



MINISTRY OF TRANSPORTS AND INFRASTRUCTURE  
ROMANIAN RAILWAY AUTHORITY - AFER

ROMANIAN RAILWAY INVESTIGATING BODY



## INVESTIGATING REPORT

on the railway accident  
occurred on the 19<sup>th</sup> of June 2011 between the railway stations CFR Timisul de Sus - Predeal  
on the range of activity of CF Brasov Regional Branch



*Final report  
The 5<sup>th</sup> of September 2011*

## NOTICE

With reference to the railway accident occurred on the **19<sup>th</sup> of June 2011**, at **11:16 a.m.**, on the range of activity of **CFR Brasov Regional Branch**, the running section Brasov – Bucharest (double line electrified), **between the railway stations CFR Timisul de Sus - Predeal**, on the running wire I at the km 150+825 **consisting of the derailment of the first bogie in the running direction of the wagon no. 81536656119-0 in the composition of the freight train no. 83568**, belonging to the freight railway undertaking SNTFM “CFR – Marfa” SA, Romanian Railway Investigating Body carried out an investigation, according to the provisions of the Government Decision no. 117/2010. Through the investigation, the information on the respective accident was gathered and analyzed, the conditions were established and the causes determined.

Romanian Railway Investigating Body investigation did not aim to establish the guilty or the responsibility in this situation.

Bucharest, the 5<sup>th</sup> of September 2011

*Approved by*  
Dragoş FLOROIU  
Director

*I agree the compliance with the  
legal provisions on the  
investigation performance and  
drawing up of this Investigation  
Report, that I submit for approval*

**Chief Investigator**  
Nicu PĂLĂNGEANU

*This approval is part of the Report for the investigation of the accident occurred on the 19<sup>th</sup> of June 2011, at 11:16 a.m., on the range of activity of CFR Brasov Regional Branch, the running section Brasov-Bucharest (double line electrified), between the railway stations CFR Timisul de Sus - Predeal, on the running wire I at the km. 150+825, consisting of the derailment by the first bogie of the wagon no. 81536656119-0 in the composition of the freight train no. 83568.*

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## **I. PREAMBLE**

### **I.1. Introduction**

In the case of the railway accident occurred on the **19<sup>th</sup> of June 2011**, at **11:16 a.m.**, on the range of activity of **CFR Brasov Regional Branch**, the running section Brasov – Bucharest (double line electrified), **between the railway stations CFR Timisul de Sus - Predeal**, on the running wire I at the km.150+825 **consisting of the derailment of the first bogie in the running direction of the wagon no. 81536656119-0 in the composition of the freight train no. 83568**, belonging to the freight railway undertaking SNTFM “CFR – Marfa” SA, Romanian Railway Investigating Body carried out an investigation, according to the provisions of the Government Decision no. 117/2010. Through the investigation, the information on the respective accident was gathered and analyzed, the conditions were established and the causes determined.

Romanian Railway Investigating Body investigation did not aim to establish the guilty or the responsibility in this situation, its objective being to improve railway safety and to prevent railway incidents or accidents.

### **I.2. Investigation process**

According to the provisions of the art. 48, paragraph 1 of the Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by Government Decision no. 117/2010, on the 19<sup>th</sup> of June 2011 Romanian Railway Investigating Body decided to start an investigation on the accident occurred on the range of activity of **CFR Brasov Regional Branch**, the running section Brasov – Bucharest (double line electrified), **between the railway stations CFR Timisul de Sus - Predeal**, on the running wire I at the km.150+825 **consisting of the derailment of the first bogie in the running direction of the wagon no. 81536656119-0 in the composition of the freight train no. 83568**, belonging to the freight railway undertaking SNTFM “CFR – Marfa” SA.

Taking into consideration that the occurrence is defined as accident according to the art. 3 point 1 of the Law 55/2006 on railway safety and that this accident is relevant for the railway system, in accordance with the article 19 paragraph (2) of the Law no. 55/2006 on railway safety, corroborated with the art. 49, paragraph 2, letter a of the Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by Government Decision no. 117/2010, the OIFR director decided to start an investigation. So, through the decision no. 61 from the 20<sup>th</sup> of June 2011, of the OIFR director, the investigation commission was appointed consisting of:

- |                |   |                     |
|----------------|---|---------------------|
| ▪ ȚENA Lucian  | - Investigator – OIFR                                 | - main investigator |
| ▪ PAUL Sever   | - Investigator – OIFR                                 | - member            |
| ▪ SAV Vasile   | - Regional Inspector SC – Freight Branch Transilvania | - member            |
| ▪ BUCUR Ștefan | - Regional Inspector SC – CF Brasov Regional Branch   | - member            |
| ▪ COTESCU Dan  | - Inspector sector L - CF Brasov Regional Branch      | - member            |

## **A. BRIEF PRESENTATION OF THE ACCIDENT**

### **A.1. Brief presentation**

On the **19<sup>th</sup> of June 2011**, at **11:16 a.m.**, on the range of activity of **CFR Brasov Regional Branch**, the running section Brasov – Bucharest (double line electrified), **between the railway stations CFR Timisul de Sus - Predeal**, on the running wire I at the km.150+825 **occurred the derailment of the first bogie in the running direction of the wagon no. 81536656119-0 in the composition of the freight train no. 83568**, belonging to the freight railway undertaking SNTFM “CFR – Marfa” SA.

The freight train no. 83568 belonging to the freight railway undertaking SNTFM “CFR – Marfa” SA, running on the section Poieni-Dalga, had in composition 20 wagons type Fals (loaded with broken stone), being towed by the locomotive EA 845 – titular and the pushing locomotive EA 238. Both locomotives belong and were served by staff belonging to the freight railway undertaking SNTFM “CFR – Marfa” SA.

There were no deaths or injuries in this accident.

### **A.2. Direct cause, contributing factors, underlying causes and root causes**

#### **A.2.1. Direct cause**

**The direct cause** of the occurrence of this accident is the escalation of the rail on the right in the running direction by the leading wheel no. 8 near the kilometric position 150+825, the derailment of the first axle of the first bogie in the running direction of the wagon no. 81536656119-0 (wheels no. 7 and no. 8) followed by the derailment of the wheels of the 2<sup>nd</sup> axle of the same bogie, as consequence of the discharge of load of the leading wheel due to the inclination of the wagon box.

**Contributing factors** at the occurrence of this accident were:

- the absence of the side bearer block from the bogie with the wheels 1-4 (the 2<sup>nd</sup> in the running direction), on the left in the running direction, which determined the inclination of the wagon box to the inside of the curve up to its contact with the bogie frame and the increase of the amounted stroke at the side bearers blocks of this bogie at the value of 66 mm and also the discharge of load and reduction of the guiding force of the leading wheel no. 8;
- the inappropriate tightening and insuring against self-detachment of the fixing screws of the side bearer block on the frame of bogie;
- the inappropriate fixing of the side bearer due to the steel filler plate (partially missing (cut at the corners in diagonal) in the area of the fixing screws on the frame of bogie;
- the pack of steel filler plates at the side bearer blocks formed of several pieces that did not cover the entire setting area;

#### **A.2.2. Underlying causes**

**The underlying cause** of the occurrence of this accident:

- non-compliance with the provisions on the steel plates of adjustment and on the packs of steel filler plates admitted to be used for the repair of the top sliding on the occasion of the performance of RP and provided in the “*Instruction for checking and repairing the chassis and the passenger and freight wagons boxes*” no. 936/1991 chap. 2, “Technical conditions at the check of the chassis of the passenger and freight wagons” point 2.3 letter “f” respectively, the use of supplements of adjustment of more than a piece as the use of packs of supplements formed of more than two plates.

#### **A.2.3. Root cause**

None.

### **A.3. Severity level**

According to the provisions of the art. 3, letter l of the Law no. 55/2006 on railway safety, the event by its consequences is categorized as railway accident.

According to the provisions of the art. 7, paragraph (1), letter b of the Regulations for the

investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by Government Decision no. 117/2010, the event is categorized as railway accident.

#### **A.4. Safety recommendations**

None.

This investigating report will be sent to Romanian Railway Safety Authority, to the manager of the public railway infrastructure CNCF “CFR” SA and to the freight railway undertaking SNTFM “CFR-Marfa” SA.

### **B. INVESTIGATING REPORT**

#### **B.1. Description of the accident**

On the 18<sup>th</sup> of June 2011 the freight train no. 83568, belonging to the railway undertaking SNTFM “CFR-Marfa” SA, was sent from the railway station CFR Poieni, at 8:46 p.m., with the destination the railway station CFR Dalga.

The train was composed of 20 wagons type Fals loaded with broken stone, towed by the towing locomotive EA 845 and the pushing locomotive EA 238 and was belonging to the freight railway undertaking SNTFM “CFR-Marfa” SA, being driven and served by staff belonging to the same railway undertaking.

At formation in the railway station CFR Poieni, the train had the technical inspection at formation by the technical inspector of wagons (RTV) belonging to the inspection station Cluj Napoca Est.

From Poieni the train left at 8.46 p.m. and arrived in the railway station CFR Cluj Napoca Est at 11.15 p.m., railway station where it's changed the towing mean and is performed technical inspection in transit and complete test and the train leaves at 11.45 p.m.

The running of the train from the formation to the moment of the accident occurrence was without technical, commercial or of railway safety, on the range of CFR Brasov Regional Branch entering through the railway station of regional border Razboieni at 01:13 a.m. and getting to the railway station CFR Brasov Triaj on the 19<sup>th</sup> of June 2011, at 09:15a.m.

After the traction staff exchange and the technical inspection in transit, the train was sent at 10:25 a.m. in the direction Predeal.

Around 11:16 a.m. between the railway stations CFR Timisul de Sus - Predeal, on the running wire I at the km. 150+825 (curve with left deviation in the running direction of the train) occurred the derailment outside the curve of the first bogie in the running direction of the wagon no. 81536656119-0 (the 12<sup>th</sup> by the locomotive), the wagon running derailed up to the km. area of 150+300.





## B.2. Circumstances of the accident

### B.2.1. Involved parties

The running section where the railway accident took place is managed by CNCF “CFR” SA and maintained by its employees.

The railway infrastructure and superstructure are managed by CNCF “CFR” S.A. and maintained by the employees of the Lines district 2 Timisul de Sus in the Section L1 Brasov, CFR Brasov Regional Branch.

The installations signaling on the distance Brasov - Predeal are managed by CNCF “CFR” SA and maintained by the employees of the Section CT 1 Brasov, CFR Brasov Regional Branch.

The installations of railway communications on the towing locomotives are the property of the railway undertaking SNTFM “CFR-Marfa” SA and maintained by its employees.

The wagon involved in the derailment is the property of the railway undertaking SNTFM “CFR-Marfa” SA.

### B.2.2. Forming and equipments of the train

The freight train no. 83568 belonging to the freight railway undertaking SNTFM “CFR-Marfa” SA was composed of 20 wagons Fals loaded with broken stone, having 80 axles, 1493 gross tones, of which automatic braked according to the timetable walk 747 tones, real automatic braked 936 tones, hand braked according to the timetable walk 254 tones, real hand braked 378 tones and had a length of 350 meters.

The safety and vigilance equipments (DSV), the equipment for the point control of the speed and hitchhiking (INDUSI) in the equipment of the towing locomotives were active (excepting the pushing locomotive which had the installation insulated according to the regulations in force) and were instructionally working, the lever in the enclosure of the installation INDUSI was on the position “M”, appropriate to the freight trains.

### **B.2.3. Railway equipments**

#### ***Description of the railway path***

In the area of the derailment the railway path in plane is in curve from the km 150+218 to the km 150+931 with left deviation (in the running direction of the train) with 3 radii, respectively  $R_1=274$  m,  $R_2=305$  m and  $R_3=286$  m.

The derailment occurred on circular curve with radius  $R_3=286$  m having the following geometric features: arrow  $f=175$  mm, over-elevation  $h=110$  mm, over-enlargement  $s=10$  mm.

The cross profile of the path is excavated with depth of 2.5 m.

In profile along the railway path is in slope of 27‰ (ramp in the running direction of the train).

#### ***Description of the railway superstructure***

In the area of the accident occurrence the railway superstructure is composed of rail type 60, normal wooden sleepers, elastic clamping type SKL 12, path with joints with the panels length of 30m and with the prism of broken stone complete.

### **B.2.4. Means of communication**

The communication between the titular locomotive driver and the movement inspectors and between the locomotive drivers was provided through radio-telephone installations.

### **B.2.5. Triggering the railway emergency plan**

Immediately after the occurrence of the railway accident, triggering the intervention plan to remove damages and restore the trains traffic was performed according to the provisions of the Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by Government Decision no. 117/2010, after which were present representatives of the manager of the public railway infrastructure (CNCFR "CFR" SA - CFR Brasov Regional Branch), of the freight railway undertaking SNTFM "CFR-Marfa" SA, of Romanian Railway Authority - AFER and of the Operative Department of Railway Transports Police.

To restore on the rails the derailed wagon was asked the intervention train specialized with hydraulic winches and the crane EDK of 125 tf belonging to S.C. Interventii Feroviare S.A. - District Brasov, with departure from the railway station CFR Brasov Triaj at 1:15 p.m. The derailed wagon was restored on the rails around 4:50 p.m., without other consequences.

## **B.3. Consequences of the accident**

### **B.3.1. Deaths and injuries**

None.

### **B.3.2. Material damages**

The amount of the material damages according to the estimates prepared by the owner of the rolling stock, of the intervention means and by the manager of the public railway infrastructure is the following:



• <b>at the derailed wagon</b> according to the estimate no. 5 REV/1/1188/2011	<b>319.80 lei</b>
• <b>at the lines</b> according to the estimate no. 1141/19.08.2011 of the Section L1 Brasov	<b>16 9369.00 lei</b>
• <b>at the installations</b> – no damage	<b>0 lei</b>
• <b>cost of the intervention means</b> according to the estimate no. 230/1/156/2011 of the Lines Division Brasov	<b>4 918.76 lei</b>
<hr/>	
<b>Total amount of the damages</b>	<b>174 607.56 lei</b>

### **B.3.3. Consequences of the accident in railway traffic**

The railway accident did not produce major perturbations in railway traffic as after its occurrence the traffic was performed on the running wire II. On the 19<sup>th</sup> of June 2011, at the place of the accident were performed works of checking and restoration of the running path, after these works being restored the trains traffic also on the running wire I, with speed restriction of 30 km/h from the km. 150+300 to the km. 150+850, at 6:50 p.m.

### **B.4. External circumstances**

On the 19<sup>th</sup> of June 2011, between 10:00 a.m. - 2:00 p.m. the visibility was good and the rail temperature was of about +40° C.

The visibility of the light signals was in accordance with the specific regulations in force.

### **B.5. Investigation course**

#### **B.5.1. Summary of the involved staff statements**

**The technical inspector of wagons** who performed the technical inspection in transit of the train no. 83568 in the railway station Brasov Triaj on the driver side stated as follows:

- at the technical inspection of the wagon no. 81536656119-0 he did not find damages or failures at the friction stones of the bogies of this wagon or of the others in the composition of the train;
- he considers that the existence of the two nuts and of the two washers Grower found at the place of the derailment on the pallet sleeper are the result of the existence of the screws and of the supplements at the friction stones in the moment of the train leaving from the railway station CFR Brasov Triaj.

**The technical inspector of wagons** who performed the technical inspection in transit of the train no. 83568 in the railway station Brasov Triaj on the driver assistant side stated as follows:

- at the technical inspection of the train he found missing brake shoes which were replaced and at the 6<sup>th</sup> wagon by the rear of train a suspension spring with the main leave spring broken which was replaced;
- he did not find at the concerned wagon damages or deficiencies regarding the side bearers blocks.

**The locomotive driver** who drove the bank engine EA 238 in the composition of the train 83568 stated as follows:

- hauling the train, around 11:00 a.m. getting out of the speed limit of 30 km/h from the line I between the railway stations Timisul de Sus – Predeal, the driver assistant watching the train exit from the speed limit part of the line noticed dust release on his side;

- after a more attentive observation he announced that the wagon was displaced towards right than the other wagons, being derailed;
- he announced through the radio-telephone to the driver of the hauling locomotive to stop the train, with the expression “so good, we stop the train”;
- he reduced the traction force at “0”, the hauling locomotive driver stopping the train;
- in the moment of braking, the train speed was of about 30 km/h;
- he was acting to maintain the train on the place.

**The locomotive driver assistant** who served the bank engine EA 238 in the composition of the train 83568 stated as follows:

- hauling the train, around 11:00 a.m. getting out from the speed limit of 30 km/h on the wire I between the railway stations Timisul de Sus – Predeal, watching the train in curve and leaving the limitation he noticed dust release on his side;
- first he had the impression that it was about a load drain from the wagon, but analyzing more attentively the position of the wagon to the other wagons he found that it was displaced to the right in the running direction with about 30 cm to the following wagon;
- he announced the driver that the wagon was derailed and the driver communicated the same to the driver of the hauling locomotive;

**The locomotive driver** who drove the titular hauling EA 845, hauling the train 83568 stated as follows:

- he was acting to stop the train after the driver from the hauling locomotive announced him to stop the train as a wagon was derailed;
- after the train stopped, the driver assistant went towards the end of the train and coming back to told him that the 12<sup>th</sup> wagon by locomotive was derailed;
- he announced the movement inspector from the railway station Timisul de Sus and the dispatcher about this situation;
- he considers that in the moment of the derailment the train speed was of 26-27 km/h.

**The locomotive driver assistant** who served the titular locomotive EA 845, towing the train 83568 stated as follows:

- hauling the train, from the km. 150+200 between the railway stations Timisul de Sus – Predeal the driver stopped the train as consequence of the communication made by the driver of the hauling locomotive regarding the derailment of a wagon in the train;
- he went to the concerned wagon where he found that it was derailed by the first bogie in the running direction;
- he was acting to maintain on the place the train with the handbrakes.

**The movement inspector** on duty in the railway station Timisul de Sus on the 19<sup>th</sup> of June 2011, stated as follows:

- the train 83568 passed through the railway station Timisul de Sus at 10:54 a.m. and he ran to the railway station Predeal on the running line I according to the order RC 14;
- at the train scrolling he did not find anything special, the train passing completely, without problems;
- he was notified by the driver of the hauling locomotive that the wagon no. 815366561190 derailed by the first bogie in the running direction;
- he notified the head of the railway station, the RC dispatcher and at 11:20 a.m. he gave order to be closed the current line I Timisul de Sus-Predeal.

## **B.5.2. Safety management system**

At the moment of the railway accident occurrence, CNCF “CFR” SA as manager of the railway infrastructure had implemented its own railway safety management system, according to the

provision of the Directive 2004/49/CE on community railway safety, of the Law no. 55/2006 on railway safety and of the Order of the Minister of transport no. 101/2008 on granting the security authorization to the administrator / management of railway infrastructure in Romania.

At the moment of the railway accident occurrence, SNTFM “CFR Marfa” SA Bucharest as railway undertaking had implemented its own safety management system, according to the provisions of the Directive 2004/49/CE on community railway safety, of the Law no. 55/2006 on railway safety and of the Order of the Transport Minister no. 535/2007 on granting the safety certificate to perform railway transport services on Romanian railways.

### **B.5.3. Norms and regulations. Sources and references for the investigations**

In the investigation of the railway accident one took into account the following norm and regulations:

- Instructions on technical inspection and maintenance for wagons in operation no. 250/2005;
- Instruction for checking and repairing the chassis and the passenger and freight wagons boxes no. 936/1991.
- Instruction for setting terms and order for the rail inspections no. 305 approved by OMT no. 71 on the 17<sup>th</sup> of February 1997;
- Instruction for the lineman head of district for the rail maintenance no. 323/1965;
- Instruction for the activity of the foreman for the maintenance of the line no. 322/1972;
- Instruction for the flagmen and rail or dangerous points inspectors no. 321/1972;
- Instruction of standards and tolerances for the construction and maintenance of the rail - standard gauge lines no. 314/1989;
- Instruction no. 305/1997 for setting terms and order for the rail inspections;
- Instruction for the use of rail measuring wagons no. 329/1995

#### *sources and references*

- copies of the documents required by the members of the investigation commission submitted as annexes to the investigation file;
- photos taken immediately after the railway accident by the members of the investigation commission;
- documents on the lines maintenance provided by the responsible with their maintenance;
- results of the measurements performed immediately after the occurrence of the railway accident at the railway superstructure;
- inspection and interpretation of the technical condition of the elements involved in the accident: infrastructure, railway installations and train;
- questioning of the staff involved in the occurrence of the railway accident;

### **B.5.4. Work of the technical installations, of the infrastructure and of the rolling stock**

#### **B.5.4.1. Data found on the line**

##### ***Findings and measurements performed at the line after the occurrence of the derailment and the lift of the wagons***

The derailment occurred on the area of the circular curve with left deviation (in the running direction of the train, the train running in the opposite direction of the kilometric line) and radius  $R=286$  m after the previous climbing of the rail on the right.

The first dropping mark of the wheel on the right of the first axle (in the running direction of the train) of the 9<sup>th</sup> wagon by the locomotive, was identified at the km 150+825, on the top side of the

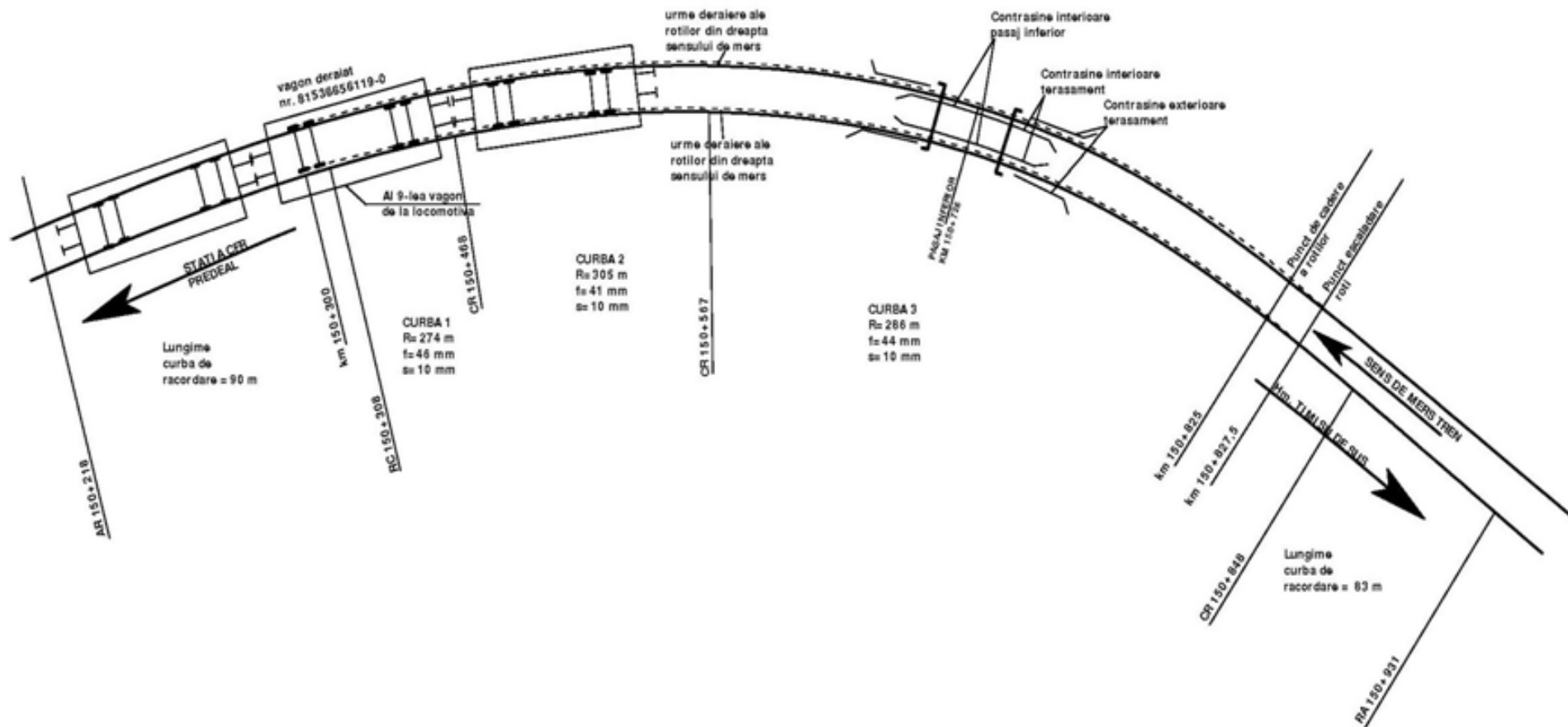
vertical screw rod of the fixing system SKL 12, on the right of the rail on the outer wire of the curve, at a distance of 2.5 m (km 150+827.5) after the mark of climbing of this rail.

The normal wooden sleepers in the area of the derailment occurrence were in appropriate condition excepting a sleeper of the two joints (adjacent) from the joint at the km 150+834 (placed at a distance of 6.5 m before the point of climbing of the rail on the right of the outer line of the curve).

From the km 150+850 to the km 150+300 on the right of the rail on the inner line of the curve and also on the right of the rail on the outer line, were found on the top sides of the vertical screws rods, on the ends of the coach screws and on the top sites of the wooden sleepers, marks left by the wheels rim that ran derailed.

After check of the gauge (E) and of the cross level of the path (N) performed with the rail measuring pattern and of the curve arrows by measurement in the middle of the chord of 20 m, there was not found the exceeding of the tolerances admitted by the *Instruction of standards and tolerances for the construction and maintenance of the rail - standard gauge lines* no. 314/1989, for the running speed of the line.

After check of the vertical and side wears of the rails there was not found the exceeding of the values admitted by the same instruction.



### ***Technical condition of the line before the occurrence of the derailment***

The maximum running speed on the current line I between the railway station Timisu de Sus and the railway station Predeal is of 50 km/h. At the date of the derailment occurrence on the area of the km 150+700-150+750 from this current line, was introduced a speed restriction of 30 km/h as safety measure for the bottom passage from the km 150+726, whose gauge portal had been damaged.

The last check of the rail geometry on the running wire I Timisu de Sus-Predeal, before the derailment occurrence, was performed with the rail measuring cart (VMC 503-5) on the 17<sup>th</sup> of November 2010. After this check on the area of the curve km 150+218-150+931 was recorded a damage of grade 3(J<sub>3</sub>) at the km 150+370, which was repaired the same day through the performance of the corrective works of the cross level through manual stuffing on the area of the km 150+250-150+400. This was the only work performed on the area of this curve before the derailment occurrence.

According to the provisions of the art. 8, sheet no. 4 of the Instruction no. 305/1997, on setting terms and order for the rail inspections, the last check of the curve km 150+218-150+931 on the gauge, the cross level, the arrow and the vertical and side wear of the rail on the outer wire of the curve was performed on the 4<sup>th</sup> of May 2011. The resulted values were within the tolerances admitted in operation for the running speed of the line.

#### **B.5.4.2. Data found on the work of the rolling stock and on its technical installations**

##### ***Preliminary findings performed at the place of the derailment at the train and at the wagon no. 81536656119-0, involved in the derailment***

The train 83568, composed of 20 wagons series Fals was appropriately linked (instructionally), all the automatic brakes were active, excepting the wagons no. 815366531307 and 815366511799 (according to the description of the wagons and to the “brake note”), the “empty-loaded changeover device and freight passenger changeover device on the appropriate positions, excepting the wagon no. 815366548809 to which the changeover device “empty-loaded” was on the position “empty”, the wagon being loaded.

The wagon no. **81536656119-0** (the 12<sup>th</sup> by locomotive) is type Fals, on four axles, designed for the transport of freight with discharge by gravity, with bogie Y25Cs, brake type KE GP DRV 2AT-600 and monoblock wheels.

The wagon had the last overhaul repair type RP on the 13<sup>th</sup> of April 2011 this being valid for 6 years.

At the place of the derailment at the involved wagon were found also the following:

- the wagon was derailed by the leading bogie in the running direction, (the bogie with the wheels 5-6, 7-8), the wheels 5-7 on the left and the wheels 6-8 on the right in the running direction;
- at the bogie with the wheels 1-2, 3-4 (the non-derailed bogie, the 2<sup>nd</sup> in the running direction) was missing the side bearer block on the left in the running direction;
- at the same bogie, on the frame of bogie near the support of the bearer block were found a nut (metric 16) in the back side and in the front side a nut and two washers grower disposed one near the other according to the photo no. 1.



photo no. 1.

- at the non-derailed bogie, on the left in the running direction, the wagon box (swing door frame) was in contact with the bogie frame according to the photo no. 2



photo no. 2

- the amount of tolerance between the side bearer blocks from the non-derailed bogie (wheels 1-2, 3-4 ) was of about 66 mm;
- at the derailed bogie, with the wheels 5-6, 7-8 on the left in the running direction, one of the steel filler plates of the top friction stone cut at two corners in diagonal in the area of the clamping screw;



- the amounted tolerance between the the side bearer blocks from the front bogie (wheels 5-6, 7-8) is of about 42 mm (left 0 mm, right 42 mm);
- the wheels tread from the 4 wheels of the derailed bogie had compactions and material pinches, occurred as consequence of the derailed running.

After the measurements performed by the investigation commission at the geometric elements of the wheels and of the axles of the derailed bogie at the wagon repair and maintenance depot Brasov, resulted the following:

Characteristics	Symbol	Instructional	R5	R6	R7	R8
-Clearance qR	qR	> <b>6.5</b>	10	10.5	10,5	10
- flange thickness	Sd	> <b>22</b>	31.5	32.5	31,5	31,5
- height of flange	Sh	< <b>36</b>	28	28.5	28,5	28
- Clearance between the outer sides	Dfe	> <b>1410</b> < <b>1426</b>	1425		1423.5	
- Clearance E between internal faces	Dfi	+ <b>3</b>	1362		1361	
		<b>1360</b>	1362		1361.5	
		- <b>3</b>	1362		1361	

After the removing of the bogies from the wagon were found also:

**a) at the derailed bogie:**

- the existing centre pivot socket liners with signs of lubrication and cracked;
- at the top the side bearer block , on the side with the wheels 5-7, two weakened screws at an end of the friction plates pack and an insuring screw of the same plate, in the opposite end, loosened, according to photo no. 3 and no. 4;



photo no. 3



photo no. 4

- the steel filler plate at the side bearer blocks prepared of several pieces, which was not covering the entire settlement area, according to the photo no. 5;



photo no. 5

- friction signs with big rough on the bottom the side bearer block of the bogie.

**b) at the non-derailed bogie:**

- the existing centre pivot socket liners, in proper condition;
- the top bearer block near the wheels 1-3, missing;
- the fixing holes of the friction plate on the support of side bearer block (missing) at the top side, with signs of contact of the fixing screws;
- signs of rust and oxidation of the sole of the support of the top side bearer block.

After the occurrence of the accident the derailed wagon was checked by weighing on the electronic scales of Brasov Depot, in order to verify the distribution of the load and to establish the loads report on axle, respectively on bogies, occasion on which were found the following:

R1	R2	R3	R4	R5	R6	R7	R8
9190 kg	9120 kg	10440 kg	8000 kg	12200 kg	6260 kg	12000 kg	5520 kg
R1/R2=1.007<1.25		R3/R4=1.3>1.25		R5/R6=1.94>1.25		<b>R7/R8=2.17&gt;1.25</b>	
Bogie (1,2,3,4)=36750 kg (I)				Bogie (5,6,7,8)=35780 kg (II)			
Bogie I / Bogie II=1.02<3:1							

## **B.6. Analysis and conclusions**

From the analysis of the findings performed at the place of the accident, of the photos taken at the place of the derailment and of the statements of the involved employees one could conclude that the railway accident occurred under the following circumstances:

- on the 19<sup>th</sup> of June 2011, at 9:15 a.m., the train no. 83568 composed of 20 wagons type Fals loaded with broken stone, hauled by the hauling locomotive EA 845 and the bank engine locomotive EA 238 and owned to the freight railway undertaking SNTFM “CFR-Marfa” SA, driven and served by staff belonging to the same railway undertaking, arrives in the railway

station CFR Brasov Triaj, railway station where is performed the traction staff exchange and the technical inspection in transit, then the train no. 83568 was sent at 10:25 a.m. to Predeal;

- after passing by the joint from the kilometer 150+834, at a distance of about 6m of it, on the area of a circular curve with left deviation in the running direction of the train, occurred the climbing of the rail on the right by the leading wheel no. 8 of the first axle of the first bogie of the wagon 81536656119-0, placed the 12<sup>th</sup> by locomotive;
- at the kilometer 150+825, after another 2.5 m from the place where was identified the marks of climbing of the outer rail, occurred the droing of the wheel on the right of the first axle (wheel no. 8) from the first bogie of the wagon in the running direction, followed by the derailment of the second axle of the same bogie, the rim of the derailed wheels rolling on the coach screws ends and on the top sides of the wooden sleepers;
- the climbing of the outer rail was determined by the vertical wheel unloading caused by the occurrence of a allowance at the side bearer block the second bogie in the running direction bigger than the admitted one, allowance caused by the loss of the top side bearer block on the left of this bogie from self-dissolution of the clamping screws of the side bearer block on the bogie bolster;
- the wagon ran derailed from the kilometer 150+825 to the kilometer 150+300 when the train was stopped by the hauling locomotive driver at the indications of the bank engine driver.

#### **B.6.1. Conclusions on the technical condition of the railway superstructure and geometry**

The geometric elements of the railway superstructure and the technical condition of its construction elements could not favor the occurrence of the derailment.

### **B.7. Causes of the accident**

#### **B.7.1. Direct cause**

**The direct cause** of the occurrence of this accident is the escalation of the rail on the right in the running direction by the leading wheel no. 8 near the kilometric position 150+825, the derailment of the first axle of the first bogie in the running direction of the wagon no. 81536656119-0 (wheels no. 7 and no. 8) followed by the derailment of the wheels of the 2<sup>nd</sup> axle of the same bogie, as consequence of the discharge of load of the leading wheel due to the inclination of the wagon box.

**Contributing factors** at the occurrence of this accident were:

- the absence of the side bearer block from the bogie with the wheels 1-4 (the 2<sup>nd</sup> in the running direction), on the left in the running direction, which determined the inclination of the wagon box to the inside of the curve up to its contact with the bogie frame and the increase of the amounted stroke at the side bearers blocks of this bogie at the value of 66 mm and also the discharge of load and reduction of the guiding force of the leading wheel no. 8;
- the inappropriate tightening and insuring against self-detachment of the fixing screws of the side bearer block on the frame of bogie;
- the inappropriate fixing of the side bearer due to the steel filler plate (partially missing (cut at the corners in diagonal) in the area of the fixing screws on the frame of bogie;
- the pack of steel filler plates at the side bearer blocks formed of several pieces that did not cover the entire setting area;

#### **B.7.2. Underlying causes**

**The underlying cause** of the occurrence of this accident:

- non-compliance with the provisions on the steel plates of adjustment and on the packs of steel filler plates admitted to be used for the repair of the top sliding on the occasion of the performance of RP and provided in the “*Instruction for checking and repairing the chassis and the passenger and freight wagons boxes*” no. 936/1991 chap. 2, “Technical conditions at the check of the chassis of the passenger and freight wagons” point 2.3 letter “F” respectively, the use of supplements of adjustment of more than a piece as the use of packs of supplements formed of more than two plates.

### **B.7.3. Root cause**

None.

### **C. SAFETY RECOMMENDATIONS**

None.

This investigating report will be sent to Romanian Railway Safety Authority, to the manager of the public railway infrastructure CNCF “CFR” SA and to the freight railway undertaking SNTFM “CFR-Marfa” SA.

Members of the investigation commission:

- |                |                     |
|----------------|---------------------|
| ▪ ȚENA Lucian  | - main investigator |
| ▪ PAUL Sever   | - investigator      |
| ▪ SAV Vasile   | - investigator      |
| ▪ BUCUR Ștefan | - investigator      |
| ▪ COTESCU Dan  | - investigator      |