MINISTRY OF TRANSPORT AND INFRASTRUCTURE - MTI
ROMANIAN RAILWAY AUTHORITY - AFER
ROMANIAN RAILWAY INVESTIGATING BODY - OIFR

INVESTIGATING REPORT

of the railway accident happened on the 18th of March 2010, on the running line between the railway stations Crivadia and Merisor

Final edition
The 23rd of November 2010

NOTICE

With reference to the railway accident occurred on the **18th of March 2010**, in the **Branch of the Railway County Timisoara**, track section Simeria – Petrosani (double electrified line), **between the railway stations Crivadia and Merisor**, at the km 58+916, on the running line, consisting in the **derailment of 6 wagons of the freight train no. 50503** (belonging to the railway undertaking SC UNIFERTRANS SA Bucuresti), 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.
Romanian Railway Investigating Body considers necessary that the corrective measures be taken in order to improve the railway safety and to prevent the accidents, so it included in the report a series of safety recommendations

Bucharest, the 23rd of November 2010

Approved by,
Director
Dragos Floroiu

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 18th of March 2010,at 9,06 hour, in the Branch of the Railway County Timisoara, track section Simeria – Petrosani (double electrified line), between the railway stations Crivadia and Merisor, at the km 58+916, on the running line I, consisting in the derailment of 6 wagons of the freight train no. 50503.

CONTENT

PREAMBLE

I.1 Introduction

Concerning the railway accident happened on the **18th of March 2010**, at **9,06** hour, in the **Branch of the Railway County Timisoara**, track section Simeria – Petrosani (double electrified line), **between the railway stations Crivadia and Merisor**, at the km 58+916, on the running line I, consisting in the **derailment of 6 wagons of the freight train no. 50503** (belonging to the railway undertaking SC UNIFERTRANS SA Bucuresti), Romanian Railway Investigating Body carried out an investigation, according to the provisions of the Government Decision no. 117/2010, in order to prevent some accidents with similar causes, establishing the conditions and determining the causes. Romanian Railway Investigating Body investigation did not aim to establish the guilty or the responsibility, its objective being to improve the railway safety and to prevent the railway incidents and accidents

I.2 Investigation process

According to the provisions of art. 49, paragraph 2 from the Regulations for the investigation of the accidents and incidents, for the improvement of the railway safety on Romanian railway and subway network, approved by Government Decision no. 117/2010, on the 12th of May 2010, through the paper no. 2120/192/2010, Romanian Railway Safety Authority asked Romanian Railway Investigating Body to perform an investigation of the accident happened about the railway accident happened on the 18th of March 2010, at 9,06 hour, in the Branch of the Railway County Timisoara, track section Simeria – Petrosani (double electrified line), between the railway stations Crivadia and Merisor, at the km 58+916, on the running line, consisting in the derailment of 6 wagons of the freight train no. 50503 (belonging to the railway undertaking SC UNIFERTRANS SA).

Taking into account that, the happened deeds are defined as accidents according to the art.3, point 1 of the Law 55/2006 on the railway safety and that this accident is relevant for the railway system, in accordance with the art. 19, paragraph (2) of the Law 55/2006 on the railway safety, corroborated with the art. 49, paragraph 2, letter d of the Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by the Government Decision 117/2010, Romanian Railway Investigating Body director decided to start an investigation.

So, through the Decision of OIFR director, no. 19 from the 13th of May 2010, the investigation commission was appointed, consisting in:

- Stoian Eduard - main investigator
- Zamfirache Marian - investigator
- Pais Luca - investigator
- Oltenacu Livius - investigator

ACCIDENT RESUME

A.1 Brief presentation

On the **18th of March 2010, at 9,06 hour**, in the **Branch of the Railway County Timisoara,** track section Simeria – Petrosani (double electrified line), **between the railway stations Crivadia and Merisor**, at the km 58+916, on the running line I , 6 wagons of the **freight train no. 50503** (belonging to the railway undertaking SC UNIFERTRANS SA Bucuresti) derailed, as follows:

- the first bogie of the wagon no. 88536657494-0 (the 5th from the locomotive) derailed in the running direction;
- the first bogie and the first axle of the second bogie of the wagon no. 88536657850-2 (the 6th from the locomotive) derailed in the running direction;
- both bogies of the wagon no. 88536657854-4 (the 7th from the locomotive) derailed and inclined to the outside of the curve , at about 45^0;
- the first axle of the second bogie of the wagon no. 88536656656-4 (the 8th from the locomotive) derailed in the running direction;
- the first axle of the first bogie and the first axle of the second bogie of the wagon no. 88536656449-4 (the 9th from the locomotive) derailed in the running direction;
- the first axle of the first bogie and the first axle of the second bogie of the wagon no. 88536656455-1 (the 10th from the locomotive) derailed in the running direction.

The freight train no. 50503 consisting in 24 wagons, 96 axles, 1893 tons, length 345 m and hauled by the locomotive EA 53127 (all belonging to the railway undertaking SC UNIFERTRANS SA Bucuresti), run between Plopsoru – Episcopia Bihor, the wagons loaded with coal (brown coal).

This accident generate the damage of the line on about 80 m length. No damages at the hauling locomotive of the train and at the railway equipments.

No deaths or injuries.

A.2 Direct cause, contributing factors and root causes

A.2.1 Direct cause

The direct cause of the accident is the derailment of the axle no. 7-8 (the first axle) from the first bogie in the running direction of the wagon 88536657494-0 (the 5th from the locomotive), at the km 58+916, consisting in the leaving of the right rail by the wheel no. 8 (the rail corresponding to the curve inside track). It was possible bacause the total gauge clearance of this axle exceeded the accepted limits, provided that the thickness of the wheel flange no. 7 was under the maximum limit stipulated in the Instruction no. 250/2005.

Contributing factors were:

- existance of some edgeds and wears on the outside active flange of the wheel no. 7;
- the strong wear of the wheels flange from the left side of the wagons, in the train running direction, generated by the running of the trains belonging to the railway undertaking between Plopsoru-Episcopia Bihor, in winter 2009-2010, as push-pull train, without changing the trains forming;

- strong wears at the disks of the buffers from the wagons no 88536657494-0 and no. 88536657723-2, because of it the running in curve led to a very strong friction between them;
- important unloading of the first axle (corresponding to the wheels 7-8) of this wagon, because the stiffness behaviour of the wagons no. 88536656494-0 and no. 88536657723-2 and a spontaneous brake application on a curved track section with gradient 15,3‰.

A.2.2 Underlying cause

The underlying cause of this accident is the non-performance of the compulsory works and inspections, that have to be made by the examiner, during the inspection in the forming of the train no. 50503, on the 18th of March 2010, it leading to non-identification of the failures from the first wheel no. 7 of the wagon no. 88536657494-0, failures that imposed the taking out of the wagon from the train.

A.2.3 Root cause

The root cause of this accident is the lack of regulations that stipulate the periodical lubrication of the disks of the wagon buffers, between two periodical repairs.

A.3 Severity level

According to the provisions of the art. 3, letter 1 of the Law no. 55/2006 on the railway safety, the event, through its consequences, is categorized as railway accident.
According to the provisions of 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 the Government Decision 117/2010, the event is defined as railway accident.

A.4 Safety recommendations

The addressees of the safety recommendations are SC UNIFERTRANS SA Bucuresti, as railway undertaking, and Romanian Railway Safety Authority.

The safety recommendations aim to solve the next issue:

1. Performance of an inspection, by Romanian Railway Safety Authority, at the freight undertaking, in order to check the organization and carrying out of inspections of the technical condition of the wagons from own trains.
   At the end of this action, Romanian Railway Safety Authority will propose measures for the removal of the found nonconformities.
2. Romanian Railway Safety Authority, together with the railway undertakings, shall analyze the opportunity that, in order to decrease the friction forces appered during the running between the disks of the wagon buffers, these be lubricated from time to time.
   If, following this analysis, one shall establish that it is usefull to perform from time to time the lubrication of the wagon buffer disks, Romanian Railway Safety Authority shall udate in this respect the Instructions on the technical inspection and maintenance of the wagons in operation no. 250, approved by Order of Minister of Transports, Constructions and Tourism no. 1817 from the 26th of October 2005.

This investigation report will be sent to Romanian Railway Safety Authority , to the public railway infrastructure manager CNCF „CFR" SA and to the railway undertaking SC UNIFERTRANS SA Bucuresti, as well as to the other freight undertakings.

B. INVESTIGATING REPORT

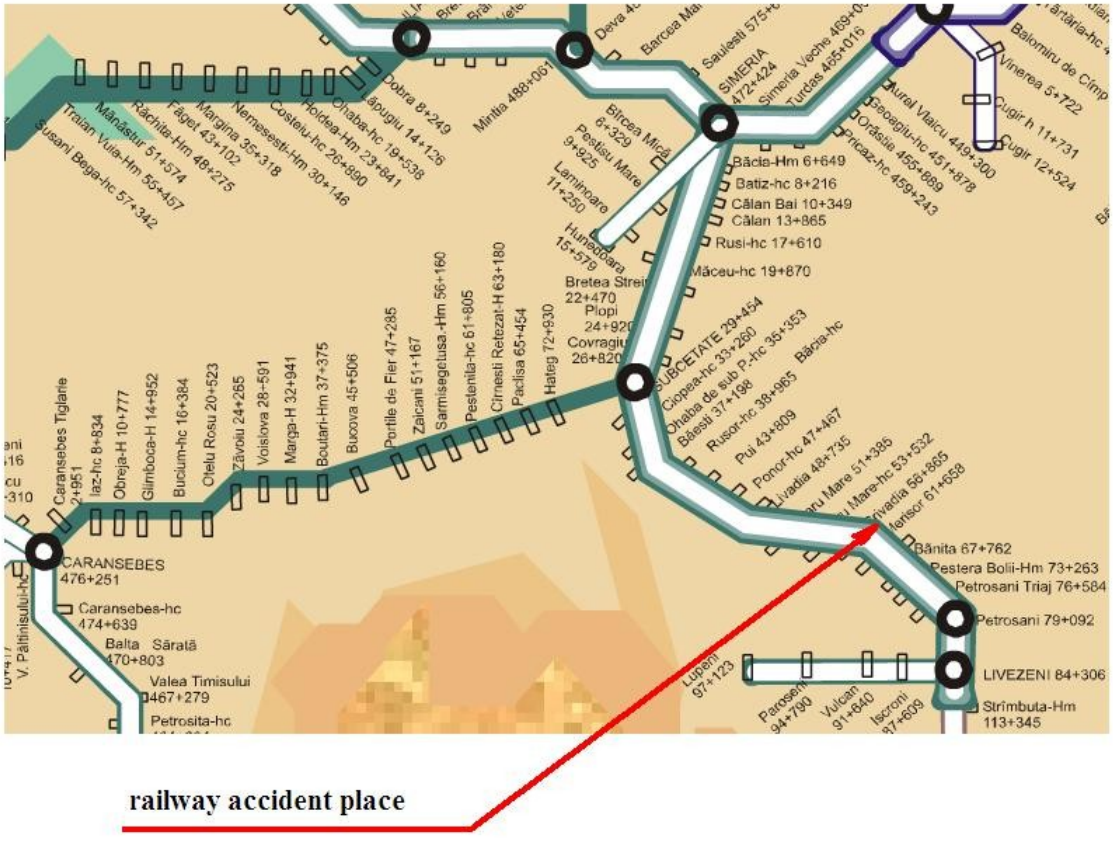
B.1 Description of the accident

On the 17th of March 2010, through the order no. 1785, the Central Office for the Management of the Railway Traffic scheduled the freight train no. 50503, belonging to the railway undertaking SC UNIFERTRANS SA Bucuresti, that was to run as push-pull train loaded with coal between Plopsoru – Livezeni – Ciumeghiu – Episcopia Bihor

On the 18th of March 2010, at 3,33 hour, the freight train no. 50503, consisting in 24 wagons loaded with coal and hauled by the electric locomotive EA 531 was dispatched from the railway station Plopsoru.

The train run without stops up to the railway station Amaradia, where stopped between the hours 4,25 – 4,47, then run up to the railway station Targu Jiu, arriving here at 5,00 hour. After coupling the banking locomotive EC 107 of the same railway undertaking, the train was dispatched at 5,17 hour to the railway station Ecaterina Teodoroiu, where it arrived at 5,27 hour. After the passing of the trains no. 13696, 2082 and 46676-1, the train 50503 was dispatched at 5,53 to the railway station Parangu, where it arrived at 6,04 hour. After the passing of the passenger train no. 2021, the train was dispatched at 6,15 to the railway station Strambuta, where it arrived at 7,14 hour. After the passing of the passenger train no. 9021, the train was dispatched at 7,17 hour to the railway station Petrosani, where it arrived at 7,38 hour. Here, after it was notified about the speed restrictions and the passing of the trains no. 79802, 1831 and 46676-1, the train was dispatched to the railway station Banita, where it arrived at 8,42 hour. Here, the banking locomotive was uncoupled and the train no. 50503 was dispatched at 8,46 hour to the railway station Pui, on the line I.

After passing through the railway station Merisor, at 8,56 hour, the train arrived at the km 58+916 at 9,06 hour, where it is braked in order to keep the speed of 30 km/h. After running 156 m from the braking start, the train was emergency braked, because of the un-coupling of the air pipes between the 6th and the 7th wagon, it generating the emergency braking of the train and then its stop.



On spot, one found out **6 derailed wagons**, as follows:

- the first bogie of the wagon no. 88536657494-0 (the 5th from the locomotive) derailed in the running direction;
- the first bogie and the first axle of the second bogie of the wagon no. 88536657850-2 (the 6th from the locomotive) derailed in the running direction;
- both bogies of the wagon no. 88536657854-4 (the 7th from the locomotive) derailed and inclined to the outside of the curve , at about 45^0;
- the first axle of the second bogie of the wagon no. 88536656656-4 (the 8th from the locomotive) derailed in the running direction;
- the first axle of the first bogie and the first axle of the second bogie of the wagon no. 88536656449-4 (the 9th from the locomotive) derailed in the running direction;
- the first axle of the first bogie and the first axle of the second bogie of the wagon no. 88536656455-1 (the 10th from the locomotive) derailed in the running direction.

B.2 The accident circumstances

B.2.1 Involved parties

The running section where the railway accident happened is administrated by CNCF „CFR" SA and maintained by its employees.
The track infrastructure and superstructure are administrated by CNCF "CFR" SA and maintained by the employees of the District Pui from the Track Section L9 Simeria, Branch of the Railway County Timisoara.
The interlocking systems from the line Crivadia - Merisor are administrated by CNCF "CFR" SA and maintained by the employees of the Track Section CT 4 Deva, Branch of the Railway County Timisoara.
The communication equipment from the railway station Crivadia - Merisor is administrated by CNCF "CFR" SA and maintained by the employees of SC TELECOMUNICATII CFR SA.
The power and electric traction equipment (IFTE) is administrated by CNCF "CFR" SA and maintained by the employees of SC ELECTRIFICARE CFR SA.
The locomotive communication equipment is owned by the railway undertaking SC UNIFERTRANS SA and maintained by its employees.
The locomotive and wagons of the derailed train are owned by the railway undertaking SC UNIFERTRANS SA and maintained and inspected during the route by its employees, the repairs are made by the economic agents authorized as railway suppliers.

The investigation commission questioned the employees involved in the railway traffic management, lines maintenance, the driver.

B.2.2 Train forming and equipments

The freight train no. 50503 consisting in 24 wagons, 96 axles, 1893 tons, length 345 m was hauled by the locomotive EA 53127, belonging to the railway undertaking SC UNIFERTRANS SA.

The automatic brake was active, the safety and vigilance equipments (DSV), the equipment installation of speed control (INDUSI) of the hauling locomotive were in service and worked according to the instructions, excepting the lever from INDUSI equipment box, that was on "P" position, corresponding to the passenger trains instead the right position "M", corresponding to the freight trains.

B.2.3 Railway equipments

Route presentation
The area where the railway accident happened, that is between the railway stations Crivadia and Merisor, line I is part of the embankment cross section km 58+450-59+100.
The track alignment, line I, consists in 3 groups of curves and 3 insulated curves,.....
At km 58+763, in curve there is a viaduct of 136 length.
The longitudinal track section in the railway accident has gradient 15,3‰ (declivity in the train running direction) and the track alignment is in curve with right deviation (in the train running direction), having the radius R=210 m, overcant h+20mm and over-widening s=20mm. The derailment place (km 58+916) was on a constant-radius curve.
At the accident moment, on the line Crivadia – Merisor , km 61+270-57-220, there was the speed restriction of 30 km/h.
The speed restriction was established on the 29th of September 2008, when, after the works for the re-construction of the retaining wall km 60+650-61+015 and the performance of the periodical repairs consisting in the complete screening of the broken stone bed, there were necessary to perform all the technological packing I, II and III.
Because of the lack in the supplying with the broken stone necessary to perform all these packing, the speed restriction was kept on spot.
The speed restriction is signalled on spot and stipulated in the Sheet for the notification of the speed restrictions (BAR).

Superstructure presentation
In the railway stations Crivadia and Merisor, runnig line I, the track superstructure consists in rail type 49, wooden sleepers and indirect fastening type K, welded track.

Presentation of the safety equipments for the traffic management
The railway stations Crivadia and Merisor are endowed with interlocking system type CR 2, with automatic electric block system.
The equipment for the traffic control on the running line II, between the railway stations Crivadia and Merisor is type automatic electric block system double-track line

Presentation of the power and energy supply equipment
The contact wire, part of the power and energy supply equipment, consists in the suspension of the contact wire and its supporting system on reinforced concrete poles.
Between the railway stations Crivadia and Merisor line I the contact wire suspension is type complete adjusted.
The railway accident happened in an area where the maximum running speed of the trains was restricted at 30 km/h.
On the 18th of March 2010, in the accident area, one did not perform works at the lines and railway equipments.

Train forming and equipments
The freight train no. 50503 consisting in 24 wagons, 96 axles, 1893 gross tonnage, 1306 nett tonnage, automatic braked 947/1092, plus 145 tons against the timetable, hand braked 189/249, plus 60 tons against the timetable, was hauled by the locomotive EA 531 (belonging to the railway undertaking SC UNIFERTRANS SA) and run from the railway station Plopsoru to the railway station Episcopia Bihor.

The automatic brake was active, the safety and vigilance equipments (DSV), the equipment installation of speed control (INDUSI) of the hauling locomotive were in service and operated according to the instructions, excepting the lever from INDUSI equipment box, that was on "P"

position, corresponding to the passenger trains instead the right position "M" corresponding to the freight trains.

B.2.4 Means of communication

The communication between the driver and the movements inspectors, as well as between the driver and the onboard staff was ensured through radio-telephone equipments.

B.2.5 Start of the railway emergency plan

Soon after the railway accident, the intervention plan for the removal the damages and for the re-start of the trains traffic was made in accordance with the information flow stipulated in the annex 2 of the Instructions for the prevention and inquiry of the railway accidents and events – no. 003/2000.
Following of these, at the accident place came the representatives of the railway infrastructure administrator CNCF „CFR" SA, of the railway undertaking SC UNIFERTRANS SA, of Romanian Railway Authority – AFER and of the Operative Department of the Railway Police.
In order to re-rail the derailed rolling-stock, one asked and routed the specialized sequence of operations endowed with hydraulic jacks, belonging to SC Interventii Feroviare SA – Craiova District.

B.3 The consequences of the accident

B.3.1 Death and injuries

None

B.3.2 Material damages

The value of the material damages, according to the estimations drawn up by the owner of the rolling stock, intervention equipments and public railway infrastructure administrator, is:

- **at the locomotive EA 531** **none**;
- **at the wagons** according to the estimation no. 679/13.04.2010 of SC IRV Oradea **7680,02 lei;**
- **at the lines** according to the estimation no. 773/2010 of the Track Section L9 Simeria **21008,74 lei**
- **at the equipments** **none;**
- **at the intervention equipments**
- according to the estimation no. 41/21.03.2010 of the Track Section L5 Craiova **57045,69 lei;**
  according to the estimation no. 2/2/3/4.1/2278/2010 of the Electrification Centre Deva **6158,71 lei.**

Other damages

- according to the estimation no. 1099/22.03.2010 of the Traffic Controller Deva **237,34 lei;**
- according to the estimation no. TS1/604/2010 of the Depot Simeria **8967,93 lei**
- according to the estimation no. R2/427/07.042010 of the Depot Craiova **16848,39 lei**

Total value of the damages **117947,39 lei**

B.3.3 Consequences of the accident in the railway traffic

The traffic between the railway stations Crivadia and Merisor was completely closed, running line I, from 9,05 hour, the 18th of March 2010, to 14,31 hour, the 21st of March 2010.
During this time the traffic of the freight and passenger trains was transferred on the route Craiova-Piatra Olt – Caracal.
The running line II Banu Maracine – Malu Mare was open again on the 25th of September 2009, at 17,46 hour
Delayed trains – 3 passenger trains with 107 minutes total.

B.4 External circumstances

On the 18th of March 2010, between the hours 8,00 and 10,00, the visibility was good, the temperature was about 1^0 C.

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

B.5 Investigation course

B.5.1 The summary of the of the involved railway staff testimonies

The driver of the locomotive EA 531, hauling the freight train no. 50503 stated:

- he took the locomotive from the railway station Plopsoru, in transit, according to the arrangement of shifts established by the railway undertaking UNIFERTRANS SA Bucuresti, after the inspection and testing performed by the movements inspector on duty in the railway station Plopsoru;
- he inspected visually the locomotive and it was in good condition, having the seals from INDUSI and DSV equipments intact;
- he did not check the speed recorder , because the key 2 did not work right and he could not introduce his data in the equipment;
- because the time to took the locomotive in transit was short be could not observe that the lever of INDUSI equipment box was on "P", corresponding to the passenger trains instead the right position "M" corresponding to the freight train;
- within the distance between the routing station and the accident place, the locomotive worked properly;
- between the railway stations Crivadia and Merisor, on the running line I, during the re-filling of the general air pipe of the train after a necessary braking for keeping the train speed under the limit of 30 km/h, he felt a return of the train, then the pressure in the general air pipe decreased suddenly;
- he took measures for the immediate braking of the train and after its stop, he inspected the train and observed its derailment;
- after that he asked the driver assistant to go and ensure the train with the hand brakes and then he ensured the locomotive with the additional and hand brakes;
- after ensuring the train, he notified, by the radio equipment, the movements inspector from the railway station Crivadia about the derailment.

The wagon examiner, who examined the train for routing from the railway station Plopsoru, stated:

- he performed technical inspection at the wagons of the respective train in composition process and the complete brake test between the hours 2,00 and 3,00 from the 18th of March 2010;
- all the failures and missing found at the train wagons were removed during the technical inspection;
- during the technical inspection he did not find any failure at the wagon no. 88536656494-0, the fifth from the locomotive;
- he did not find any failure at the axle corresponding to the wheels 7 and 8 of the wagon no. 88536656494-0 either at the visual inspection or at the checking of the wheel geometry with the template qr;
- he considers that the wheel no. 7 of the wagon 88536656494-0, where one found out, after the accident, that the wheel flange thickness was under the accepted limit stipulated in the Instruction no. 250, version 2005, as well as sharp edged and wears, had these failures following the fall of the wheel no. 8 inside the track and the friction between the wheel no. 7 and the rail from the outside of the curve, up to the climbing of this wheel outside the track;
- he considers that at the routing from the railway station Plopsoru, the geometrical parts of the wheel no. 7 from the wagon no. 88536656494-0, including the thickness of the wheel flange, were between the limits stipulated in the Instruction no. 250, version 2005.

The ganger belonging to the District no. 5 Pui-Track Section L9 Simeria, who performs the periodical technical inspection of the track no. 13, between Crivadia and Merisor, line I, km 52+200 – 59+600 stated:

- between Crivadia and Merisor line I, km 58-59+600, during the inspections performed according to the instruction provisions, he did not find any problems at the superstructure, for what he had to inform the management of the Track District, for the operative intervention;
- the maintenance works performed between the 1st of January and the 18th of March 2010 aimed the replacement of a broken fish plate, fastening of the nuts of the vertical screws (these works were performed in February 2010);
- on the 5th of March 2010 he replaced a horizontal screw from a joint at the km 58+800-58+900, it being the last performed maintenance work before the railway accident.

The gang foreman from the Track Didtrict 5 Pui – Track Section L9 Simeria stated:

- during the periodical inspections performed on the running line I Crivadia – Merisor, according to the provisions of the Instruction on the fixing of the deadlines and the order for the track inspections no. 305/1997, in the area of the km 58+000 – 59+600, he did not find important failures at the superstructure parts;
- in March 2010, the last works performed with his team on the running line Crivadia – Merisor 58+000-59+600, before the railway accident aimed the re-positioning of the metallic plates on sleepers, performed on the 4th of March 2010 and the 8th of March 2010;
- the coach screws that did not ensure yet the corresponding fastening of the metallic plates on sleepers, because of the loosen of the fastening, are marked with yellow paint by the ganger, in order to be more easy identified by the maintenance team;
- the speed restriction of 30 km/h between the railway stations Crivadia and Merisor on the line I km 61+270-57+220 was generated by the lack of supplying with the necessary quantity of broken stone in order to finish the mechanized tamping and to eliminate the speed restriction.

The reserve district permanent way inspector – Track section L9 Simeria, that at the accident date managed the District 5 Pui-Track Section Simeria, the occupant district inspector being on holiday, stated:

- the curve on the line I Crivadia – Merisor km 58+665 – 58+985 was endowed with check rail according to the provisions of the former Instruction of norms and tolerances for lines, switches, bridges and tunnels – lines with standard gauge no. 314/1964;
- during the period of time he acted as district inspector, he was not notified by the ganger either verbally or in written about the possible failures at the superstructure, that he found out;
- the speed restriction of 30 km/h between the railway stations Crivadia and Merisor line I km 61+270-57+220 was established on spot at the moment when he took over the district management.

The district inspector no. 5 Pui – Track Section L9 Simeria stated:

- the last work before the railway accident was performed on the 4th of March 2010 and consisted in the re-positioning of the metallic plates on the sleepers and the replacement of the broken coach screws;
- the curve from the km 58+665-58+985 on the running line Crivadia-Merisor was endowed with check rail, because in the year when the construction of this line was performed, Instruction of norms and tolerances at lines, switches, bridges and tunnels – lines with standard gauge, stipulated for the constructive elements of the curve at that time, fitting up of the check rail;
- the special metallic plates that ensure the fastening both of the rail and of the check rail, were not replaced besides the present geometrical elements of this curve do not imply its endowment with check rail;
- marking of the unsuitable coach screws with yellow paint is necessary for their quick identification for replacement;
- the speed restriction of 30 km/h line I between the railway stations Crivadia and Merisor km 61+270-57+220 is kept from the 28th of September 2008, because one did not ensure the broken stone necessary to finish the mechanical tamping, after the performance of the complex works for complete screening of the broken stone bed, replacement of sleepers and worn rails.

The instructor L of the Track Section L9 Simeria stated:

- following the planed and performed inspections, according to the provisions of the sheet no. 10 of the Instruction concerning the establishment of the deadlines and order for the track inspections no. 305/1997, there were found no problems at the track superstructure on the line I Crivadia-Merisor. Also, the technical-engineering staff from the Track Section L9 Simeria, that performed the control at the District 5 Pui, was not notified about some problems at the track superstructure;
- the staff that performed inspections from the train locomotive cab was not notified about the possible problems at the track superstructure;
- the curve geometrical elements from the line I Crivadia – Merisor km 58+665-58+985, according to the provisions of the Instruction of norms and tolerances for track construction and maintenance – lines with standard gauge no. 314/1989 do not impose the fitting up of the check rail in this curve.

Deputy district permanent way inspector – Track Section L9 Simeria stated:

- between the 12th of April 2005 and the 29th of September 2008 the traffic on the running line I Crivadia-Merisor was closed for works of retaining wall reconstruction, in the area of the km 60+734-60+755 and of track bed restoring. Following the non-performance of all technological packing because of deficit of broken stone, the railway traffic was open again with speed restriction of 30 km/h on the distance between those two railway stations;
- the present geometrical parts of the curve from the line I Crivadia-Merisor km 58+665-58+985, according to the provisions of the Instruction of norms and tolerances for track

construction and maintenance – lines with standard gauge no. 314/1989, did not impose the fitting of the check rail in this curve;

- within the years, because of the curve rays relatively small between these two railway stations, one found out the frequent broken of the coach screws. This situation was and is followed over time by the staff in charge with the walking technical inspection of the track, that according to the measure of the Track Section management, be marked with yellow paint the coach screws found broken or that have to be fastened by screwing;
- on the line I Crivadia-Merisor there was observed the rail slipping, but is under monitoring, performing, if necessary, works for adjustment of the joint gaps, or squire joints achievement;

The district permanent way inspector L9 Simeria

- in March 2010, during the planning of the fortnightly works, on the line I Crivadia-Merisor, were planed re-positioning of the metallic plates and the replacement of the coach screws at the km 58+000-59+600. These works were performed on the 4th and 8th of March 2010;
- during the last checking performed on the line I Crivadia-Merisor with the coach for measuring track on the 9th of December 2009, at the km 58-59 there were no failures of railway geometry;
- during the inspection planed and performed in January 2010 at the District 5 Pui, there were found out no failure at the track superstructure;
- he was not notified by the Head of the District 5 Pui about the appearance of possible failures at the track, specific to low temperature;
- following the census of the unsuitable sleepers, performed in 2009, in the area of the km 58-59, there were found out 45 unsuitable sleepers, normal wooden sleepers.

B.5.2 The safety management system

At the moment of the accident, CNCF "CFR" SA, as manager of the railway infrastructure, had implemented its own railway safety management, 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 design, maintenance and operation, including if case, maintenance and operation of the system for the traffic control and signalling.

At the moment of the accident, SC UNIFERTRANS SA, as railway undertaking, was in process of implementation of 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. 535/2007 on the granting of the safety certificate in order to perform railway transport on Romanian railways.

On the 21st of April 2010 the railway undertaking took possession the next documents concerning its own railway safety management system:

- Safety Certificate – Part A, identification number CSA 0016 – 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 0063 – 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 :
morms and regulations

- instructios on the technical inspection and 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 on the establishment of the deadlines and order for the track inspections no. 305, approved by Minister of Transports Order no. 71, from the 17th of February 1997;
- instruction for the head district permanent way inspector track maintenance no. 323/1965;
- instruction for the activity of the track maintenance gange foreman no. 322/1972;
- instruction for lengthmen and gangers or dangerous points no. 321/1972;
- instruction of norms and tolerances for the track construction and maintenance – lines with standard gauge no. 314/1989;
- instruction for the recensus of the track real sleepers, planning and monitoring their replacement no. 316/1963;
- instruction for the use of the track recording coaches no. 329/1995;
- instructions for the track and contact wire diagnosis, performed with the power car TMC, approved by the Minister of Transports, Constructions and Tourism Order no. 2256/27.11.2006.

sources and references

- copies of the documents enclosed to the inquiry file, drawn up by the inquiry commission, appointed by the decision of the director of the Branch of the Railway County Timisoara no. 4/1/3/406 from the 18th of March 2010;
- copies of the documents enclosed to the inquiry file, drawn up by the inquiry commission, appointed by the decision of the director of the Romanian Railway Safety Authority no. 2120/141/2010;
- photos taken soon after the railway accident by the members of the iquiry commission;
- photos of the wagons involved in the railway accident in the railway station Pui, as well as at the headquarters of SC „CFR – IRV" Constanta – Section IRV Oradea;
- documents on the lines maintenance, supplied by the persons in charge with their maintenance;
- instruction of norms and tolerances for lines, switches, bridges and tunnels – lines with standard gauge no. 314/1964;
- results of the measurements performed soon after the railway accident at the track suprastructure and derailed wagons;
- inspection and interpretation of the technical condition of the elements involved in the accident: infrastructure, railway equipments and train;
- questionning of the employees involved in the railway accident.

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

B.5.4.1 Data on the lines

Technical condition of the line before the railway accident

The track superstructure between the railway stations Crivadia and Merisor line I consists in rail type 49, indirect fastening type K, wooden sleepers, welded track.

The track alignment in the railway accident area is in curve,with the next characteristics: radius R=210 m, overwidening s=20 mm, overcant h=20 mm, track deflection f=60 mm.

The wooden sleepers, at the end corresponding to the rail from the inside track of the curve, are endowed with special metallic plates for the fastening both of the rail and of the check rail. Instruction of norms and tolerances for the construction and maintenance of the track – lines with standard gauge no. 314/1989 does not impose for a curve with these geometrical elements, the compulsoriness to fit up check rail.

Between the years 1985 and 1986, one performed works for the doubling of the line 116 Simeria-Livezeni, on the right side of the old route, of the running line I. During these works, „Instruction of norms and tolerances for lines, switches, bridges and tunnels – lines with standard gauge „ no. 314/1964" was in force and for the establishment of the values of the overcant in curve it did not stipulate their establishment according to the excessive overcant, as „Instruction of norms and tolerances for lines, switches, bridges and tunnels – lines with standard gauge„ no. 314/1964, in force.

The calculation of the overcants in curve according to provisions of the Instruction no. 314/1989, in force at the time of drawing up of this Report, leads to their values more smaller than the values of the overcants, calculated according to the Instruction no. 314/1964. So, during the periodical repairs with the complete screening of the broken stone bed performed in 2008, the overcant was changed from 110 mm to 20 mm.

The special metallic plates for the rail and check rail bed on the sleeper were not dismantled because their dismatling suposed a lot of unjustified activity.

Findings and measurements at the line after the wagons derailment and lift

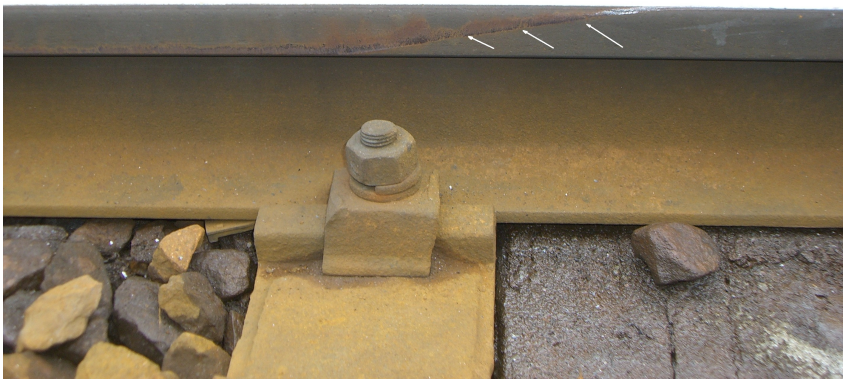
a) *km 58+916 – the place of the first trace where the rail corresponding to the inside track of the curve left the running surface*
   <u>the fastening of the inside track rail of the curve on sleepers</u>
   - one the sleeper at this trace the metallic plate was not fasten
   - those two sleepers, between that was that sleeper, had the metallic plates fastened in two coach screws each of them, instead 4;
   - under the metallic plates from this sleepers one did not onserve the polyethylene plates. However, on the sleepers there were no traces specific to the lateral displacement under the forces induced by the running rolling stock;

fastening of the outside track rail of the curve on the sleepers

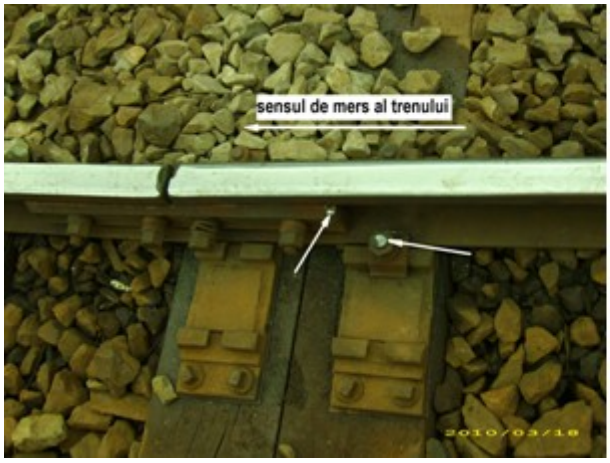
- the afferent metallic plates of those 3 sleepers were fastening according to the instruction

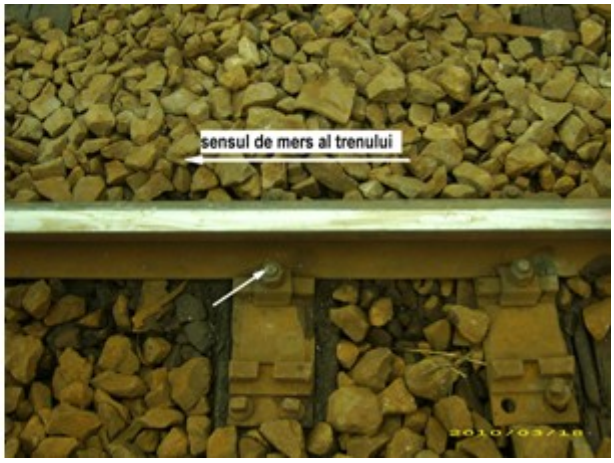
the curve inside track rail

- on the active lateral surface of the rail head one found out a trace of leaving of the rail running surface by the tyre, without affecting the fastening metallic elements for the rail fastening on the metallic plates or those for the fastening of the metallic plates on the sleepers;



- from this trace, starting with the second sleepers, in the train running direction, and up to the point where one observed the first fall trace from the running surface of the left rail (rail from curve outside track) left by the tyre (about 156 m), vertical screws, that fasten the rail base on the metallic plates, had polishing and hit traces of the up surface of the rod end. Also, the fish plates from the joints had traces of slight hits;





b) *km 58+760 – place of the first trace of leaving of the running surface of the rail head corresponding to the curve outside track*
rail of the curve outside track

- at about 156 m (km 58+760) against the previous trace from the active lateral surface of the rail head corresponding to the curve inside track, there was found out on the

outside lateral surface of the rail corresponding to the outside track of the curve, a trace of leaving of the running surface of this rail head, followed by the successive hit of the metallic elements for the fastening of the rail on the sleepers, both on the left side of the rail corresponding to the curve outside track, and to the same metallic elements inside the track, serving for the fastening of the right rail in the running direction of the train, corresponding to the curve inside track.

- starting with this point, the train run about 77 m up to stop, on this distance being identified elements of the track superstructure, damaged because of the running of the rolling stock on them (vertical screws, coach screws, metallic plates, sleepers);

c) *Measurements performed at the line:*

- from the point of the first trace found on the lateral surface between those tracks of the rail corresponding to the curve inside track, in the opposite direction of the train running, there were peformed checkings of the gauge (E) with the template and of the track cross section (N), in the points of which equidistance was 2,5 m;
- in the same points there were identified vertical wears (Uv) and lateral wears (UI) of the rail from the curve inside track

Gauge (E)	32	26	20	24	28	27	26	23	25	24
Cross section (N)	8	9	9	10	10	10	10	7	6	6
Vertical wear (Vw)	2	2	1	2	1	1	1	2	1	1
Lateral wear (Lw)	2	3	1	3	2	2	3	3	3	3

- the measured values are between the tolerances accepted by the Instruction of norms and tolerances for track construction and maintenance – lines with standard gauge no. 314/1989.

The maintenance performed on the line I between the railway stations Crivadia and Merisor before the railway accident

The works performed at the infrastructure before the serious railway accident

The last intervention at the superstructure of the line I Crivadia-Merisor, before the railway accident, was performed on the 8th of March 2010, in the area of the km 58+200-58+600 and consisted in the replacement of 18 coach crews and repositioning of 25 metallic plates.

On the 18th of March 2010, the staff of the District no. 5 Pui had planed checking of the hidden parts of the switches no. 18 and no. 14/16 from the railway station Pui.

Walking inspection of the track
From the walking inspection point of view, the running line I between the railway stations Crivadia and Merisor, it is performed into the revision no. 13 of the District for the Line Maintenance Pui of the Track Section L9 Simeria.
The last walking inspection, on the track I of the running line, wa performed by the ganger on the 17th of March 2010, according to the provisions of art. 1, sheet 2 of the Instruction on the establishment of the deadlines and order for the performance of the track inspections no. 305/1997 of the inspection schedule drawn up by the management of the Track Section 9 Simeria and approved by the management of the Track Division Timisoara.

Checking of the track geometry
On the 18th of March 2009 there was performed the checking of the track geometry, corresponding to the track I Crivadia-Merisor with the power car for the diagnosis of the track and of the contact wire, type EM 130 no. 146. Following this measurement there was found no failure of the track parameters, that by their amplitude could put in danger the railway safety.
The last checking of the geometry of the track I Crivadia-Merisor was performed with the track recording coach on the 9th of December 2009. Following the analysis of the recorded diagrams, there was identified no track failure that could put in danger the railway safety.
The interpretation of the failures and the assessment of the track condition on this km were made in accordance with the provisions of the chapter 3, point 3.6 and point 38 d) from the Instruction for the use of the track recording coaches no. 329/1995, taking into account the speed of 30 km/h, corresponding to the speed restriction.

Census of the unsuitable sleepers
Following the census of the sleepers, performed in 2009, for 2010 by the inspector from the Track District no. 5 Pui and submitted to the management of the Track Section L9 Simeria by the paper no. 351/2009, on the track Crivadia-Merisor, in the area of the km 58+000-59+000 there were found out 45 unsuitable wooden sleepers, that reported to the laying of the sleepers represent 2,5%.
The highest number of unsuitable sleepers, 10 pieces, was found out in the area of the km 58+400-58+500, representing 5,5% unsuitable sleepers from the total number of sleepers/100 m.

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

Findings at the train wagons in the railway station Pui
The excahanger empty-loaded „Freight-Passengers" were on the right positions correponding to the wagons condition, that is on „Freight" and „Loaded".
The train had 3 wagons with the the automatic brake off, that is the wagons no. 88536656494-0, 88536657854-4 and 88536656641-6, the 5th, 7th and 14 from the locomotive.
During the braking tests the fastening and looseness times were suitable (also at the wagon 88536656494-0) and also the tightness test of the general air pipe was according to the provisions of the Instruction no. 250, version 2005.
At the wagon no. 88536656494-0 (the 5th of the train), the first derailed bogie of the first wagon in the train running direction, at the wheels 5 and 7, running on the outside track of the curve there were found out:

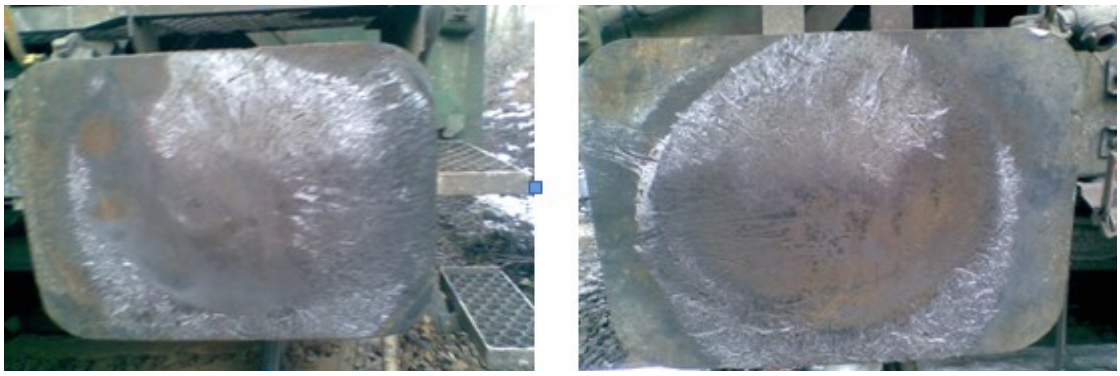
- quota q_r under the limit 6,5 mm accepted in the tabel 1, point 5 of the Instruction no. 250, version 2005, that is 5 mm at both wheels;

- at the first wheel no. 7:
  - edgeds and wears of 2-4 mm on the active surface on about 70% from the wheel diameter;

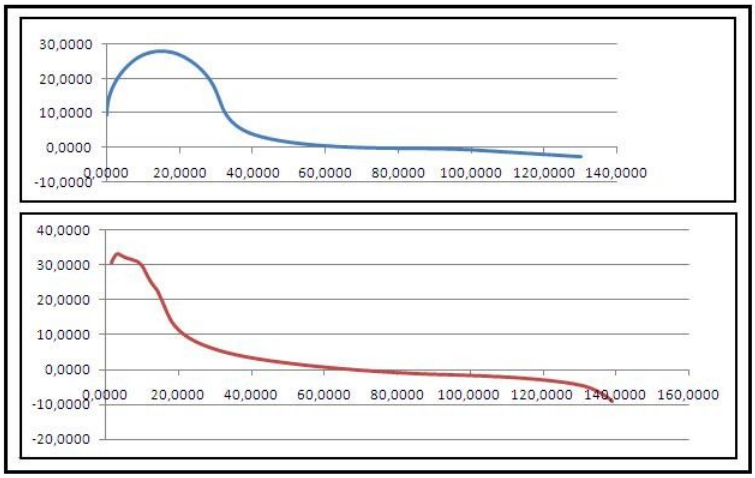
- thickness of the wheel flange of 18 mm, under the limit of 22 mm, stipulated in the tabel no. 1, point 8 from the Instruction no. 250, version 2005;

- at the wheel 5, lack of a part from its flange on about 160 mm;

- the buffer trays had very important wears;



In order topresent the real running profile of the wheel no. 7 of this wagon, one used the device Mini Prof Weel, manufactured by Greenwood Engineering.
In the bellow drawing is presented the real profile of this wheel flange related to the running profile ORE.



key: - blue chart is the running profile ORE;
- red chart is the real running profile of the wheel measured with the device Mini Prof Weel.

Findings at the wagons of the train, performed at SC „CFR-IRV" Constanta SA-Section IRV Oradea

They were checked by lifting and detachment of the bogies of the wagons no. 88536656494-0, 88536657854-4 and 88536656641-6, the 5th, 7th and 14 from the train no. 50503, finding out:

- the clearance at the friction blocks was according to the limits stipulated by the Instruction no. 250, version 2005;
- the lower, upper center castings, as well as the polyamide plates were in good condition, without failures;
- the bogie frames and the wagon underframes had no distorsions (these parts were not measured because the economic agent where these checkings were performed had no necessary benches);
- the traction gears were in good condition, without failures.

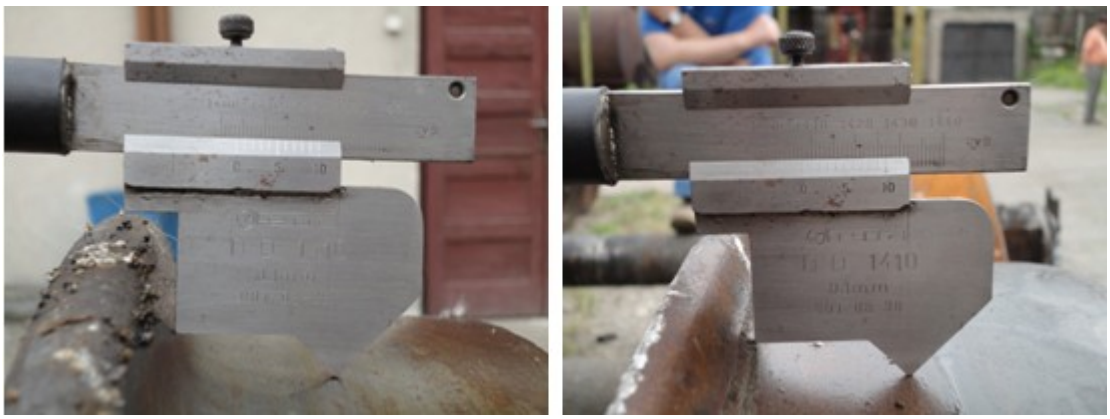
There were performed measurements of the characteristic elements from the axles 3 and 4, belonging to the first bogie in the running direction of the wagon no. 88536656494-0 (the 5th of the train) and from the axles 3 and 4 belonging to the first bogie in the running direction of the wagon 88536656723-2 (the wagon in front of the first derailed wagon and the 4th of the train), finding out:

- during the checking with the template q_r, there was found that the quota q_r was not under the limit stipulated in the Instruction no. 250, version 2005;
- one could not performe measurements of the flanges of the wheels 5 and 7 belonging to the wagon no. 88536656494-0 and of the wheel no. 7 from the wagon no. 88536656723-2, because the running surface profile of this wheel could not be measured (the thickness of the wheel flange was under the minimum value of 20 mm that can be measured with device for the checking of the wheel flange size of the wagon type DVB 1-40;

- there were performed measurements of the flange profile of the wheels 6 and 8 of the wagon no. 88536656494-0 and of the wheel 8 of the wagon no. 88536656723-2 (complementary wheels with the wheels 5 and 7) and the values of their geometrical parts (flange height, thickness, flange and quota q_r) were between the limits accepted by the Instruction no. 250, version 2005.

On the 5th of May 2010, a commission consisting in inspectors of Romanian Railway Safety Authority- Railway Safety Inspectorate Timisoara checked the axle corresponding to the wheels 7-8 (guiding axle) from the wagon no. 88536656494-0, finding out:

- the distance between the outside surfaces of the flanges of the wheels 7-8, measured in two antipodal points was 1403 and 1408 mm, under the limit value (1410 mm) stipulated in the table 1, point 4, letter a of the Instruction no. 250, version 2005;



- on whole wheel outer surface, on the active flange of the wheel no. 7 there were observed edgeds and wears arranged gradually, from which one of them leads to the tip of the wheel flange.

B.6 Analysis and conclusions

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

- for the curve from 58+665-58+985 on the track I Crivadia-Merisor, with the geometrical parts above mentioned, the Instruction for norms and tolerances for track construction and maintenance – lines with standard gauge no. 314/1989 does not impose the fitting up of the check rail;
- during the measurement of the track geometry of the track I Crivadia-Merisor, performed on the 18th of March 2009 with the power car for the track and contact wire diagnosis, type EM 130 no. 146 and on the 9th of December 2009 with the track recording coach there were registered no failures at the line in the area of the km 58+000-59+000 that generate speed restrictions or railway traffic close for their removal works;
- the vertical and lateral wears of the rail of the curve outside track were according to the instruction provisions, having values very small;
- the values of the gauge and of the cross section did not exceed the maximum values accepted by the Instruction for norms and tolerances for track construction and maintenance – lines with standard gauge no. 314/1989, for the curve with the geometrical parts previous presented;
- the last maintenance works before the railway accident were performed on the 4th and 8th of March 2010, with 14, respectively 10 days before the accident;
- the technical condition of the sleepers and of the parts for the fastening of the metallic plates on the sleepers from the km 58+916, together with that 156 m of the upper surface of the

vertical screws rods, as well as the ends of the center castning edgeds were slight touched by the running rolling stock, lead to the conclusion that they could not generate the fall of the right wheel in the train running direction inside the track, because on this distance the metallic plates, the coach screws and the sleepers had no specific derailment traces.

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

Concerning the running gear, respectively the wheels of the wagons no. 88536656723-2 (the 4th of the train) and no. 88536656494-0 (the 5th of the train) there were found the next failures stipulated in the Instruction no. 250, version 2005:

- the thickness of the wheel flange measured at 10 mm above the running tread under 22 mm;
- edgeds and wears on the outer profile of the wheel flange, at a distance over 2 mm from the wheel flange tip;
- the distance between the outer surfaces of the wheel flanges of the axle corresponding to the wheels 7-8 of the wagon no. 88536656494-0, measured between two points situated at 10 mm in the outside of the the running treads of the wheels, next to the upper level of the rails, under 1410 mm.

According to the same instruction, if each of these failures is found out during the technical inspections of the trains, can be removed taking off the wagons from the train.
The distance run by the wagons of the train no. 50503, on the 18th of March 2010, from the routing railway station (Plopsoru) to the railway accident area is about 116 km, within this distance, during the wagons running, there is no possible that during the wagon running appear wears that lead to the decrease of the wagon wheel flange thisckness with about 4 mm.
Thaking into account these above mentioned, we consider that the first wheel 7 of the wagon no. 88536656494-0 had the above mentioned failures also before to perform the technical inspection at the train forming in the railway station Plopsoru. These failures were not found during the technical inspection at the train forming, because of a human mistake appeared within the technological process for the technical preparation the train wagons.

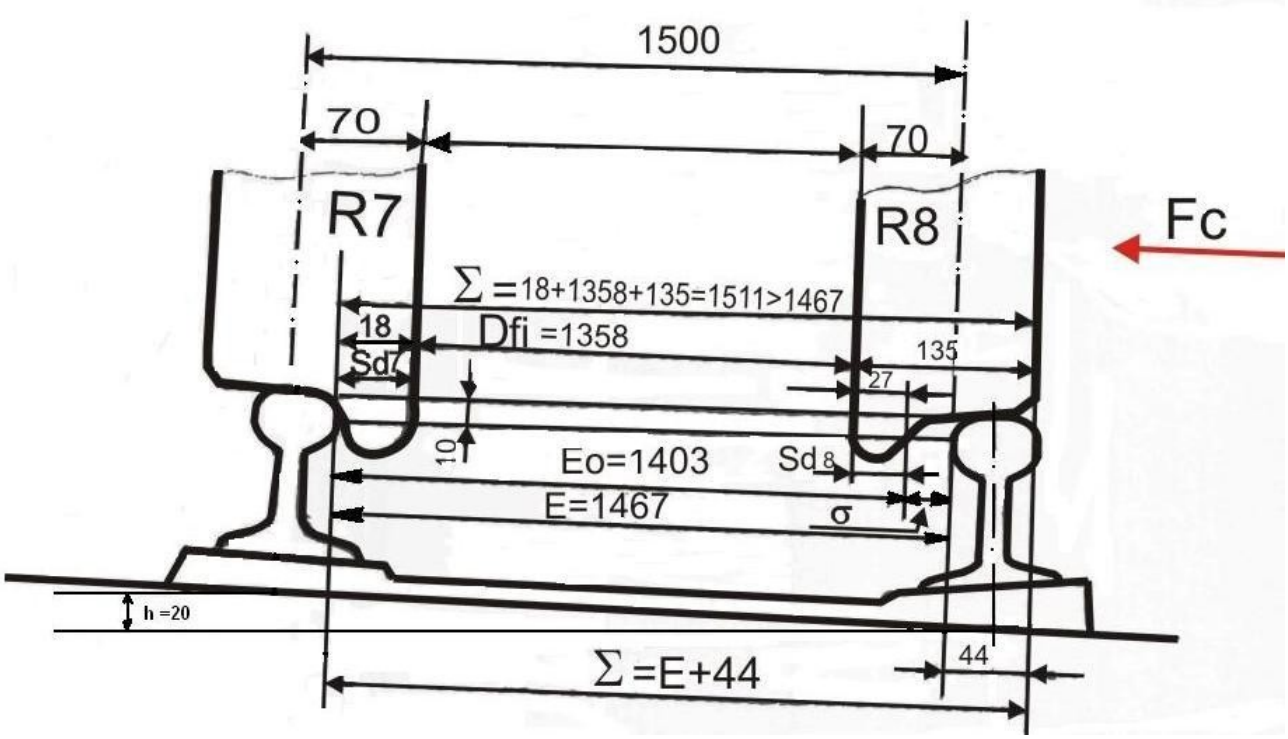
B.6.3 Analysis and conclusions on the train derailment occurrence

Taking into account the geometrical parts of the track from the first trace of leaving of the rail head by the wheel no. 8 (km 58+916) and by the first axle (corresponding to the wheels 7-8) from the wagon no. 88536656494-0 (first derailed wagon), that is:

- the track gauge measured (E) 1467 mm;
- the geometrical parts of the first axle:
  - the distance between the inside surfaces of the tyres (Dfi) 1358 mm;
  - the breadth of the part that serves for tyre from the wheel no. 8 (L_{b8}) 135 m;
  - the flange thickness of the wheel 7 (S_{d7}) 18 mm,

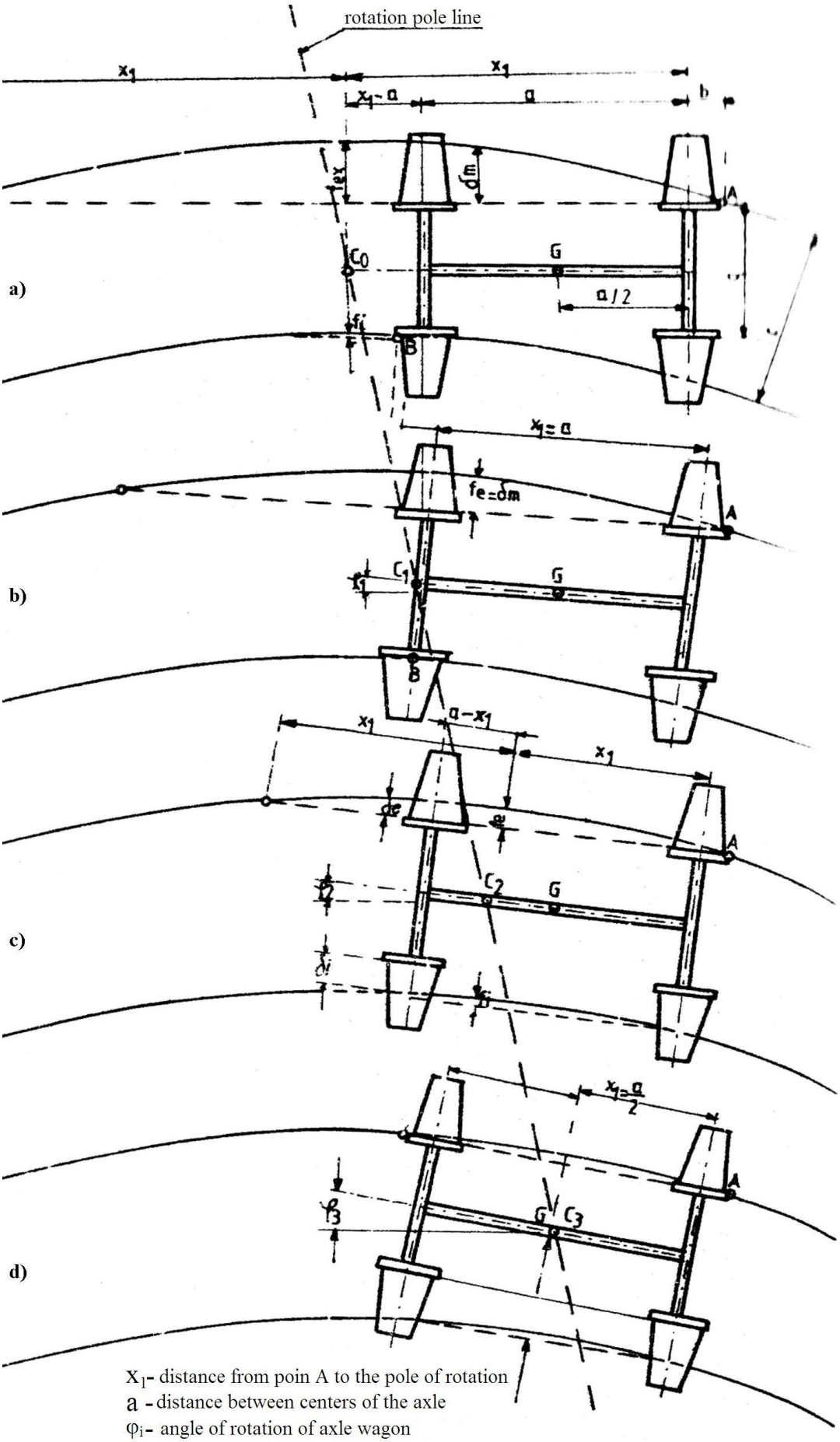
results that the the track gauge in this point (E=1467 mm) was smaller with 44 mm than the sum of those 3 geometrical parts of the first axle ($\sum=S_{d7} + Dfi + L_{b8} = 1511$ mm).
Taking into account these above mentioned, one can conclude that at the moment of leaving the inside rail of the curve by the wheel 8 from the first axle, by fall inside the tracks, at km 58+916, the wheel no. 7 of the same axle did not run normally on the outside rail of the curve.
From the analysis of the findings from the railway accident place, of the technical condition of the train wagons, of the photos taken from the derailment place, as well as from the statements of the involved employees and taking into account the geometrical parts of the track from the first trace of leaving of the rail head by the wheel no. 8 (km 58+916) and by the first axle (corresponding to the wheels 7-8) from the wagon no. 88536656494-0 (first derailed wagon), one can conclude that the derailement had the next occurrence dynamic:

- at the moment of the train braking start, gradient 15,3‰ corresponding to the area where the railway accident happened, the first part of the train was very high compressed. In these conditions the axle corresponding to the wheels no 7-8 of the first bogie in the running direction of the wagon no. 88536656494-0 (the 5th of the train) arrived at the km 58+916, where the interaction between the rails and the wheels of the axle 7-8 was as in in the drawing no 1;



drawing no 1- *axle no. 7-8 before derailment*

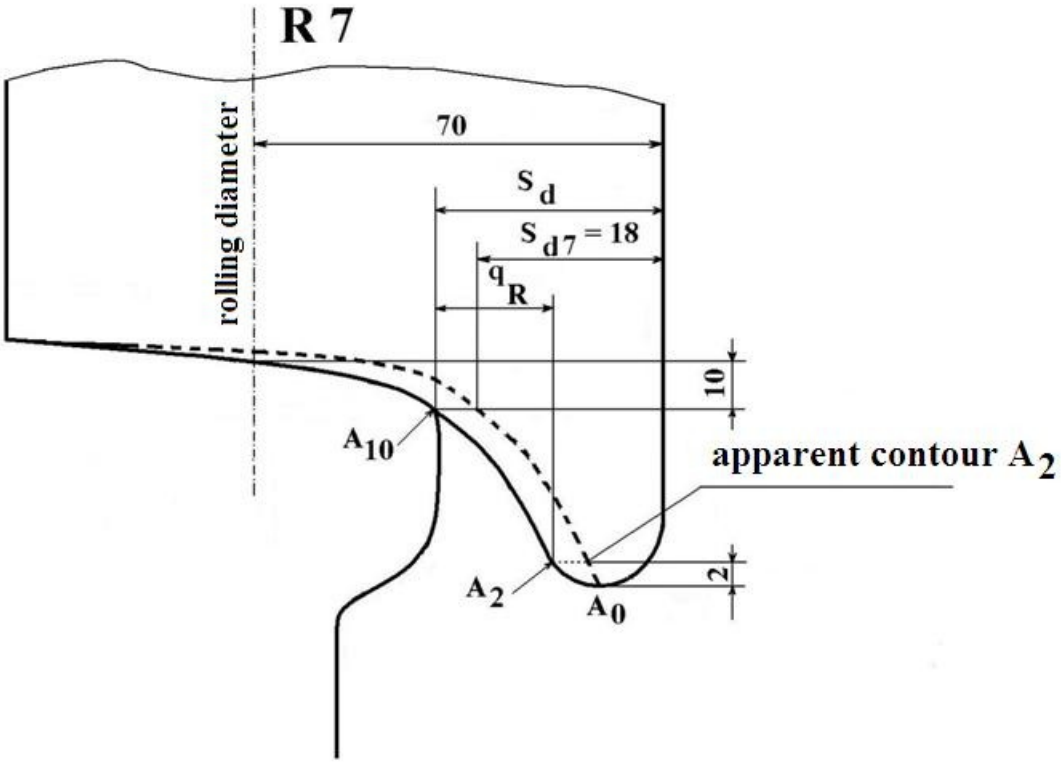
- because the thickness of the flange of the wheel no. 7 was under the minimum limit accepted by the Instruction no. 250/2005, it led to the increase of the total cross clearance of the pair of wheels 7-8 during the running and implicitly to the increase of the wheel striking angle in relation to the rail and to the stop flange angle of the wheel running profile. In these conditions, when entering in position chord bogie (drawing no. 2, letter d), the outside guiding surface of the profile of the wheel flange no. 7 came into contact with the right lateral stop flange of the left rail, determing the wheel no. 8 to run on the inside curve rail on the running profile with maximum conical tread;



X_1- distance from poin A to the pole of rotation
a - distance between centers of the axle
φ_i- angle of rotation of axle wagon

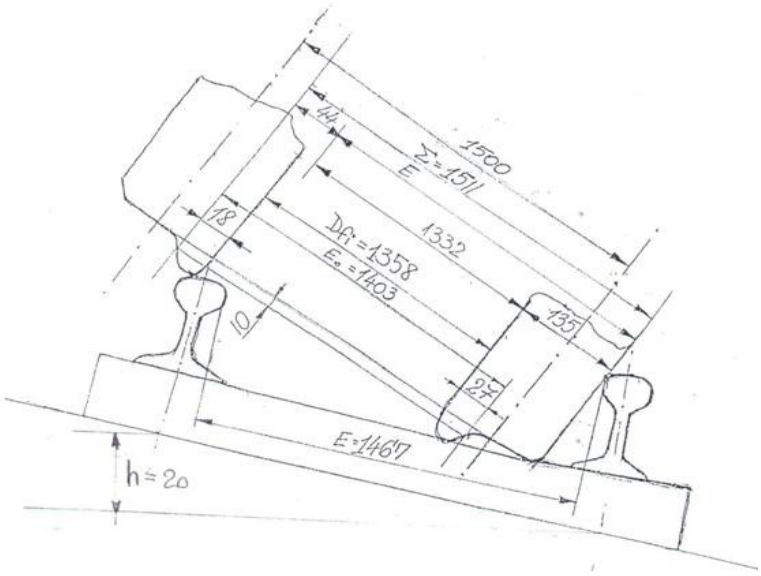
drawing no.2

- taking into account this situation and the existing of circular edgeds on the stop flange of the wheel no. 7, as well as of the increased stop flange angle following the wear of 7 wheel flange, the contact between the outside flange stop of 7 wheel flange and the inside stop flange of the outside rail head was in the point of the apparent profile of the point A_2, the nearest from the point A_0 (drawing no.3), where the risk that 7 wheel flange overclimbs on the active outside running surface increased very much.



drawing no.3

After 7 wheel flange overclimbing on the rail, the contact between them was in point A_0 , where the risk that this wheel derail and the wheel no. 8 leave the running surface of the curve inside rail is maximum, followed by its fall inside the tracks (drawing no. 4)



drawing no.4 - axle.no. 7-8 after derailment

- overclimbing of the outside rail by the wheel no. 7 was favored by the serious unloawding of the axle 7-8 (first axle), because of the train compression and total compression of the wagon no. 88536656494-0 buffers, these buffers being non-lubricated and with important wears. This is supported by the fact that the traces left by the wheel no. 8 on the vertical screws inside the rails from the curve inside are small in relation to the traces that the derailed wheel of a loaded wagon on which presses a normal load;
- after the wheel no. 7 from the first axle overclimed the outside rail, it run with this wheel on the outside rail head and with the wheel no. 8 on the track inside, hitting the vertical screws from the fastening of the curve inside rail about 156 m, up to the km 58+760;

- from this km, the wheel no. 7, that run on the outside rail head, left the running surface of this rail head, hitting strongly the fastening parts of the rail on the sleepers, and the traces left by the wheel no. 8 on the parts for the fastening of the inside railbecame more visible;
- after the fall of the wheel no. 7 outside the track, the first derailed axle started to run tangent to the track curve and then generated the derailment of the second axle of the bogie;
- the derailment of this bogie (first bogie in the train running direction) of the wagon no. 88536656494-0 led then the derailment of the next train wagons;
- following the impacts appeared during the derailment, the air pipes between the 6th and 7th wagons uncoupled, it leading to the emergency braking of the train, followed by its stop, the wagon no. 88536656494-0 (the 5th of the train), stopping at the km 58+606.

B.7 Accident cause

B.7.1 Direct cause

The direct cause of the accident is the derailment of the axle no. 7-8 (the first axle) from the first bogie in the running direction of the wagon 88536657494-0 (the 5th from the locomotive), at the km 58+916, consisting in the leaving of the right rail by the wheel no. 8 (the rail corresponding to the curve inside track). It was possible bacause the total gauge clearance of this axle exceeded the accepted limits, provided that the thickness of the wheel flange no. 7 was under the maximum limit stipulated in the Instruction no. 250/2005.

Contributing factors were:

- existance of some edgeds and wears on the outside active flange of the wheel no. 7;
- the strong wear of the wheels flange from the left side of the wagons, in the train running direction, generated by the running of the trains belonging to the railway undertaking between Plopsoru-Episcopia Bihor, in winter 2009-2010, as push-pull train, without changing the trains forming;
- strong wears at the disks of the buffers from the wagons no 88536657494-0 and no. 88536657723-2, because of it the running in curve led to a very strong friction between them;
- important unloading of the first axle (corresponding to the wheels 7-8) of this wagon, because the stiffness behaviour of the wagons no. 88536656494-0 and no. 88536657723-2 and a spontaneous brake application on a curved track section with gradient 15,3‰.

A.7.2 Underlying cause

The underlying cause of this accident is the non-performance of the compulsory works and inspections, that have to be made by the examiner, during the inspection in the forming of the train no. 50503, on the 18th of March 2010, it leading to non-identification of the failures from the first wheel no. 7 of the wagon no. 88536656494-0, failures that imposed the taking out of the wagon from the train.

A.7.3 Root cause

The root cause of this accident is the lack of regulations that stipulate the periodical lubrication of the disks of the wagon buffers, between two periodical repairs.

C. Safety recommendations

The addressees of the safety recommendations are SC UNIFERTRANS SA Bucuresti, as railway undertaking, and Romanian Railway Safety Authority.

The safety recommendations aim to solve the next issue:

1. Performance of an inspection, by Romanian Railway Safety Authority, at the freight undertaking, in order to check the organization and carrying out of inspections of the technical condition of the wagons from own trains.
   At the end of this action, Romanian Railway Safety Authority will propose measures for the removal of the found nonconformities.
2. Romanian Railway Safety Authority, together with the railway undertakings, shall analyze the opportunity that, in order to decrease the friction forces appered during the running between the disks of the wagon buffers, these be lubricated from time to time.
   If, following this analysis, one shall establish that it is usefull to perform from time to time the lubrication of the wagon buffer disks, Romanian Railway Safety Authority shall udate in this respect the Instructions on the technical inspection and maintenance of the wagons in operation no. 250, approved by Order of Minister of Transports, Constructions and Tourism no. 1817 from the 26th of October 2005.

This investigation report will be sent to Romanian Railway Safety Authority , to the public railway infrastructure manager CNCF „CFR" SA and to the railway undertaking SC UNIFERTRANS SA Bucuresti, as well as to the other freight undertakings.

Members of the investigation commission:

- Stoian Eduard - main investigator
- Zamfirache Marian - investigator
- Paiş Luca - investigator
- Oltenacu Livius - investigator