shoes and their keys. Two of them were found at 8,5m (on the same track section) against the derailment point (one outside the left rail - *photo no.2* – and another one outside the right rail), and their keys at 10,3 m, respectively 14,10 m from them. The 3rd brake shoe was found at 15,60 m against the first two brake shoes fallen, and its key at 7,70 m from the brake shoe. The 4th brake shoe was found at 352 m against the derailment point, and its key at 1 m from it.



Foto nr.2

Findings at the railway infrastructure and rolling stock involved in the derailment

Infrastructure

At the derailment site, the line is curved with right deviation in the train running direction, having the next characteristics: AR=528+370, RC=528+470, CR=528+930, RA=529+010, R=560m, over-widening

S=0 mm, effective cant $h_{ef}=135$ mm. The track superstructure consisted in a welded one, rail type 49, fitted on concrete sleepers T13, with indirect fastening type K. The speed was limited at 30 km/h, between km 527+800 - 529+000, from the 11th October 2018, following the schedule of works for the replacement of the bridge girders, km 528+920 and wooden sleepers on the cross-over end Y of the railway station Zam (switches no.4 and 8).

In order to make measurements at the line, the line was marked from the point „0” reversely the train running, from 2,5 m to 2,5 meters, marking on the site the points from 0 to 20 (between the points 0 and 2 the marking was made from 0,5 m to 0,5 m). The line was also marked from 2,5m to 2,5 m, starting with the point „0”, in the train running direction, marking on site the points from 0 to – 5. In the points selected one made measurements at the track gauge, track level and versine. One also did vertical and horizontal readings with the device for the establishment of the vertical and lateral wears of the exterior rails, respectively of the vertical wears on the interior rail.

From the analysis of the values measured and of the findings at the elements characteristics of the line and of the track geometry, one can conclude that the infrastructure/superstructure did not contribute at the derailment.

Rolling stock

The locomotive for the train hauling, EA 002 (5100 Kw), had the safety and vigilance device, INDUSI equipment for the punctual control of the speed and the radio-phone equipment in service and sealed. The braking equipment of the locomotive was in good working condition.

When the wagon no.31817853504-7 derailed (the 14th one of the train), the train speed was 22 km/h, and after running 660 m with the wagon in derailed condition, the train stopped, the coupling between the 13th wagon and 14th one broke. Before the train stop, the derailed wagon came on the rails following the coming up of the wheels on the rail at the double frog of the cross-over 2-4-6-8 (situated to the centre of Zam railway station). All the wagons of the train had the automatic brake in service, and the load changeovers were on the position corresponding to the freight train no.70926, on freight position, respectively loaded.

The 13th wagon after the locomotive, no.33607855466-8, at the end to the 14th wagon, had the bar of the draw hook broken (new breakage, with irregular forms) at about 20 mm from the hook (*photos no.3 and 4*), and the left buffer in the running direction with the screws for fastening in the headstock pulled, with up position.



Photo no.3



Photo no.4

The 14th wagon after the locomotive, no.31817853504-7, had the first bogie in the running direction (axles no.3 and 4) with the axles on the rail, but with specific traces of running in derailed condition on the concrete sleepers (the wheel flanges deteriorated), having those 4 brake shoes from the axle ends and their keys missing. The right buffing gear, against the running direction, with slight hit traces at the interior side of the buffer plate. The left buffing gear, back against the running direction, distorted from the headstock of the wagon, inside directed, with the plate mounted on the plate of the buffing gear from the close wagon.

Because the measurements did on site, there were found at the wagon no.31817853504-7 (the 14th one of the train), the both axles of the first bogie in the running direction of the train (axles no.3 and 4) twisted (the distance between the inner side of the wheels, measured in 3 points, at an angle of 120^0 , had differences over 2 mm), for putting the wagon in traffic, in safety conditions, one took measures for the bogie replacement (Y25Cs) in Zam railway station, using the crane for lifting the wagon body from the bogies. On this occasion, in Zam railway station, one done also the detailed technical finding of the wagon.

One did:

- measurements at the geometric profile of the wheels, the values resulted being in accordance with the instruction regulations;
- controls of the spring side bearers, that had the spiral springs in corresponding condition, and the antifriction plates with working traces in arc of circle;
- controls of the centre casting working way, fining that the centre pivot liner were in corresponding condition, having traces of normal working contact, and the upper centre castings with metallic lustre in the working area:

One checked the fitting of those 12 brake shoes rested at the wagon no.33817853504-7 after the derailment, finding as follows:

- all the keys of the brake shoes were introduced through the fitting place of the keys of the brake shoe, ensuring the corresponding fastening of the brake shoe on brake block holder;
- the keys of the brake shoes were fitted with their nose at the upper side of the brake block holder, at 10 keys, their nose being lifted in the fastening place with values between 3 and 5 cm;
- the brake shoe key from the wheel 3, outside part, had fitted a splint at the key tip, like safety measure;
- all the brake shoe were between the normal limits of wear, with the thickness in the most thin part between 3,5 and 4,5 cm.

One did the control of the compatibility of the brake block holders (from which the brake shoes got out) with the brake shoes and their keys found on site, finding the next:

- the depth of the case of the brake heads, where enters the hold for the brake shoe fastening, was of about 2,5 cm;
- the high of the hold for the brake shoe fastening, measured at the brake shoes recovered from the site, was about 2,5 cm;
- the brake shoes recovered from the site were type P10 (S2), presenting normal wears of operation, appeared following the friction with the wheel running surface;
- the keys recovered from site were type S2, in normal condition without distortions.

One performed a checking at the ensemble brake shoe – brake block holder (at one of the brake shoes rested at the wagon), the possibility of the accidental exit of the keys, finding that for its removal it is necessary an important force from down to up, following the frictions existing in this ensemble. One checked the possibility of the fall of the key from the ensemble brake shoe – brake block holder, in case of its fitting through the brake head, but through the fastening case of the brake shoe, finding that the key was not falling following the size of its nose.

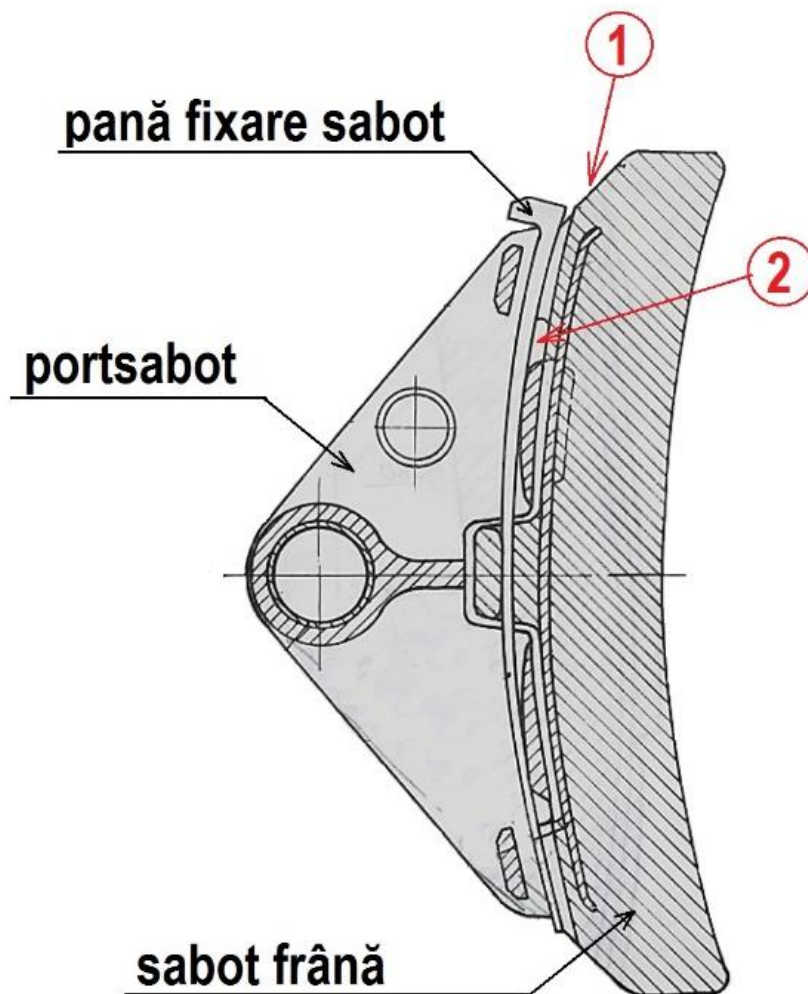
One checked the left brake shoe, running direction (*photo no.5*), first brake shoe found after the derailment site, finding traces of mechanic hit on the brake shoe width, at one of its front parts, having material recently removed, from the working area of the brake shoe and two cross cracks (possible following the interposition of the brake shoe between the wheel and the running surface). Those three parts of the brake shoe (generated through breakage) were kept by the steel armature of the brake shoe.



Photo no.5

One checked the ensemble consisting in the brake shoe, mentioned before, the key and the brake block holder of the wheel no.8 (front left, running direction of the wagon of the train), finding the next:

- the key introduced in the brake block holder (without the brake shoe) could not fall following the size of its nose;
- taking into account that, after the site of brake shoe identification, fallen on site, one identified also their keys, one did many simulations for the establishment of the way of this fall, close to those two parts, was possible (brake shoe – key). Following these simulations one concluded that the only position that could lead to the simultaneous fall was that with the key introduced about 1/3 between the brake shoe and the brake block holder (*drawing no.3*). The explanation that the key could reach this position was just following the intervention of some persons nonidentified that, for their removal and the theft of the brake shoes, they took out the keys from normal position and tried their use like lever for the removal of the brake shoes from their heads. The try to remove the brake shoes, using this method, with success, supposed that the automatic brake be not applied, it being done short time before the train departure from the railway station, in this case, before the train start from the railway station Milova (last stop of the freight train no.70926, before the derailment of the train wagon no.33817853504-7).



Drawing no.3 Remarks: points 1 and 2 – place for the introduction of the key for the dislocation of the brake shoe from the brake block holder.

The way for the identification of the first derailment trace (only the trace of the wheel fall, without the identification also of the trace of rail head climbing) and the simultaneous fall of the both wheels from the same axle, on the same track section, show that the wheel derailment happened following a mechanic shock generated by a blunt body interposed between the running surface of the wheel and the rail head. Taking into account the identification of the brake shoes and of their key, close to the derailment point, and the presence of the hit traces on the first brake shoe, one can conclude that the derailment was generated by the fall of the brake shoe from the wagon no.33817853504-7 (first on the left side in the running direction of the train), that falling interposed between the running surface of the wheel and the rail head.

Taking into account these mentioned, the investigation commission concludes that the derailment of the wagon no.33817853504-7 was generated by the fall of a brake shoe from the wagon, that falling interposed between the running surface of the wheel and the rail head. The fall of the brake shoe followed by the fall of its key happened through the intervention of some nonidentified persons, that during the stop of the freight train no.70926 in the railway station Milova, having the intention of stealing the brake shoes, they removed the keys, trying to use them for the dislocation of the brake shoes from their heads. The operation could not be ended because the automatic brake of the train during the stop is applied. This external intervention generated, after the release of the automatic brake of the train and the departure of the train from the railway station, in its running, the possibility of the fall of the brake shoes non-ensured, and implicitly of their keys, left between the brake shoes and their holders.

Following the conclusions above mentioned, **we propose the closing of the investigation started through the decision no.281 from the 16th November 2018 and the reclassification of this railway incident** according to the provisions of the *Investigation regulations*, **at art.10** - *"The facts of thirds, individuals or legal persons, that put in danger the railway safety, resulting in the interruption of the railway transports, destruction and/or theft of parts or materials from the composition of the railway vehicles..."*.