



MINISTRY OF TRANSPORTS AND INFRASTRUCTURE
ROMANIAN RAILWAY AUTHORITY - AFER

ROMANIAN RAILWAY INVESTIGATING BODY



INVESTIGATING REPORT

on the railway accident
occurred on the 13th of January 2011, in the railway station CFR Dej Triaj



*Final EDITION
The 2nd of March 2011*

NOTICE

With reference to the railway accident occurred on the 13th of January 2011 in the running of the freight train no. 31185-2, on the range of activity of CF Cluj Regional Branch, in the railway station CFR Dej Triaj, consisting of the derailment of the locomotive no. 91530474024-3 and of the wagon no. 21531502445-9 (the first in the composition of the train), Romanian Railway Investigating Body carried out an investigation, 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*. 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 2nd of March 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
Sorin CONSTANTINESCU

This approval is part of the Report for the investigation of the accident occurred on the 13th of January 2011 in the running of the freight train no. 31185-2 belonging to SNTFM “CFR Marfa”, in the railway station CFR Dej Triaj, on the range of activity of CF Cluj Regional Branch;

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I. PREAMBLE

I.1. Introduction

With reference to the railway accident occurred on the 13th of January 2011, at 5:45 p.m. on the range of activity of CF Cluj Regional Branch in the railway station CFR Dej Triaj, in the running of the freight train no. 31185-2 (belonging to the railway undertaking SNTFM “CFR Marfa”-SA), at its shunting at the line no. 6 A from the railway station, consisting of the derailment by all the axles of the locomotive ED no. 91530474024-3 and of the wagon no. 21531502445-9 (the first in the composition of the train - loaded with ammonium nitrate), Romanian Railway Investigating Body carried out an investigation, according to the provisions of the Government Decision no. 117/2010, in order to prevent accidents with similar causes, by establishing the conditions and determining the causes.



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 incidents or railway accidents.

I.2. Investigation process

Taking into consideration the notification of the General Inspectorate of traffic safety from CNCF “CFR”- S.A. regarding the accident occurred on the 13th of January 2011, at 5:45 p.m. on the range of activity of CF Cluj Regional Branch, in the railway station CFR Dej Triaj, in the running of the freight train no. 31185-2 (belonging to the railway undertaking SNTFM “CFR Marfa”-SA), at its shunting at the line no. 6 A from the railway station, consisting of the derailment by all the axles of the locomotive ED no. 91530474024-3 and of the wagon no. 21531502445-9 (the first in the composition of the train - loaded with ammonium nitrate) and taking into consideration that the railway event is categorized as accident according to the provisions of the art. 7(1) point b) of the Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, under the article no. 19 paragraph (2) of the Law no. 55/2006 on railway safety, corroborated with the art.48(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, the OIFR director decided to start an investigation. So, through the decision no. 45 from the 14th of January 2011 of the OIFR director, the investigation commission was appointed, consisting of:

- Nicolescu Mircea - main investigator
- Groza Cristian - investigator - OIFR
- Costin Niculaie - territorial inspector ASFR
- Donea Cristian - territorial inspector ASFR
- Pascu Gabriel - head of Regional Inspectorate SC CF Cluj Regional Branch
- Cârjan Răzvan - head of Control Service P.P.S.U. SNTFM Transilvania Branch

A. BRIEF PRESENTATION OF THE ACCIDENT

A.1. Brief presentation

On the 13th of January 2011, the freight train no. 31185-2, composed of 17 wagons (16 empty, one loaded with ammonium nitrate) 66 axles, 377 gross tons, 24 net tons, length 274 m, towed with the locomotive ED no. 91530474024-3, served by the staff belonging to SNTFM “CFR Marfa”, was formed in the railway station Cluj Napoca Est, being sent at 3:45 p.m. to the railway station CFR Dej Triaj. It ran on this distance with stop in the railway station CFR Dej Calatori, where it was sent at 5:38 p.m. At the train shunting in the railway station Dej Triaj, at the line 6A, after passing over the switch no. 15A attacked to the heel occurred the derailment by all the axles of the locomotive ED no. 91530474024-3 and of the wagon no. 21531502445-9 (the first in the composition of the train – loaded with ammonium nitrate), on the line section between the switch 15A and 21A.

The railway traffic was not affected as consequence of the occurrence of this railway accident.

There were damages at the towing locomotive of the train and at the first wagon in the composition and at the line.

There was no damage at the installations.

There were no deaths or injuries.

A.2. Direct cause, contributing factors and root causes

A.2.1. The direct cause of the occurrence of this accident was the loss of guidance capacity of the first axle in the running direction of the locomotive ED no. 91530474024-3, that was towing the freight train no. 31185-2, because of the occurrence of a local deformation in the embankment body as consequence of the phenomenon of freeze / thaw and of abundant precipitation as rain.

Contributing factors to the occurrence of this accident were:

- stagnation of rain water due to failure of proper drainage system.

A.2.2. Underlying causes

- non performance of the works of drain from the railway embankment which favored the degradation of the railway infrastructure and superstructure as consequence of the phenomenon of freeze / thaw, according to the provisions of the norm “Norms of time to the maintenance and regular repair of the normal railway lines” – code 173 Sifting of the earthen ballast at the muddy joints.
- Non replacement of the normal wooden sleepers reviewed as inappropriate according to the provisions of the “Instruction of standards and tolerances for the construction and maintenance of the rail - standard gauge lines no. 314/1989”.

A.2.3. Root causes

None.

A.3. Safety recommendations

None.

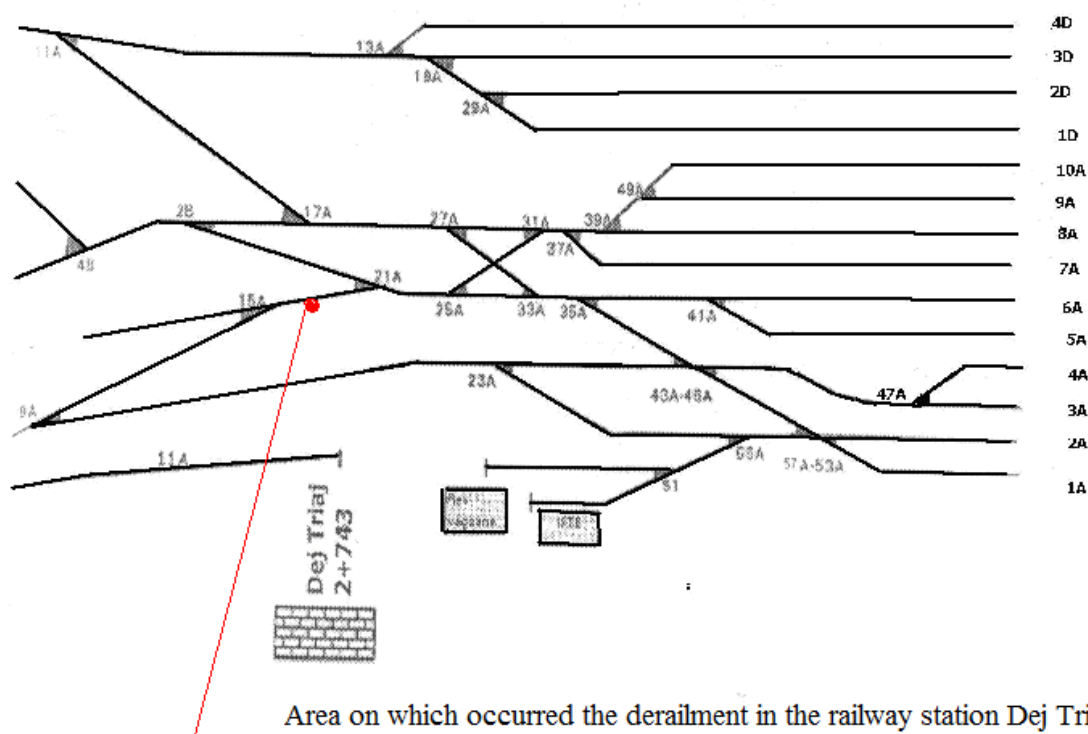
This Investigation Report will be sent to Romanian Railway Safety Authority, to the manager of the public railway infrastructure CNCF “CFR” SA and to the railway undertaking SNTFM “CFR Marfa” SA.

B. INVESTIGATING REPORT

B.1. Description of the accident

On the 13th of January 2011, the freight train no. 31185-2, composed of 17 wagons (16 empty, one loaded with ammonium nitrate) 66 axles, 377 gross tons, 24 net tons, length 274 m, towed with the locomotive ED no. 91530474024-3, served by the staff belonging to SNTFM “CFR Marfa”, was formed in the railway station Cluj Napoca Est, being sent at 3:45 p.m. to the railway station CFR Dej Triaj. It ran on this distance with stop in the railway station CFR Dej Calatori, where it was sent at 5:38 p.m. At the train shunting in the railway station Dej Triaj, at the line 6A, after passing over the switch no. 15A attacked to the heel occurred the derailment by all the axles of the locomotive ED no. 91530474024-3 and of the wagon no. 21531502445-9 (the first in the composition of the train – loaded with ammonium nitrate), on the line section between the switch 15A and 21A.

The derailment occurred at about 14.7 m from the first joint on the top of the path device by the escalation of the right wire of the path (in the running direction) in the area of the mechanic joint placed in this point. After the derailment the locomotive continued to run for about 50 m.



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 District 4 Dej Triaj in the Section L7 Dej, CF Cluj Regional Branch.

Installations signaling, centralization and blocking (SCB) in the railway station CFR Dej Triaj are managed by CNCF “CFR” SA and maintained by the employees of the Section CT 2 Dej, CF Cluj Regional Branch.

The installation of railway communications from the railway station CFR Dej Triaj are managed by CNCF “CFR” SA and maintained by the employees of SC TELECOMUNICATII CFR S.A.

The installation of power and electric traction (IFTE) is managed by CNCF "CFR" SA and is maintained by staff belonging to SC ELECTRIFICARE CFR SA.

The installation of railway communications on the locomotive is the property of the railway undertaking SNTFM “CFR Marfa” SA and is maintained by its employees.

The locomotive and the wagons in the composition of the train no. 31185-2 are the property of the railway undertaking SNTFM “CFR Marfa” SA and are maintained and inspected in traffic by its employees and the repairs are performed by the authorized companies as railway suppliers.

B.2.2. Forming and equipments of the train

- the freight train no. 31185-2, composed of 17 wagons (16 empty, one loaded with ammonium nitrate) 66 axles, 377 gross tons, 24 net tons, length 274 m, towed with the locomotive ED 024, all belonging to the railway undertaking “CFR Marfa” -S.A.
- the safety and vigilance equipments (DSV), the equipment for the point control of the speed and hitchhiking (INDUSI) in the equipment of the traction locomotive were active and instructionally working.
- the automatic brakes of the wagons in the train were active excepting three wagons that had the automatic brake isolated: wagon no. 31531502445-9 (the first by the locomotive), wagon no. 31535301577-1 (the 3rd by the locomotive) and wagon no. 31535481473-5 (the 10th by the locomotive) and wagon no. 31535301884-1 (the 13th by the locomotive).

B.2.3. Railway equipments

Description of the railway superstructure

In the area of the derailment occurrence the railway superstructure is built of lines and switches type 49, wooden sleepers, indirect clamping type K, path with joints, and the prism of broken stone complete. The line is in alignment and ramp with slope of 10‰. The maximum running speed in this area is of 30 km/h.

Description of the safety installations to control railway traffic

The railway station CFR Dej Triaș is provided with electrodynamic centralizing installation type CR3.

Description of the force installations and power supply

The contact line, component of the force installation and power supply, consists of the strand suspension and its support system on metal brackets.

B.2.4. Means of communication

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

B.2.5. Triggering the railway emergency plan

Immediately after the occurrence of the railway incident, triggering the intervention plan was necessary to remove the damages and restore train traffic, the railway accident being announced through the information circuit mentioned in 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 the notification were present on spot representatives of CNCF “CFR” SA – the manager of railway infrastructure, inclusively of SC Interventii Feroviare SA, of the involved railway undertaking, respectively SNTFM “CFR Marfa” SA of Romanian Railway Safety Authority and of Romanian Railway Investigating Body.

The operations of restoring the train traffic were performed by SC Interventii Feroviare SA.

To restore on the rails the derailed rolling stock, was asked and directed the intervention train specialized with crane of 125 tf from the railway station CFR Cluj and also the intervention train specialized with hydraulic winches from the railway station CFR Brasov.

B.3. Consequences of the accident

B.3.1. Deaths and injuries

None.

B.3.2. Material damages

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

- **at the locomotive EA024** **122 688 lei**
according to the estimate no. 119/2011 of SC CFR IRLU SA
- **at the wagon no. 21531502445-9** **379.35 lei**
according to the estimate no. of SNTFM CFR Marfa SA Transilvania Branch
- **at the line** **1281.62 lei**

according to the estimate no.87/2011 of the Section L 7 Dej

<ul style="list-style-type: none">• cost of the intervention means	
for the intervention train specialized belonging to Brasov District of SC Interventii Feroviare SA according to the estimate no. IF/27/17.02.2011	548.38 lei
For the crane EDK of 125tf according to the estimate no. 3/114/2011 of section L3 Cluj	443.7 lei

B.3.3. Consequences of the accident in railway traffic

The railway traffic was not affected by the consequences of the accident.

B.4. External circumstances

On the 13th of January 2011, during the interval 4:00 p.m. - 6:00 p.m. the visibility was good (about 2000 m), cloudy sky and the air temperature was of about 5⁰ 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 driver of the locomotive EA 024 that towed the freight train no. 31185-2 stated as follows:

- he took over the locomotive in the railway station CFR Cluj Napoca Est, this being linked at the train and brake and at 3:45 p.m. he put the train in move and drove without problems to the railway station Dej Calatori, where he stationed 28 minutes;
- he left from the railway station CFR Dej Calatori at 5:38 p.m., based on the light signal of exit with permissive light in the direction Dej Triaj and he drove in normal conditions to the area behind the screening hump where he felt a strong shock, and the locomotive was leaning heavily on the right;
- in this moment he took actions to rapidly brake and to bring the controller on the position "0", and after the complete stop of the train he found the derailment by both bogies of the locomotive and of both axles of the first wagon;

The driver assistant of the locomotive EA 024

- he took over the locomotive in the railway station CFR Cluj Napoca;
- it ran in normal conditions to the railway station Dej Calatori, from where it left at 5:38 p.m. based on the permissive indication of the light signal of exit;
- it ran in normal conditions to the entry in group A of the railway station Dej Triaj, in the area behind the screening hump;
- after passing by the hump building the locomotive had tilted increasingly hard to the right, when the driver made a quick brake and stopped the train;

The movement inspector officer on duty in the railway station Dej Triaj on the 13th of January 2011 stated as follows:

- after receiving the departure notice from the railway station Dej Calatori he performed running route in block to receive the train 31185-2 at the free line 6A;

- he communicated through RTF to the locomotive driver the running conditions;
- chasing on the lumino-scheme the shunting of the train 31185-2 at the line 6A he noticed that it was stationing too much on the section 21-33A in the input route of the train 31185-2;

The team leader of railway maintenance from the section L7 Dej stated as follows:

- he has a number of 4 members in his team instead of a number of 15, he had in 1994, the year when he became team leader;
- in 2010, on the range of activity of the lines team were reviewed for replacement about 950 normal sleepers of which only 21 had been received;
- the works focus on the tops that need immediate intervention, so there remain a lot of problems to be solved which need immediate intervention;
- he thinks that the defects at the gauge and level found by the investigation commission were not dangerous from the point of view of the traffic safety, their evolution being due to the phenomenon of freeze / thaw;
- the melt of the ice from under the sleepers, from under the ends on the right and because of the big quantity of water came from the snow melt and rains during the last two days, the worsening of the defects occurred shortly;

The head of the lines district Dej Triaj stated as follows:

- he has problems in activity due to lack of materials and staff;
- for 2010 were reviewed a number of 1833 normal wooden sleepers, 1464 special wooden sleepers of which they received and replaced a number of 21 normal wooden sleepers and 47 special wooden sleepers during 2010 ;
- he considers the technical condition of the rail on the line section between the switches 15A – 21A satisfactory in terms of sleepers and clampings, with the indication that at the level measurements was found a defect;
- because of the few employees and of the insufficient materials they intervene on the elimination of the tops that need immediate intervention, so, remaining in the path deficiencies of lower amplitude that cannot be repaired immediately and that in certain conditions could generate major defects shortly;
- the defect at level found on the line between the switches 15A-21A is due to the fact that during a short period were big temperature variations, freeze, thaw and rains that led to the formation of a water bag on the ends of the sleepers on the right which favored the occurrence of the defect;
- he explains the fact that this defect was not found by the maintenance responsible at the inspections and works performed because it occurred shortly due to the sudden thaw and the rains and also due to the fact that the joint was not fallen (blind plain) the defect was visible only under load.

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 provisions 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, being in possession of:

- Safety Authorization - Part A with the identification no. ASA09002 – through which the Romanian Railway Safety Authority from AFER confirms the acceptance of the safety management system of railway infrastructure manager;
- Safety Authorization - Part B with the identification no. ASB9007 – through which the Romanian Railway Safety Authority from AFER confirms the acceptance of the provisions adopted by the railway infrastructure manager to meet specific requirements necessary to

ensure safety of rail infrastructure, in the design, maintenance and operation, including where appropriate, maintenance and operation of traffic control and signaling system.

At the moment of the railway accident occurrence, SNTFM “CFR Marfa”- SA as railway undertaking had implemented its own safety management system, according to the provisions of the Law no. 55/2006 on railway safety and of the Order of the Minister of Transport no. 535/2007 regarding the approval of the licensing of railway and safety certificates in order to make rail services on the railways in Romania, being in possession of the following documents regarding the own safety management system:

- Safety certificate - Part A with the identification no. CSA 021 through which the Romanian Railway Safety Authority from AFER confirms the acceptance of the safety management system of the railway undertaking;
- Safety certificate - Part B with the identification no. CSB 017 through which the Romanian Railway Safety Authority from AFER confirmed the acceptance of the provisions adopted by the railway undertaking to accomplish the necessary specific requirements for safe operation on the relevant network in accordance with the national applicable 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

- Instruction for setting terms and order for the rail inspections no. 305 approved by OMT no. 71 on the 17th 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;
- Instructions for technical inspection and maintenance of wagons in operation no. 250 approved by the Order of the Minister of Transport, Constructions and Tourism no. 1817 on the 26th of October 2005;
- Instruction on the mounted axles repair no. 931/1986
- Instructions for the activity of locomotive staff in railway transport no. 201/2007;

sources and references

- copies of the documents submitted as annexes to the investigation file;
- photos taken soon after the railway accident by the members of the investigation commission;
- photos taken to the derailed rolling stock in the accident on the lines of the depot Dej;
- 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 and at the derailed wagons;
- inspection and interpretation of the technical condition of the elements involved in the accident: infrastructure, railway installations and train;
- questioning and statements 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

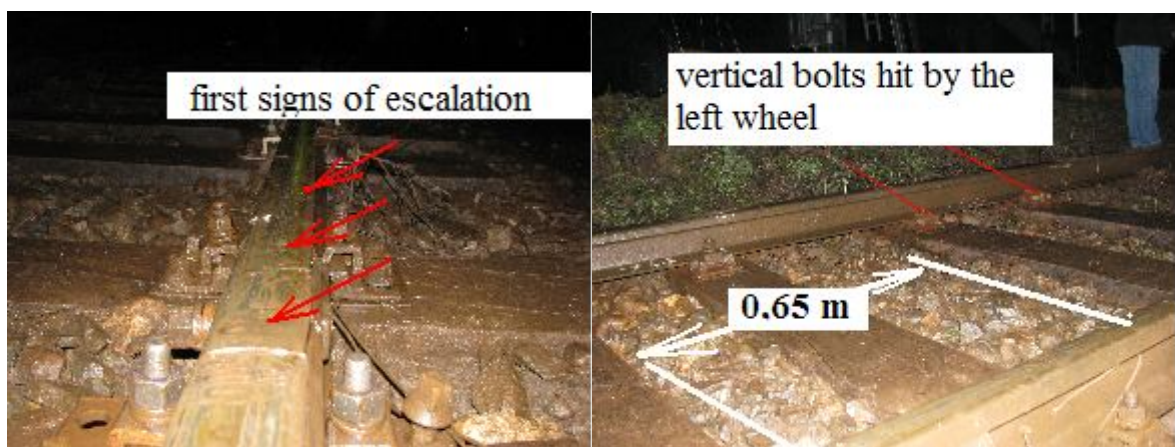
The derailment occurred on the line section between the switches no. 15A and 21A from the group A of the railway station, at 14.7 m from the joint on the top of the switch no. 15A.

The line portion between these switches is built of 5 panels of path without joints, rail type 49, wooden sleepers.

Starting from the top of the switch no. 15A on a distance of 9.70 m the line is composed of 2 panels of 4.8 m respectively 4.9 m then there is a panel of length 11.9 m which has in addition on the wire on the right a mechanic joint resulted from the replacement of a defect rail with two rail coupons. The joint is located at 4.96 m from the end of the panel and it has no correspondence on wire on the left of the line.

The derailment occurred by escalation of the rail on the right wire of the line by the wheel on the right of the locomotive, at a distance of 14.7 m measured from the top joint of the switch no. 15A, on the panel of 11.99 m length, right next to the additional joint.

- the first escalation sign was found on the rail on the right of the 3rd panel counted from the top of the switch no. 15A;
- on the wire on the left of the path the first derailment sign is noticed at about 0.65 m from the corresponding point of the mechanic joint on the other wire.
- From the place of the first derailment sign in the opposite of the running direction of the train were performed with the rail measuring pattern checks of the gauge (E) and of the cross level of the path (N), in points having the equidistance of 2.5 m. Also were performed on the derailed area, placed after the point “o”. The values of these measurements are listed in table no. 1:
- the measurements were performed with the rail measuring pattern type ROBEL in the equipment of ISF Cluj.





On the wire on the left, the first falling sign is noticed at about 0.65 m from the corresponding point of the mechanic joint on the other wire. Further, it is noticed on the first 5-6 m from the derailment signs of rolling on metallic plates and on the vertical bolts from inside the path, then on the sleepers between the path wires and also outside the path (on the right in the running direction).

Table 1

Point	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10
E(mm)	14	12	22	31	18	4	5	10	18	21	22	7	4
N(mm)	36	43	52	30	22	19	14	9	12	13	26	26	24
C _v - dr	146	144	145	145	145	144	146	146					
C _o - dr	32	30	30	29	31	30	30	30					
C _v - stg	144	145	144	144	145	146	146	146					
C _o - stg	30	31	30	30	29	28	29	29					
U _v - dr	3	4	4	4	4	3	3	3					
U _L - dr	5	3	3	2	4	3	3	3					
U _v - stg	5	4	5	5	4	3	3	3					
U _L - stg	5	4	3	3	2	1	2	2					

- there were performed measurements also with the gauge measuring rails wear in all the points where were measured the gauge and the level to determine the vertical wear “U_v” and the side wear “U_L” of the rails resulting the values in the table above..
- the running direction of the train was from the point “- 10” to the point “0” representing the derailment place. The Point “0” is at 14.70 m from the first top joint of the path device no. 15A.
- the measuring points from – 10 to – 6 are located on the switch no. 15A which is type 49, Af, left deviation, radius R = 300m, tangent 1:9.

From the interpretation of the measured values resulted the following:

- the tolerances at the gauge are within the value provided in the instruction no: 314/1989, at the art.1, point14, letter c in the measuring points « -3 », « -4 » and « - 5 ». In the other measuring points the tolerances for gauge are exceeded, but is not exceeded the maximum value in operation of the gauge, respectively 1470 mm (+35 mm) is not exceeded. In the measuring points placed on the switch no. 15A the tolerances at the gauge are within the value provided in the instruction no. 314/1989, at the art.19, Table, in the measuring point « -10 ».

- the variation of the deviations at the gauge is within the value of 2 mm/m provided in the instruction no. 314/1989, at the art.1, point 14.1, letter c, paragraph 2, between the measuring points “2” et “1” ; “-3” et “-4” ; “-4” et “-5”. Between the other measuring points the value of 2 mm/m admitted for the variation of the deviations at the gauge **is exceeded**, with values within 4 mm et 9 mm. Between the measuring points –1 and 0. 0 and 1 **variation of the deviations at the gauge is exceeded** with 4 mm respectively 5 mm.

on the line section after the path device no. 15A, the tolerances at the cross level of the path **is not within** the value of 10 mm, provided in the instruction no. 314/1989, at the art.7, letter A, point 1, paragraph 2, excepting the measuring point “– 5” where the measured value is instructionally. In the other measuring points is found that on the entire measured length of the line the right wire corresponding to the running direction of the train is fallen, being lower than the other wire, with values within 4 mm and 42 mm as follows:

- in the measuring point no. – 4 is an exceedance of the admitted value for cross level with 4 mm,
- in the measuring point –3 the exceedance is of 9 mm,
- in the measuring point –2 the exceedance is of 12 mm,
- in the measuring point –1 the exceedance is of 20 mm ,
- in the measuring point « 0 » the tolerance at cross level **is exceeded** with 42 mm .
- in all the measuring points placed on the switch no. 15A the admitted values for cross level **are exceeded** with values within 7 mm and 21 mm.
- the value of the rail twisting of 12.5 mm provided for speeds within $10 < V \leq 30$ km/h in the instruction no. 314/1989, at the art.7, letter A, point 4 is respected in all the measuring points, excepting the value calculated between the measuring points –1 and 0, where this is 22 mm, with 9.5 mm more than the admitted value. Also the value of the rail twisting is exceeded between the measuring points – 7 and – 8, placed on the switch no. 15A, where is recorded a value of 13 mm, with 0.5 mm more than the admitted value.
- regarding the analysis of the measured data on rails wear was found that the **vertical and side wear are within** the limits admitted by the Instruction no. 314/1989 table 24 and 25, and of the provisions from the “Technical prescriptions on measuring the vertical and side wears of the rails”, approved by the order no. 30/1298/1987 of DLI Bucharest.

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

Findings performed at the rolling stock immediately after the occurrence of the derailment:



- the locomotive ED nr. 91530474024-3
 - derailed in the area of the connection rail of the switch needle 21A attacked to the heel,
 - the wheels on the left in the running direction derailed and suspended and those on the right were derailed and at about 1 m outside the rail on the right. The last were buried in the prism of broken stone;

- plow of the locomotive was leaning on the cable channel of SCB installation;
- the locomotive was vertically inclined to the right in the running direction at about 35°- 40°;



- wag. no. 21531502445-9
 - derailed by both axles;
 - the first axle suspended as consequence of the impact pads action on the right in the running direction;
 - the air front valve of the general pipe pulled and with the thread damaged because of the pull;

Findings and measurements performed during the investigation at the locomotive EA 024 that towed the train

The locomotive had the last repair type RK at IRLU Craiova on the 25th of February 2010, date from which it ran 42985 km. The last current repair type RT was performed in IRLU Craiova on the 3rd of November 2010, date from which it had run 7850 km.

At the place of the accident were performed the following findings:

- installations INDUSI and DSV sealed and operating;
- the valve KD2 from the driving station II (from where was driven the locomotive) in position of quick braking, the valve FD1 on braking position;

At the check IVMS in Depot Dej Triaj

- the locomotive passed the input signal of the group A of the railway station Dej Triaj, it ran a distance of 295 m with the maximum speed of 27 km/h (under the maximum speed admitted by the line of 30 km/h) then the speed decreased gradually to 13 km/h and then suddenly at 0 occurring the stop at 17:47.28.

Findings performed on the 17th of January 2011 at the depot Dej Triaj, on the occasion of the checks performed at the two bogies that equipped the locomotive and that were removed from the locomotive due to its removal to release the line and restore the traffic:

- cross coupling fixed head broken (new breaking 100%) and the mobile head with new breaking of about 50% of the section and twisted;

- the coupling housing did not show damages and deformations, not being found elements to lead to the coupling blocking;
- cross dampers at the bogie II between the axles 4 and 5 deformed;
- gear drum no. 6 broken part in the bottom side;
- deformed brake wheelhouse;
- animals plow station II deformed;
- metalastic jaw axle 5 left side broken – new breaking 100%;
- supports of the vertical dampers axle 6 broken on the left in the running direction and at the axles no. 3 and 4 on the right in the running direction broken;

Measurements performed at the axles of the locomotive ED 024 on the 17th of January 2011:

Measured rates	Axle 1		Axle 2		Axle 3		Axle 4		Axle 5		Axle 6	
	L	R.	L	R.	L	R.	L	R.	L	R.	L	R.
A	0.5	0	0	0	1	1	0	0	0	0	0.5	0
B	77	77	77.5	77.5	76.5	76	78	77.5	77	76.5	76.5	77
C	30	30	31	32.5	31	30	30.5	30	31.5	31	30	30
I	28.6	28.6	28.6	28.6	28.7	29	28.6	28.6	29	28.6	28.6	28.5
qR	9.5	9	11	11	10	9	9.5	9	11	10	9	8.8
D(or N)	1419.57		1423.04		1420.02		1420.32		1421.45		1419.69	
E(orK) E1	1359.57 1359.61		1359.54 1359.5		1359.02 1359.52		1359.82 1359.7		1358.95 1358.81		1359.69 1359.67	
E2	1359.6		1359.10		1359.69		1359.68		1359		1359.91	
Bandage width	142	142.5	142.5	142.1	141.9	141.3	142	141.8	141.9	140.2	140.9	141.7

Releasing the axles mounted on the bogies at the Section IRLU Craiova were performed measurements at the locomotive wheels diameters obtaining the following values:

Axle 1		Axle 2		Axle 3		Axle 4		Axle 5		Axle 6	
PN	PA	PN	PA	PN	PA	PN	PA	PN	PA	PN	PA
1249.33	1249.25	1249.43	1250.22	1248.47	1249.14	1249.03	1249.38	1249.21	1249.74	1249.27	1249.23

Unit for all the measured rates – mm.

Obs: PN non-geared part, PA – geared part;

The rates are within the limits admitted by the “Instructions for the activity of locomotive staff in railway transport” no. 201/2007 and by the Instructions no. 931 on the repair of the axles mounted at the railway vehicles.

Findings performed during the investigation at the derailed wagon

At the place of the accident were performed the following findings:

- on the entire length of the train the connection couples were tighten to the touching of the buffer heads;
- the automatic brakes isolated at the wagons in the composition of the train corresponded to the fallen ones from the form “description of the wagons”
- the braking percentage was provided;

Findings performed at the derailed wagon – wagon no. 21531502445-9 (the first in the composition of the train):

- the last periodic inspection performed on the 21st of June 2005;

- the front valve (the side towards the locomotive) pulled from the thread on the general pipe,
- the threaded part of the general pipe was deformed and had the thread damaged by the pull of the valve AK8;
- there were signs of damage of the half-plates of guard from the first axle in the running direction (the wheel no. 3);

Measurements performed at the wagon

	Wheel 1	Wheel 2	Wheel 3	Wheel 4
Dfi	1359.1 1359.9 1359.7		1359.9 1360.1 1360.4	
Height of the rim	30.5	31	29.5	30
Thickness of the rim	31.5	30	32	30
Rate qR	10.2	10.5	10	10
Distance between the connection of the suspension spring and the chassis	17	19	25	18

Unit for all the measured rates – mm.

The rates are within the limits admitted by the “Instructions on technical inspection and maintenance for wagons in operation” no. 250/2005.

The wagon was weighed on the 20th of January 2011 in the railway station CFR Zalau Nord, occasion on which were found the following values:

- gross mass weighed 39060 kg, to 38696 kg marked in the transport document, value that is within the measuring error of the scales of 3%;
- there results the mass on axle 19530 kg which is within the maximum authorized load on axle.

B.6. Analysis and conclusions

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

Exceedance of the tolerance for the rail twisting (with +9,5 mm to the maximum limit admitted by the Instruction no. 314/1989) and the local dipping of the embankment due to rainfall and thaw phenomenon allowed the rail escalation by the wheel on the right of the appeal axle of the locomotive next to the mechanic joint corresponding to the measuring point “0”.

B.6.2. Conclusions on the technical condition of the rolling stock

From the checks and the measurements performed at the locomotive and also at the derailed wagon had not been determined elements to show a malfunction of them or rates not being within the limits provided by the norms and regulations in force.

B.7. Causes of the accident

B.7.1. The direct cause of the occurrence of this accident was the loss of guidance capacity of the first axle in the running direction of the locomotive ED no. 91530474024-3, that was towing the freight train no. 31185-2, because of the occurrence of a local deformation in the embankment body as consequence of the phenomenon of freeze / thaw and of abundant precipitation as rain.

Contributing factors to the occurrence of this accident were:
stagnation of rain water due to failure of proper drainage system.

B.7.2. Underlying causes

- non performance of the works of drain from the railway embankment which favored the degradation of the railway infrastructure and superstructure as consequence of the phenomenon of freeze / thaw, according to the provisions of the norm “Norms of time to the maintenance and regular repair of the normal railway lines” – code 173 Sifting of the earthen ballast at the muddy joints.
- Non replacement of the normal wooden sleepers reviewed as inappropriate according to the provisions of the “Instruction of standards and tolerances for the construction and maintenance of the rail - standard gauge lines no. 314/1989”.

B.7.3. Root causes

None.

C. SAFETY RECOMMENDATIONS

None.

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

Members of the investigation commission:

- Nicolescu Mircea - main investigator
- Groza Cristian - investigator - OIFR
- Costin Niculaie - territorial inspector ASFR
- Donea Cristian - territorial inspector ASFR
- Pascu Gabriel - head of Regional Inspectorate SC CF Cluj Regional Branch
- Cârjan Răzvan - head of Control Service P.P.S.U. SNTFM Transilvania Branch