



MINISTRY OF TRANSPORTS AND INFRASTRUCTURE
ROMANIAN RAILWAY AUTHORITY - AFER

ROMANIAN RAILWAY INVESTIGATING BODY



INVESTIGATING REPORT

on the railway accident happened
on 02.10.2011, in the railway station Valea Albă



Final edition
24th of february 2012

NOTICE

As regards the railway accident occurred on **02nd of October 2011**, at **17:59** o'clock, in the **Branch of the Railway County Craiova "Regional Center of Operation, Maintenance and Railway Repairs"**, on the running section Strehia-Drobeta Turnu Severin (electrified single line), **in the railway station Valea Albă**, at km 349+060, line 2, by the **derailment of a wagon from the freight train no.70838-1 composition** (belonging to GRUP FERROVIAR ROMÂN S.A), the Romanian Railway Investigating Body developed an investigating action according to the provisions of GD no. 117/2010. By this investigating action, were collected and analyzed information on the railway accident occurrence and also were established the conditions and was determined the cause.

The action of the Romanian Railway Investigating Body didn't have as purpose to establish the guilt or the responsibility in this case.

Bucharest, 24th of February 2012

I give my positive opinion

Director
Dragoş FLOROIU

I find the observance of the legal provisions on the development of the investigating action and drawing the present investigating report that i'm proposing for approval.

Chief Investigator
Nicu PĂLĂNGEANU

The present Notice is a part of the Report for investigating the railway accident occurred on 02nd of October 2011, at 17:59 o'clock, in the Branch of the Railway County Craiova "Regional Center of Operation, Maintenance and Railway Repairs", on the running section Strehia-Drobeta Turnu Severin (electrified single line), in the railway station Valea Albă, at km 349+060, line 2, by the derailment of a wagon from the freight train no.70838-1 composition;

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I. PREAMBLE

I.1. Introduction

As regards the railway accident occurred on **02nd of October 2011**, at **17:59** o'clock, in the **Branch of the Railway County Craiova "Regional Center of Operation, Maintenance and Railway Repairs"**, on the running section Strehaia-Drobeta Turnu Severin (electrified single line), in the **railway station Valea Albă**, at km 349+060, line 2, by the **derailment of a wagon from the freight train no.70838-1 composition** (belonging to GRUP FERVIAR ROMÂN S.A), the Romanian Railway Investigating Body developed an investigating action according to the provisions of GD no. 117/2010 in order to prevent accidents with similar causes, by establishing the conditions and determining the causes.

The action of the Romanian Railway Investigating Body didn't have as purpose to establish the guilt or the responsibility in this case.

I.2. The investigation process

On **02.10.2011** the Romanian Railway Investigating Body was notified by the Safety Traffic Regional Office within Craiova Regional Center of Operation, Maintenance and Railway Repairs through the investigator in charge within the regional structure, about the railway accident occurrence in the railway station Valea Albă and one went to the accident site where he found traces of derailment and fallen subassembly, from a wagon in the freight train no. 70838-1 composition (belonging to SC GRUP FERVIAR ROMÂN SA).

Taking into account that the facts occurred are defined as accident according to art.3 point.1 from Law no. 55/2006 on railway safety and this accident is relevant for the railway system, under art.19, paragraph.(2) of Law no.55/2006 on railway safety, in conjunction with art.49, paragraph.2 from the Regulation for accident and incident investigation, development and improvement of railway safety on the Romanian railway and subway transport network, approved by GD no. 117/2010, the Romanian Railway Investigating Body opened an investigating action.

By decision no.72 of 14.10.2011 of OIFR's Director, was appointed an inquiry commission composed of:

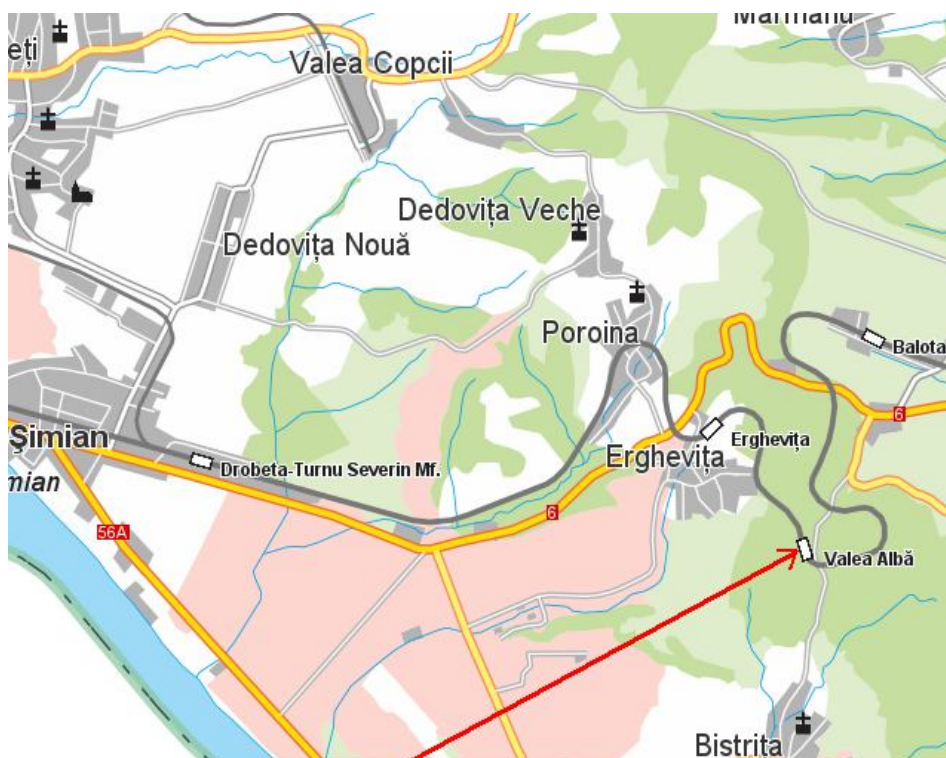
- Popescu Nicolae main investigator
- Zamfirache Marian RRIB investigator
- Dorobanțu Ion regional inspector SC L – CREÎR CF Craiova Branch - member
- Ciurea Alexandru regional inspector SC V – CREÎR CF Craiova Branch - member
- Crăciun Stelian head of office SCCI – SSM – SU – SC GFR SA - member
- Topală Marin dead driver – SC GFR SA - member

A. Summary of the accident

A.1. Short description

On 02.10.2011, at 17:59 o'clock, in the Branch of the Railway County Craiova "Regional Center of Operation, Maintenance and Railway Repairs", on the running section Strehaia-Drobeta Turnu Severin (electrified single line), in the railway station Valea Albă, at km 349+060, direct line II, in the freight train no.70838-1 running (belonging to SC GRUP FERROVIAR ROMÂN SA) the wagon no. 33877915348-9 derailed (the 20th from the locomotive), by a bogie, axles with the wheels 1-2 and 3-4, the first bogie in the running direction.

The accident site is located in the Branch of the Railway County Craiova "Regional Center of Operation, Maintenance and Railway Repairs", on the running section Strehaia-Drobeta Turnu Severin (electrified single line), in the railway station Valea Albă, at km 349+060.



Locul producerii accidentului

The freight train no. 70838-1, composed of 37 wagons, hauled by the locomotive EA 085 and the locomotive EA 494 as banking locomotive, both belonging to SC GRUP FERROVIAR ROMÂN SA runned on the distance Craiova –Stamora Moravița.

As a result of this accident one produced damages at the line on a length of 395m, at the railway equipments and wagon no. 31535481610-2. There were no damages at the hauling locomotive and banking locomotive.

Also, following this accident there were no lost of human life and injured people.

A.2. The accident circumstances

A.2.1. Involved parties

The direct cause of this accident consists of exceeding the stability limit at the derailment by load transfer of first wheel (axle with wheels no. 1-2 was the first axle of the first bogie in the running direction) of wagon no. 33877915348-9, which led to the line overclimbing from the track left side and fall of the first wheel on the running track exterior. Load transfer of first wheel occur as a result of an reaction additional force appearance between the first wheel and the first bogie frame, the force arising as a result of braking the joining bolt between the brake hanger and brake head of first wheel interior, followed by spining of the brake head around triangle axle bolt followed by the entry and blocking the brake hanger between the brake head and wheel.

A.2.2 Underlying causes

None

A.2.3 Root causes

None

A.3. Severity level

According to the provisions of article 7, paragraph 1, letter b of the **Regulation for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety**, approved by GD 117/2010, the event is qualified as railway accident.

A.4. Safety recommendations

None

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The present Investigating Report shall be transmitted to the Romanian Railway Safety Authority, to the National Company of Railways „CFR” SA București, to the railway undertaking SC GRUP FERROVIAR ROMÂN SA București.

B. INVESTIGATING REPORT

B.1. Description of the accident

On 02.10.2011, at 01:56 o'clock, the freight train no. 70838-1 (the wagon no. 33877915348-9 was in its composition) was routed from the railway station Râureni to the railway station Stamora Moravița. On the distance Râureni – Craiova the train runned without railway safety problems.

At 14:45, on 02.10.2011, the freight train no. 70838-1 is dispatch from the railway station Craiova, to the railway station Drobeta Turnu Severin and runned with any railway safety problems until the railway station Prunișor, where it arrived at 16:40.

After adding the banking locomotive EA 494, at 16:48, the train no. 70838-1 was dispatch from the railway station Prunișor to the railway station Balota, where it arrived at 17:05.

The freight train no. 70838-1 was dispatched from the railway station Balota at 17:42 and stopped at the railway station Valea Albă on direct line II around 17:56. After a parking of about 4 min, around 18:00, the train was dispatched in the direction of the railway station Drobeta Turnu Severin-Mărfuri when, at 349+080 the wagon no. 33877915348-9 derailed (the 20th from the locomotive), by the first bogie in the running direction (the axles corresponding to the wheels 1-2, 3-4).

The derailment happened on straight constant-radius curve of line II by overclimbing the curve right head of rail (left on the running direction) by the flange of wheel of the left wheel from the first axle in the running direction and, after a distance of one meter on the head of rail, the whell fell in the exterior of the rail. Along with its fall, the right wheel of the same axle fell inside the line, followed by the fell of the second axle from the first bogie.

The derailed wagon runned about 395 meters on right curve, followed by a left curve, runned over the switch no. 8 and pass the point trailing no. 2, the wheels 2 – 4 (right side in the running direction) from the first bogie overclimb built-up common crossing check rail and after running a distance of about 4 meters it overclimbed the rail.

Along with the right wheels, the left wheels overclimbed the built-up common crossing running on it until its diamond where one overclimbed on the rail, the wagon runned in standard conditions until the railway station Drobeta Turnu Severin Mărfuri.

Following the derailment of wagon no. 33877915348-9, 4 pairs of spiral springs fell from the derailed bogie suspension (the first in the running direction), which led to the non-operation of the switches no. 2/8.

Around 20:33 o'clock, because the switches 2/8 couldn't be handled, the movement inspector on duty in the railway station Valea Albă went on the field, where he noticed derailment traces at direct line II, starting from km 349 +060 until the switch no. 8.

As a result, the movement inspector noticed the traffic operator, stationmaster and interlocking point head section on the findings ones.

The traffic controller ordered to stop and control the trains that previously run through the railway station Valea Albă. Following these controls, in the railway station Crușovăț, at the freight train no. 70838-1 one notice that the wagon no. 33877915348-9 had derailment traces and 4 pairs of spiral springs from the first bogie suspension in the running direction were missing.

B.2. The accident circumstances

B.2.1. Involved parties

The running section where the railway accident occurred belongs to CNCF „CFR” SA and it is maintained by its employees.

The infrastructure and the cant of track belongs to CNCF „CFR” SA and are maintained by District of Line no. 4 Balota employees, within Section L4 Drobeta Turnu Severin, Branch of the Railway County Craiova Regional Center of Operation, Maintenance and Railway Repairs.

The interlocking system from the railway Valea Albă belongs to CNCF „CFR” SA and are maintained by the employees of Section CT 1 Craiova within the Branch of the Railway County Craiova Regional Center of Operation, Maintenance and Railway Repairs.

The railway communication equipments onboard the locomotive belongs to SC GRUP FERROVIAR ROMÂN SA and are maintained by its employees.

The railway communication equipments from the railway station Valea Albă belongs to CNCF „CFR” SA and are maintained by SC Telecomunicații CFR SA employees.

The electric traction and force equipment belongs to CNCF „CFR” SA and its maintained by SC Electrificare CFR SA employees.

The locomotive EA 085, and the banking locomotive EA 494 hauling the train no. 70838-1 belongs to SC GRUP FERROVIAR ROMÂN SA and are maintained and inspected by its employees, and the repairs are performed by economic agents authorised as railway suppliers.

The involved wagon (no. 33877915348-9) belongs to SC ERMEWA SA Geneve, registered in France, in Romania it was inspected by the employees of SC GRUP FERROVIAR ROMÂN SA.

The investigation commission questioned the employees involved in the train operation and railway traffic management.

B.2.2. Composition and equipments of the train

The freight train no. 70838-1 composed of 37 wagons, automatic necessary brake 1052 tons, hand brake tonnage 326 t, real automatic brake 1518 tons, hand brake tonnage 845 t, train length 597 m.

The train was hauled by the locomotive EA 085 and the locomotive EA 494 as banking locomotive, both belonging to SC GRUP FERROVIAR ROMÂN SA București.

The freight train no. 70838-1 had in its composition 3 wagons with the automatic brake „off”: 33877919073-9, 33877916217-5 and 33877915356-2, the 22nd, 24th, and 28th from the locomotive.

The involved wagon series Zagkks no. 33877915348-9 is freight tank wagon, on 4 axles, of metal, for LPG transport (liquefied petroleum gas).

Wagon characteristics no. 33877915348-9 are :

- wagon series - Zagkks;
- serial number - 7915;

▪ bogie type	- Y25 CsII;
▪ bogie pitch	- 1800 mm;
▪ wheel type	- monobloc;
▪ wagon tare	- 37,0 t;
▪ automatic brake type	- KE with air distributor type KE-GP;
▪ automatic brake-rod adjuster type	- SAB DRV;
▪ data of last planned repair	- 06.04.2006 at the workshop code „102”;
▪ maximum maintenance period	- 6 years.
▪ tank wagon capacity	-110 630 l,

The train automatic brake was active. The safety and vigilance equipments (DSV) and the equipment for the punctual control equipment for the speed INDUSI from the locomotives were active and sealed.

B.2.3. Railway equipments

Track path description

The line II of the railway station Valea Albă is in mixed profile, right curve and gradient (slope) of 21,6 ‰.

The derailment occurred on constant-radius curve with radius of 200 m, widening of 20 mm, overcant 80 mm, right deviation, fastenings type SKL and indirect K system.

The broken stone bed was complete, the metal plates fastening system on the sleepers was complete and active.

Track superstructure description

The line II of the railway station Valea Albă, on which the derailment occurred, consists of rail type 49, welded track, wooden sleepers, fastening system type SKL and indirect system type K.

Presentation of safety equipments for railway traffic

The railway station Valea Albă has interlocking system type CR 2 and automatic block line.

Presentation of the force and energy supply equipment

The contact line, component of the force and energy supply equipment, is made of the suspension of the overhead contact wire and its supporting system on reinforced concrete piers.

The railway accident occurred on an area in which the train operation maximum speed was restricted at 50 km/h.

B.2.4. Means of communications

The communication between the driver and the movement inspectors, and between the driver and the train crew was ensured by radiotelephone equipment.

B.2.5. Starting of the railway emergency plan

Immediately after the railway accident occurrence, the start of the intervention plan for the removal of damages and restoring the trains circulation was made by the information flow *stipulated in the Regulation for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by Government Decision 117/2010*, after which the representatives of the railway public infrastructure administrator CNCF “CFR” SA, SC GRUP FERROVIAR ROMÂN SA București and of Romanian Railway Authority came.

B.3. The consequences of the accident

B.3.1. Lost of human life and injured people

None.

B.3.2. Material damages

The value of material damages according to the estimations draw up by the economic operators who made repairs to the rolling stock and railway public infrastructure administrator, is as follows:

▪ at the locomotive	none,
▪ at the wagon:	
- invoice no.231/26.10.2011 of SC I.R.V. SA Caransebes	2.920,00 lei,
- invoice no.WM076/11.11.2011 of SC Wagon Management SRL	3.207,52 lei,
- estimate no. 1170970/05.12.2011 of SC Meva SA CODE VPI 872	362,90 lei,
▪ at the line:	
- according to the estimate no.23/119/04.10.2011 of Section L4 Drobeta Turnu Severin	3.891,36 lei,
▪ at the installation	none,
▪ at the catenary-type overhead contact line	none,
▪ cost of the intervention equipments	none,
Total	10.381,78 lei

B.3.3. The accident consequences on the railway traffic

The train traffic between the railway stations Balota and Drobeta Turnu Severin Mărfuri was not affected.

B.4. External circumstances

At 02.10.2011, within 15:00 – 19:00 the visibility was good, cloudy sky, temperature was about 18°C.

The visibility of the colour-light signals was according to the provisions of the regulations in force.

B.5. The investigation development

B.5.1. The summary of the testimonies of the railway personnel

From the statements of the locomotive EA 085 driver who hauled the freight train no. 70838-1 on 02.10.2011 the followings can be retained:

- after the complete test it departure from the railway station Craiova on 02.10.2011;
- he arrived in the railway station Prunișor where he added the banking locomotive EA 494;
- he departure from the railway station Balota at 17:15;
- after departure from the railway station Balota he perform the tightening test, at which the train behave normally;
- the train was visually inspected in the railway station Valea Albă by the movement inspector;
- the exit signal of the railway station Valea Albă was indicating permissive, green – yellow.

From the statements of the movement inspector on duty on 02.10.2011 in the railway station Valea Albă the followings can be retained:

- he performed passing route in block on direct line II for the train no. 70838-1;
- after the train no. 70838-1 pass the entry signal X he went to visually inspect the train, than he returned to the movement office;
- he notice on the illuminated track-diagram that the switches 2/8 lost their control under the train;
- after this he went to check the switches;
- after the checks he notice derailment traces from km 349+060 to the switch no. 8;
- he returned to the movement office where he verbally notify the traffic controller and stationmaster about the railway accident occurrence.

From the statements of the examiner who made all the technical arrangements of the train no. 70838-1 on 02.10.2011 in the railway station Râureni the followings can be retained:

- after coupling the hauling locomotive at the train and brake it, he waited for the pressure to increase in the main air pipe and after stabiliying the air pressure in the main air pipe of the train no. 70838-1 at 5 bar, he blow the dust filter from the first 3 wagons with activ automatic brake from the front of the train;
- he inspected each wagon, he blow the main air pipe of the train on 5 wagon groups, he remedy the defects and air losses;
- he performed the technical inspection at the composition on both sides of the train;
- at the wagon no. 33877915348-9 he didn't notice any defect that may lead to danger in the railway traffic safety;
- he checked the 2 buffers agains fall from the last wagon of the train;
- he went to the hauling locomotive of the train and requested the driver to inspect if the main air pipe is at 5 bar, after which he request a complete test;
- after checking the tightening of the automatic brake he notice the driver „release the automatic brake” and he check the brake release by removing the shoes from the bearing surface;
- he draw up and hand over under signature the form “Brake Note” to the transit staff ;
- the brake test was good, signed the locomotive journey report and supervise by visual inspection from the station side the dispatch of the train.

From the statements of the examiner who technically inspected the train in transit no. 70838-1 on 02.10.2011 in the railway station Drobeta Turnu Severin Mărfuri the followings can be retained:

- he inspect each wagon of the train, according to the instructions no. 250/2005 ;
- he performed the technical inspection on both sides;
- at the wagon no. 33877915348-9 he notice no defect that jeopardize railway safety;
- he checked the 2 buffers agains fall from the last wagon of the train;
- he submitted that the technical inspection was good and supervise by visual inspection from the station side the dispatch of the train no. 70838-1.

B.5.2. Safety management system

When the railway accident happened, CNCF „CFR” SA as railway infrastructure manager, had implemented its own railway safety management system, according to the provisions of the Directive 2004/49/CE on the community railways safety, of the Law no. 55/2006 on the railway safety and of the Minister of Transports Order no. 101/2008 on the granting of the safety authorization to Romanian railway infrastructure administrator/manager, getting:

- Safety Authorization – Part A, identification number ASA 09002 – by which Romanian Railway Safety Authority, from Romanian Railway Authority – AFER agrees the acceptance of the safety management of the railway infrastructure manager;
- Safety Authorization – Part B, identification number ASB 9007 – by which Romanian Railway Safety Authority, from Romanian Railway Authority – AFER agrees the acceptance of the dispositions taken by railway infrastructure manager in order to comply with the specific requirements necessary to assure the railway infrastructure safety, in the

designing, maintenance and operation, including if case, maintenance and operation of the system for the traffic control and signalling.

SC GRUP FERROVIAR ROMAN SA, as railway undertaking had implemented its own railway safety management, according to the provisions of the Directive 2004/49/EC on the community railways safety, of the Law no. 55/2006 on the railway safety and of the Minister of Transports Order no. 535/2007 on the granting of the safety certificate in order to perform railway transport on Romanian railways.

When the railway accident happened, the railway undertaking got the next documents concerning its own railway safety management system:

- Safety Certificate – Part A, identification number CSA 0014 – by which Romanian Railway Safety Authority, from Romanian Railway Authority – AFER agrees the acceptance of safety management system of the railway undertaking;
- Safety Certificate – Part B, identification number CSB 0224 – by which Romanian Railway Safety Authority, from Romanian Railway Authority – AFER agrees the acceptance of the dispositions taken by the railway company in order to comply with the specific requirements necessary for the safety operation on the relevant network, in accordance with the Directive 2004/49/EC and with the applicable national legislation.

B.5.3 Norms and regulations. Sources and references for the investigation

In the investigation of the railway accident one took into account :

norms and regulations

- Instructions on the technical inspection and the maintenance of the wagons in operation no. 250, approved by Minister of Transports, Constructions and Tourism Order no. 1817 from the 26th of October 2005;
- Instruction for the control and repair of chassis and bodies of wagons no. 936/1991;
- Railway Technical Norm no. 57-001/27.07.2006 „Railway vehicles. Wagons. Technical provisions for repair”
- Railway Technical Norm no. 81-005/27.07.2006: „Railway vehicles. Technical provisions for the repair of the coach and wagon bogie frame”
- Instruction for fixing the deadlines and order in which the rail inspection should be performed no. 305 approved by Minister of Transports Order no. 71 from 17.02.1997;
- Instruction for the foreman ganger no.322/1972;
- Instruction for norms and tolerance for contruction and track maintenance – track with standard gauge no. 314/1989.

sources and references

- copies of the documents enclosed to the investigation file draw up by the investigating commission;
- photos taken soon after the railway accident by the members of the investigation commission;
- photos took from the wagon involved in the railway accident from the railway station Crușovăț;
- results of the measurements made after the accident at the superstructure and derailed wagon;
- inspection and interpretation of the technical condition of the elements involved in the accident: infrastructure, railway equipments, railway vehicles and train;
- questionnaires of the employees involved in the railway accident.

B.5.4 Operation of the technical equipments, infrastructure and rolling stock

B.5.4.1 Data found out on the lines

Technical condition of the line before the railway accident

The line II from the railway station Valea Albă had a mixed profile, right curve and gradient (slope) of 21,6 ‰.

The derailment happened on the circular curve with radius 200 m, overwidening 20 mm, cant 80 mm, right deviation, fastening system type SKL and indirect system type K.

The line II from the railway station Valea Alba, where happened the derailment, consists in superstructure type 49, welded track, wooden sleepers, fastening system type SKL and indirect system type K.

The fastening elements were complete and active, the broken stone bed complete and compact.

The reinforced concrete sleepers T29 were in good condition.

Findings and measurements at the line, after the wagon derailment and lifting

The derailment happened on the right circular curve of the line II at km 349+080 by the overclimbing of the rail head of the out line of the curve with the lip of tyre of the left wheel of the first axle in the running direction and after running about 0,80 m on the rail head, the wheel fell outside the rail.

At the same time, the right wheel of the same axle fell inside the track, followed by the derailment of the wheels of the second axle of the first bogie in the same way.

Following the checking of the gauge (E) and the track level crossing (N) made with the gauge measure from 2,5 m to 2,5 m, one found out the next values:

Mesuring points	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5
E(mm)	24	27	29	32	30	28	25	25	28	32	36	30	28	30	22	24
N(mm)	112	114	110	104	99	93	86	80	75	70	67	68	70	72	75	75

Remarks: point 0 is the derailment place

The running direction of the derailed wagon was from the point 0 to the point 5.

Following the the checking of the curve deflections (f) from the exterior line made with rope of 10m, from 5 to 5 m, one found aut the next values:

Mesuring points	-4	-3	-2	-1	0
f(mm)	63	56	60	76	80

One checked the vertical (C_v) and lateral (C_o) wears of the rails with the calliper in the derailment point, resulting the next values: $C_v = 147$ mm, $C_o = 32$ mm.

Following the checking of the gauge (E) , level crossing (N), deflections(f), rail wers (U_v ; U_o), one found out that the line meets, from the tolerances point of view, with the provisions of the

Instruction of norms and tolerances for track construction and maintenance – lines with standard gauge no. 314/1989.

B.5.4.2 Data on the operation of the rolling stock and its technical equipments

Findings at the wagons within the train composition in the railway station Crușovăț

The exchanger “freight-passenger” and “empty-loaded” were in the positions right for the wagons condition, respectively the positions “freight” and “empty”.

During the brake test (full brake test), made at all wagons of the train no. 70838-1, the application and the release times were right and, also during the tightness test of the general air pipe one didn't found out values of air losses between the limits stipulated by the provisions of the Instructions no. 250/2005.

During the checking of the wagons of the freight train no. 70838-1 one found out:

- the position of the air front cocks type AK on all train length, including the locomotive one “open”, excepting the front cock from the end of the last wagon of the train (rear of the train) that were on “closed” position;
- the front cocks from the attached air flexible half-couplings were on position “open”, and the cocks from the air flexible half-couplings, put in the repose holders, were in the position “closed”;
- one did not found the front cocks type AK irregular closed;
- during the check with the manometer for the control of the air pressure from the train general pipe, one found out a value of 4,7 bar;
- the automatic and hand brakes/pinning were in service, respectively “off”, according to the form “Wagons visual inspection”;
- the automatic brakes written in the form “Braking note” were found “off” (handle of the cock isolation was in horizontal position), and those ones that were not written in the form “brakes note” were found in service (the handle of the isolation cock was in vertical position);
- the train wagons that were not written in the form “Braking note” were provided with the complete number of braking shoes, with the thickness according to the limit established by the Instructions no. 250/2005;
- the attaching couplings (coupling devices) in service were coupled according to the instruction, and the other ones rested free, were in the repose holder(cock);
- the percent of braked mass was ensured both for the automatic brake and for the hand brake.

After the wagon was lifted from the bogies, one measured, according to the provisions of the table 1, point 1 of the Instruction no. 250/2005, the derailed axles geometric elements.

The values resulted following the measurements were between the limits stipulated in “Instructions for the technical inspection and maintenance of the operated wagons no. 250/2005”

Also, one measured the distance between the inner faces of the similar parts of the tyres in 3 points situated at 120° one against the another, each of them in the lowest position, as close as the head of rail , with the calliper getting the next values:

- The pair of wheels with the wheels no. 1-2 1359,5 mm 1359,15 mm 1359,15 mm
- The pair of wheels with the wheels no. 3-4 1358,4 mm 1359,15 mm 1358,15 mm

In order to check if the axle journals are or not distorted, one performed a wagon running test with the covers of the axle boxes detached and found out that the axle journals are not distorted. On the

covers of the axle boxes corresponding to the axle journals no. 1,2,3,4 one patterned with white paint the letter “D”.

During the checking of the technical condition of the wagon no. 33877915348-9 one found out:

- the suspension spiral springs from the axle box 1 and 3 were missing;
- the safety limiter (T parts) from the axle-bearings of wheels 1 and 3 were distorted;



- the brake head from the inner of the wheel no.1 was turned with about 180°;
- the tie bolt between the brake hanger and brake head from the inner of the wheel no.1 was braked in two parts, and on the two brake surfaces one observe a tendency of an old shrinkage crack on about 75% of the surface.



B.6 Analysis and conclusions

B.6.1 Conclusions on the technical condition of the track superstructure

Following the checking of the gauge (E), cross level (N), track deflections (f), rail wear (U_v; U_o) one found out that the line meets with the tolerances stipulated in the Instruction for norms and tolerances for track construction and maintenance – lines with standard gauge no. 314/1989.

B.6.2 Conclusions on the technical condition of the train wagons

Conclusions on the technical condition of the wagon no. 33877915348-9:

- braking the tie bolt between the brake hanger and brake head from the inner of the wheel no.1 happened during braking at the railway station Valea Albă, as a result of a tendency of an old shrinkage crack on about 75% of the surface;
- braking the joint bolt of the brake hanger and its fall led to the turn of the brake head from the inner of the wheel no.1 around the triunghiular axis bolt, and the brake hanger enter and block itself between the brake head and tyre of wheel no.1;
- blocking the brake hanger between the brake head and tyre of wheel no.1 of the first axle lead to an additional reaction force between the brake hanger and bogie frame no.1;
- as a result of this additional force the bogie frame raised and release the suspension parts from the right side in the running direction of bogie no.1, which led to the release of the spiral springs pairs from the axle-guidance and implicitly to its fall;

B.6.3. Analysis and conclusions on the train derailment occurrence

From the analysis of the findings from the accident site, of the technical condition of the wagon derailed, photos taken from the derailment site, as well as of the testimonies of the involved employees, one can conclude that the dynamics of this derailment was:

- during the braking process to stop the train no. 70838-1 in the railway station Valea Albă occur the brake and fall of the joint bolt between the brake hanger and brake head from the inner of the wheel no.1;
- shear off the joint bolt of brake hanger with the brake head was possible due to a tendency of an old shrinkage crack on about 75% of the surface;
- after breaking the joint bolt of brake hanger, the brake head turned around the triunghiular axis, which led the brake hanger to enter and block between the brake head and first wheel of the first axle;
- blocking the brake hanger between the brake head and tyre of first wheel of the first axle lead to a additional reaction force between it and bogie frame no.1;
- as a result of this additional force the bogie frame raised and release the suspension parts from the right side in the running direction of bogie no.1;
- after a turn of 180° of the brake head, one occur the release of the brake hanger and disappearance of the additional reaction force between the brake hanger and bogie frame no.1, which led to the unload of the first wheel of first axle;
- the unload of first wheel of first axle and the right circular curve running conditions favoured the exceeding of the derailment stability limit of wheel no.1;
- following the exceeding of the derailment stability limit, the first wheel (left in the running direction) overclimbed the exterior rail at km 349+060, also favoured by the strong load transfer of the axle with the wheels 1-2 (first axle);
- after overclimbing the exterior head of rail by the flange of wheel no. 1 (left in the running direction) from the first axle, it runned with this wheel on the exterior head of rail and with the wheel no. 2 on the rail about 100 cm;
- from this position, the wheel no. 1 which was running on the exterior head of rail left the running surface of the head of rail, fell outside the track and hit the fastenings elements;
- simultaneous with the fall of the wheel no. 1 outside the track, the second wheel fell inside the rails, which led the first derailed first axle started to run tangential to the track curve, involving in the derailment also the second axle of the bogie (axle with the wheels no. 3-4);
- after this, the wagon run derailed 395 m on a right curve, than on a left curve, pass over the switch no. 8 and arrive and pass the point trailing no.2;

- the wheels no.2 and 4 (right side in the running direction) from the first bogie overclimbed the common crossing check rail of the switch and after running o distance of about 4 meters it overclimbed the rail;
- simultaneous with right wheels, the left wheels (1 and 3) overclimbed the common crossing, runned on it until its point where one overclimbed the rail, the wagon runned in normal conditions until the railway station Drobeta Tr.Severin Mărfuri.

B.7. Accident causes

B.7.1. Direct cause

The direct cause of this accident consists of exceeding the stability limit at the derailment by load transfer of first wheel (axle with wheels no. 1-2 was the first axle of the first bogie in the running direction) of wagon no. 33877915348-9, which led to the line overclimbing from the track left side and fall of the first wheel on the running track exterior. Load transfer of first wheel occur as a result of an reaction additional force appearance between the first wheel and the first bogie frame, the force arising as a result of braking the joining bolt between the hang brake hanger and brake head of first wheel interior, followed by spining of the brake head around triangle axle bolt followed by the entry and blocking the hang brake hanger between the brake head and wheel.

A.2.2 Underlying causes

None

A.2.3 Root causes

None

C. Safety recommendations

None

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The present Investigating Report shall be transmitted to the Romanian Railway Safety Authority, to the National Company of Railways „CFR” SA București, to the railway undertaking SC GRUP FERROVIAR ROMÂN SA București.

Investigation commission members:

- | | |
|---------------------|-------------------|
| ▪ POPESCU Nicolae | main investigator |
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| ▪ DOROBANȚU Ion | member |
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| ▪ TOPALĂ Marin | member |