MINISTRY OF TRANSPORT
ROMANIAN RAIWAY AUTHORITY – AFER
ROMANIAN RAILWAY INVESTIGATING BODY

INVESTIGATING REPORT

on the derailment of the passenger train no. 1641, belonging to SNTFC "CFR Calatori" SA,
on the double slip points 7/11, from the railway station Comarnic,
on the 13th of December 2007

Final edition
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1. Summary

1.1 On the 13th of December 2007, the passenger train no. 1641, belonging to the railway undertaking SNTFC "Calatori" S.A, scheduled to run from Bucharest to Baia Mare, was dispatched from the railway station Bucuresti Calatori at 21,31 hour, on interlocking system , without remarks. In the railway system Comarnic the train had entrance order from Breaza Nord from the track II, deflecting on the main track II. At the passing over the cross – over 1-7/11 from the scissors crossing no. 1-7/11-3-5/9 at the end X of the railway station Comarnic, happened the derailment of the first bogie of the locomotive, on the direction of traffic.

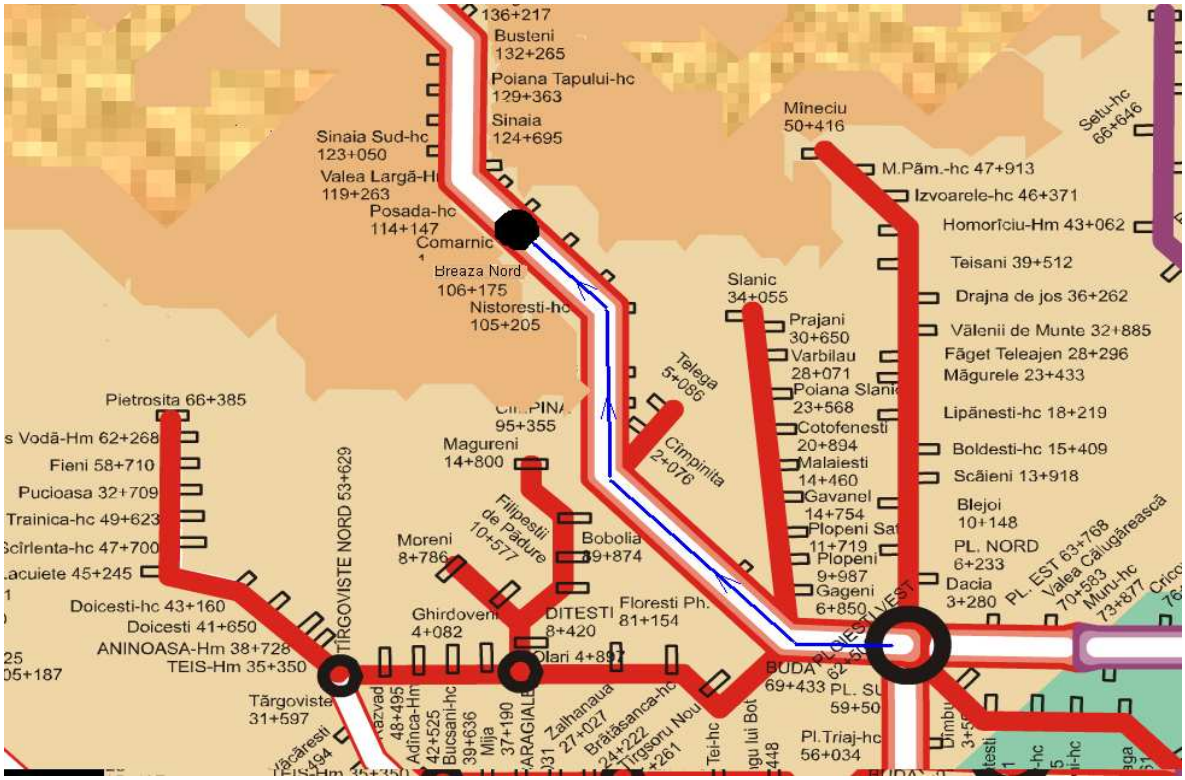
1.2 There were no victims or injured persons in this railway events.

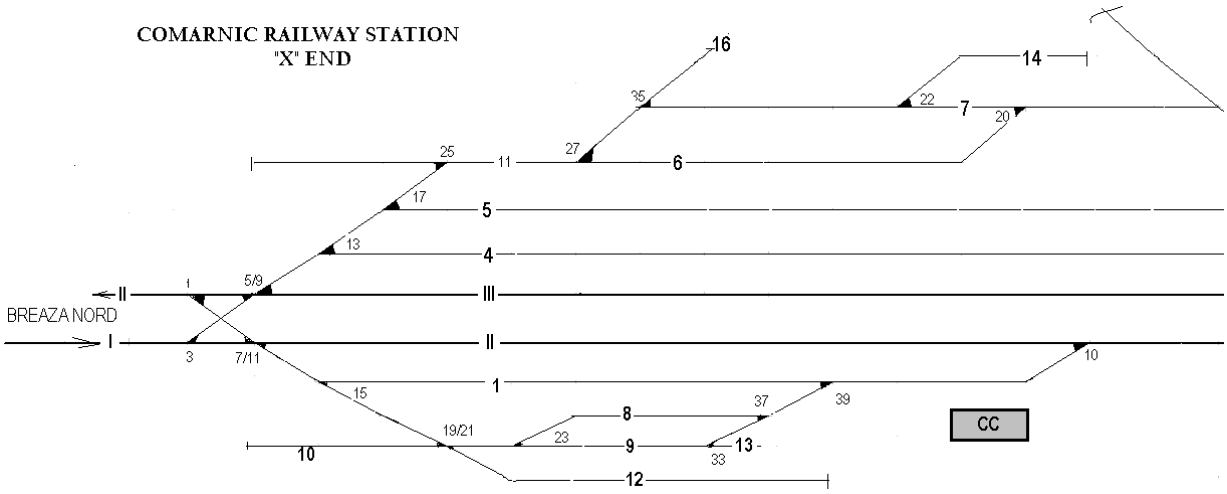
1.3 According to the provisions of the art. 3, paragraph I, from the Law no. 55/2006, concerning the railway safety, this event, respectively the derailment of the passenger train no. 1641, is a railway accident.

1.4 In order to establish the connections between the direct causes and the favourable factors, respectively the underlying causes, it was necessary to question the involved railway staff as well as to perform the technical checking of the railway infrastructure and of the geometrical elements of the running gear of the locomotive.

1.5 The railway station Comarnic belongs to the subsidiary of the Bucharest Railway County and it is placed at 106 km north from Bucharest.

Figura 1: Geographical position of the accident





1.6 Direct cause of the railway event occurrence is that the right wheel of the axle 6 climbed over the curved points, on the deflecting direction of the switch 7 of the double-slip points 7/11, in the following situations and deviations situated at the limit of the operation limits:

1.6.1 the curved points being at the wear up limit that can be taken for a breach that can lead to the climbing of the tyre lip over the rail;

1.6.2 the right stock rail being at the lateral and vertical wear limit that can not protect the tip of the curved points from the action of the tyre lip of the first axle;

1.6.3 the transversal level of the track shows that the running surface of the curved points is with 16 mm under the level of the curved stock rail of the switch no. 7 on the outside of the curve with the radius R=190 m, added to a track torsion value of 8 mm (basis of 2,5 m);

1.6.4 alteration of the fastening of the outside track of the curve on the deflecting direction of the switch no. 7 by the putting of the polyethylene clips on the outside of the curve between the metallic plates and the sleepers;

1.6.5 the running of the locomotive on declivity of 17,32 ‰ in the situation of the increase of the active and apparent power, with a speed 28 km/h, close to the running maximum speed in a curve with a radius of 190 m without cant;

1.6.6 at the measurement of the geometrical elements of the locomotive axles, the distance between the outside faces of the tyre lips (quota E) of the first axle was 1411,5 mm because of the wear of the tyres lips up to 26,5 mm. These values could have permitted, in the conditions of some cross differences of level and track torsions, a passing on the active side of the rail under an angle that can lead to climbing by the lip tyre at the right wheel in the traffic direction over the points (right), without the tyre of the left wheel leave the running surface (no derailment traces were found on the left side between the tip of point and the check rail).

1.7 Underlying causes

1.7.1 Non-performance of all checking concerning the situation of switches that the district head has to do in accordance with the provisions of the art. 26 from the Instruction 323/1965 for the track maintenance district permanent way inspector (the non-measurement of the grooves and the wear of the double slip points parts);

1.7.2 Following the measurement of the switches, in the checking book of the switches are not written the values that exceed the accepted limits;

1.7.3 The complete technological process was not performed at the checking works of the hidden parts of the switches, this results from the measurements written in the checking book at the end of the works, these measurements show exceeding of the limits at transversal level and gauge;

1.7.4 Performance of some works for the removal of some failures found out following the measurements with the track measuring car without respect all the steps of the technological process and without perform some total checks.

1.8 Root causes, that can lead to the railway accident occurrence, are connected with the regulation and implementation framework of the railway safety management system concerning the maintenance an repairing activity of the switches that have the following failures:

1.8.1 The permanent diminution of the technological and theoretical knowledge of the staff involved in the traffic safety, following the change of the generations without a long and medium planning. So was reached the situation in witch, in the checking book of the district switches the limit value at the transversal level on a switch of a arrival and departure track (±5mm) was confound with the accepted value of the track position in side (±10 mm for V≤50km/h);

1.8.2 Keeping the metallic parts of the switches in the track until their wear limit.

1.9 Recommendations

1.9.1 Performance of an analysis concerning the wear situation of the metallic parts of the switches used especially in the passenger traffic on the main tracks and for arrival-departure in order to establish a priority concerning the order and the opportunity of their replacement.

1.9.2 Performance an analysis concerning the ways to keep and to improve the technical and practical abilities of the staff responsible with the management, maintenance and repairing of the switches, by training.

1.9.3 Re-analysis the opportunity to establish some additional works and a sever surveillance of the switches whose use follows to increase because of the increase of the traffic following the closing of some directions requested by the technological process for the performance of some modernization and rehabilitation of the tracks and railway stations.

2. The legal framework for the performance of the Romanian Railway Investigating Body investigation

2.1 According to the provisions of the art. 19 of the Law 55/2006 concerning the railway safety, was set up the Romanian Railway Investigating Body, permanent body, independent into the Romanian Railway Authority – AFER, that performs the investigation of the railway serious accidents, its objective being to improve the railway safety and to prevent the accidents.

The Romanian Railway Investigating Body can investigate, besides the serious accidents, those accidents and incidents that in little different conditions could lead to serious accidents, inclusively the technical failures of the structural subsystems or of the interoperability constituents of the European high speed or conventional railway systems.

2.2 Taking into account that on the 13th of December 2007 happened a railway accident according to the Law 55/2006 concerning the railway safety, consisting in the derailment of the locomotive EA 250 that hauled the passenger train no. 1641, the Romanian Railway Investigating Body decided to investigate this railway event, the investigation commission consisting from:

- Mihai Olaru investigator in charge
- Draghici Marian investigator
- Eduard Stoian investigator
- Dumitru Sfarlos investigator

2.3 The investigation does not aim to establish the guilty or the responsibility and it is perform at the same time with other investigations.

2.4 The investigation is performed in a public way, so all the parties can be listened to and have access to the results. The railway infrastructure administrator and the involved railway undertakings, Romanian Railway Safety Authority, victims and their relatives, the owners of the damaged goods, manufacturers, involved emergency services and the representatives of the staff and the users are regularly informed on the investigation and its course, giving, at their request, the possibility to present their opinions and points of view concerning the investigation and having the possibility to, on request, to comment on the information from the reports projects.

3. Railway accident presentation

On the 13th of December 2007, at 23,15 hour, the first bogie of locomotive of the passenger train no. 1641 derailed, on the running direction, at the entrance in the railway station Comarnic. The passenger train run from Bucharest to Baia Mare and has entrance order from Beaza Nord, on the running track II Breaza Nord – Comarnic with passing on the deflecting main track II in the railway station Comarnic and exit on the running track Comarnic – Valea Larga. In this running the train was passing over the crossover consisting of the switch no. 1 and double slip points no. 7/11 from the scissors crossing no. 1-7/11-3-5/9. In order to set up a route the switch no. 1 was operated in position "deflecting", and the switches no. 7 and 11 from the double slip points no. 7/11 were operated in position "deflecting" with access to the direct line II. Taking into account that the maximum speed running of the trains, at the crossing over a switch in position "deflecting" is 30 km/h, the driver adopted specific measures to slacken the speed , so, when the train run on the crossover 1-7/11, its speed registered on the speed recorder tape was 27-28 km/h. In this situation, at the moment of crossing over the switch no. 7 (put in position "deflecting") the axle no. 6 was suspended (first in the running direction) of the first bogie of the locomotive, and at a distance of 1,8 from the tip of the curved points, the right wheel climbed over the curved points, running on the its running surface 1,0 m then it left the running surface. It was favoured by the track torsion, whose value was close to the accepted maximum value.

The locomotive run in this way until the check rail of the double crossing from the right side that was hit with the right wheel of the first axle, this led to the breaking of check rail at 25 cm from the end. Running in this way, the right wheel forced down continuously on the check rail, tending to climb it over, and the left wheel hit the second horizontal screw from the check rail of the double crossing, then it stood suspended between the curved stock rail of the switch no. 11 and the double crossing of the double slip points, running on the outside of the double crossing check rail. When the left wheel reached the point of rail flaring was favoured the climbing of the left wheel over the curved points and of the right wheel over the right stock rail of the switch no. 11. Running in this way, with the wheels of the first axle on the both stock rails, the curve points of the switch no. 11 was forced open , but was still pointed, following the strong impact that happened, the left wheels of the first bogie hit the supporters of the common crossing check rail of the switch no. 11, and the right wheels of the same bogie run on the common crossing of the switch no. 11. Arriving at the heel joint of the common crossing of the switch no. 11, with access at the deflecting section 2, happened the derailment of the right wheels in the outside of the track 2, and the left wheels in the inside of the track 2. Following this situation the locomotive hit a rail from a bundle of 4 rails (stored between the rails), that passed through the locomotive plough and came between the tambour and the first left wheel. The derailed loco-

motive displaced the rail about 10 meters, after that happened the breaking of the cross coupling, when the locomotive stopped.

4. Consequences

4.1 Victims and injured persons there were no dead or injured persons.

4.2 Closed tracks the running track I and II Breaza Nord – Comarnic and the deflecting section I and main track II railway station Comarnic were closed from the 13th of December 2007, 23,15 hour until the 14th of December 2007, 2,25 hour.

4.2.1 Damages

4.2.2 at the locomotive 634,67 lei for locomotive repair.

4.2.3 intervention means 1044,78 lei being the cost for the running and intervention of the special car at the derailment place.

4.3 Other damages 2876,51 EUR +157,66 lei (without TVA) being the price of the hauling cars 138,81 lei being the price of the delay minutes of the passenger train no. 1641.

Total of damages 2876,51 EUR+11372,92 lei.

5. Technical issues

The railway accidents investigation was performed by a commission consisting in representatives of the Traffic Safety County Inspectorate from the Subsidiary of the Railway County Bucuresti and from the Traffic Safety County Inspectorate belonging to the Railway Passenger County Bucuresti

From objective reasons irrespective of the organization way of the Romanian Railway Investigating Body activity, the investigation commission arrived at the place of the railway event after 10 hours from its occurrence. Consequently, at the establishment of the causes that generated this event, were taken into account and analyzed the documents that were the basis of the investigation file of the railway event, file drawn up by the Traffic Safety County Inspectorate from the Subsidiary of the Railway County Bucuresti and registered with the no. SC2/37/2007, as well as the correspondence between it and the Railway Inspectorate Bucuresti.

From the analysis of the documents requested from the railway infrastructure manager and of the documents from the investigation file resulted the following issues:

Tracks division

5.1 In the investigation file no. SC2/37/2007 are 2 minutes concerning the checking of gauge and of the crossing level of the switch no. 7 from the double slip points 7/11 with the gauge measure, on witch occurred the derailment:

- The minute no. 212 from the 14th of December 2007, appropriated by the traffic safety county inspector from the Subsidiary of the Railway County Bucuresti, by the safety traffic county inspector of the Passenger Railway County Bucuresti and by the head of Tracks Division L5 Comarnic, minute that was drawn up following the checking with the gauge measure, belonging to the Tracks Division L5 Campina;
- The minute no. 213 from the 14th of December 2007, appropriated by a commission consisting in representatives of the Railway Safety Traffic County Inspectorate from the Subsidiary of the Railway County Bucuresti , representatives of the Traffic Safety County Inspectorate from the Subsidiary of the Railway Passenger County Bucuresti and representatives of the Traffic Safety County Inspectorate of the Railway Passenger County Brasov, that was drawn up following the checking

with the gauge measure belonging to the Railway Traffic Safety County Inspectorate of the Railway Passenger County Bucuresti. This minute is not appropriated and signed either by the head of the Tracks Division L5 Campina or by the head of the local tracks district subordinated to the Tracks Division L5 Campina;

Remark:

- there is no remark in any document from the investigation file concerning the reasons for the drawing up of the second minute;
- although in both minutes is stipulated that the checking of the gauge and of the cross level with the gauge measure was performed in the points situated at equidistances of 2,5 m and that the measurements were performed from the same point in the same direction, there is no remark why in the second minute are few checking points as in the first minute and witch are the reasons for what there are big differences between the values of the same parameters corresponding to the same points.

5.2 In the correspondence between the Safety Traffic County Inspectorate from the Subsidiary of the Railway County Bucuresti and of the Railway Inspectorate Bucuresti, in one of the documents is stipulated that the gauge measure presented by the Traffic Safety County Inspectorate of the Railway Passenger County Bucuresti, shows measurements with a deviation of -4 mm for the gauge and +1 mm for the crossing level.

5.3 According to the Legal Metrology Standard NML 041-05 "Equipments for the measurement of the railway or subway track parts" from the 14th of June 2005 the metrology requirements that the gauge measure must comply with are:

- the measurement error of the rail track gauge and of the subway rail 3 must not be over ±1 mm in nominal conditions of operation;
- the measurement error of the railway track and of the subway track 3 cant must not be over ±1 mm for the interval 0….100 mm and of ±1,5 mm for the interval 100 mm ….160 mm, in nominal conditions of operation.

5.4 Because the gauge measure presented by the Traffic Safety County Inspectorate of the Railway Passenger County Bucuresti, with its measurement errors was not according to the said standard provisions, at the moment of the measurement values interpretation were taken into account the measurements performed with the gauge measure belonging to the Tracks Division L5 Campina.

5.5 The track gauge and the crossing level from the double slip points no. 7/11 of the crossover 1-7/11 of the double crossover from the end X of the railway station, were checked , with the gauge measure by measurement in the points whose equidistance was 2,5 m. Following these checks was found out that the limits of the crossing level were not in accordance with the value +/- 5 mm, according to the provisions of the art. 19, point 6 of the Instruction 314/1989, so in the point of the tip of the switch points no. 7 the crossing level had values situated in the interval 8 mm and 16 mm.

5.6 At the last check of the track performed on the 9th of November 2007, the testing and recording car on the track I Breaza Nord – Comarnic, in the switch no. 7 of the double slip points no. 7/11, at the km 108+950 was registered crossed difference of level N_{3-4} witch absolute total value of 18 mm measured on the car tape. The trains run ning on the switches from the end X of the railway station Comarnic with a speed restriction of 30 km/h for witch, according to the provisions of the art. 3.8 a) of the Instruction for the use of the testing and recording cars no. 329/1995, this defect was not pointed out.

5.7. According to the records from the building site book of the performed works from the 16th of November 2007, this defect was removed. In order to find out the measurement points from the table 3 was asked the railway station plan where was identified the geometrical point PG of the double slip points as km 108+974,90, leading to the identification of the field with crossed differences of level between the tip of the common crossing of the switch no. 7 and the first two sleepers from the switch point, on the direction 1-7/11:

Point no / km	0 0+950	1	2	3	4	5 +962,5	6 +965	7 +967,5	8 +970	9	10	11	12	13
distance (m)	0	2,5	5	7,5	10	12,5	15	17,5	20	22,5	25	27,5	30	32,5
Track gauge (mm)	12	12	13	18	22	27	10	27	6	12	13	0	0	0

5.8 The analysis of the measurements performed on the 16th of November 2007, the registered cross difference of level was only under dynamic effect for the area situated between the measurement points 5 – 8;

5.9 At the visual check of the metallic parts of the switch no. 7 from the double slip points 7/11, was found out:

- The right stock-rail of the direction II (with access to the main track II railway station Comarnic) on the active lateral bottleneck has advanced wear;
- The curved rail point of the direction II presented lateral wear starting from the tip of points on its total length following the vertical and lateral wear of the due right stock rail
- Keeping in the track of the right stock rail with the vertical and lateral wear that permits to the vehicle wheel to take the tip of the curved points and to generate lateral wears on a length over 200 mm is against the provisions of the Instruction no. 314/1989 of standards and limits for the track construction and maintenance – tracks with standard gauge table 23 point 3b
- The right stock rail is kept in the track if the vertical and lateral wear permits to the vehicle wheel to reach the fish plate, that is against the provisions of chapter III, art. 22, point 2 from the Instruction no. 314/1989 of standards and limits for the track construction and maintenance – tracks with standard gauge.
- Under the foot of the right stock rail of the switch no. 7 of the direction II, a part of the special slide plates had convex shape, that is against the provisions of the art. 4.13 from the Instruction no. 314/1989 of standards and limits for track construction and maintenance - tracks with standard gauge. The polyethylene clips under the metallic plates show that , for the rectification of the cross level was used attachments made of these clips

<u>Rolling stock</u>

The locomotive EA 250 has according to the dimensional measurements of the tyres and of mechanical clearance between the grease box and the bogie frame, respectively between the bogie frame and the grease box, two values close to the limit as follows:

- at the axle no. 6 that at the moment of derailment was the first axle following the measurements performed on the 11th of December 2007 in Depot Brasov, the distance between the outside faces of the tzres lips (quota E) was 1411,5 mm. The instruction limits of these values stipulated in the

Instruction concerning the repair of the railway vehicles pair of wheels no. 931/1986 are: E_{min}= 1410 mm, E_{max}=1426 mm;

- the vertical clearance between the axle box and the bogie frame corresponding to the axle 6, measured according to the sheet from the 16th November 2007 was 45 mm against the values J_{vmin} =30 mm and J_{vmax}=45 mm established by General Direction of Traction paper no. 310/4/a/2800/1993 concerning the "Technical operation conditions for the electric locomotive axles CFR";
- the horizontal clearance (Jo) between the bogie frame and the locomotive case at the bogie no. 1 was 28 mm, in the conditions when the accepted values by the same technical conditions are J_{omin}=22 mm, J_{omax}=28 mm.

6. Event circumstances

6.1 On the railway event place (the place of the switches from the end X of the railway station Comarnic), the track bed is in embankment, the track over-structure being from combined double crossover type 49 consisting in 2 switches and 2 double slips points, fitted up on wood sleepers.

6.2 The double slip points no. 7/11 on witch occurred the derailment has the following characteristics: type 49, Radius=190 m, tg= 1:9, flexible points, gauge 1435 mm.

6.3 The railway signaling is ensured by the interlocking block system equipment.

6.4 The running lines I and II from Breaza Nord to Comarnic, as well as the deflecting section I and main line II from Comarnic railway station were closed on the 13th of December at 23,15 hour, until the 14th of December 2007, at 2,25 hour.

6.5 14 passenger trains had delays, having a total delay of 882 minutes.

6.6 Re - putting of the locomotive in traffic and setting free the clearance gauge were ensured during the works performed with the specific means and the staff of the specialized work train, belonging to the Passenger Depot Bucuresti.

7. Dead persons, injured persons and material damages

7.1 There were no dead persons or injured persons.

7.2 The locomotive needed running repairs.

8. Outside circumstances

8.1 Good visibility, unclouded sky, good weather, temperature -10^0 C.

8.2 For a right identification of the track gradient in the switches area the Railway Cadastre Department from the Subsidiary of the Railway County Bucuresti, was requested to measure the quotas and to present the situation plan and of the longitudinal section of the scissors crossing 1-7/11-3-5/9 from the end X of the railway station Comarnic. The real gradient of the tracks is 17,32‰ with the up-grade direction in the mileage direction. From the measurements analysis didn't result the existence of some of a long profile connection , in the vertical plan, in this scissors crossing.

9. Analysis and conclusions

9.1 Direct cause of the railway event occurrence is that the right wheel of the axle 6 climbed over the curved points , on the deflecting section of the switch 7 of the double slip points 7/11 in the following situations and deviations situated at the limits of operation limits:

9.1.1 the curved points being at the wear up limit that can be taken for a breach that can lead to the climbing of the tyre lip over the rail;

9.1.2 the right stock rail being at the lateral and vertical wear limit, that can not protect the tip of the curved points from the action of the tyre lip of the first wheel;

9.1.3 the transversal level of the track shows that the running surface of the curved points is 16 mm under the level of the curved stock rail of the switch no. 7 on the outside of a curve with the radius R=190 m added to a value of track torsion of 8 mm (basis 2,5 m);

9.1.4 alteration of the fastening of the outside track of the curve on the deflecting direction of the switch 7 by the putting of the polyethylene clips on the outside of the curve between the metallic plates and the sleepers;

9.1.5 the running of the locomotive on declivity of 17,32‰ in the situation of the increase of the active and apparent power supply, with a speed 28km/h, close to the running maximum speed in a curve with a radius of 190 m without cant;

9.1.6 at the measurement of the geometrical elements of the locomotive axles, the distance between the outside faces of the tyre lips (quota E) of the first axle was 1411,5 mm because of the wear of the tyres lips up to 26,5 mm. These values could have permitted, in the conditions of some cross differences of level and track torsions, a passing on the active side of the rail under an angle that can lead to the climbing by the lip tyre at the right wheel in the traffic direction over the points (right), without the tyre of the left wheel leave the running surface (no derailment traces were found on the left side between the tip of point and the check rail.

9.2 Underlying causes

9.2.1 Non-performance of all checks concerning the situation of switches that the district head has to do in accordance with the provisions of the art. 26 from the Instruction 323/1965 for the track maintenance district permanent way inspector (the non-measurement of the grooves and the wear of the double slip points parts).

9.2.2 Following the measurement of the switches, in the checking book of the switches are not written the values that exceed the accepted limits.

9.2.3 The complete technological process was not performed at the checking works of the hidden parts of the switches, this results from the measurements written in the checking book at the end of the works, these measurements show exceeding of the limits at transversal level and gauge.

9.2.4 Performance of some works for the removal of some failures found out following the measurements with the track measuring car without respect all the steps of the technological process and without perform some total checks.

9.3 Root causes, that led to the railway accident occurrence, are connected with the regulation and implementation framework of the railway safety management system concerning the maintenance an repairing activity of the switches that have the following failures:

9.3.1 The permanent diminution of the technological and theoretical knowledge of the staff involved in the traffic safety, following the change of the generations without a long and medium planning. So was reached the situation in witch, in the checking book of the district switches the limit value at the cross level on a switch of a arrival and departure track (±5mm) was confound with the accepted value of the track position in side (±10 mm for V≤50km/h);

9.3.2 Keeping the metallic parts of the switches in the track until their wear limit.

9.4 Problems found out during the investigation, but without impact on the conclusions on the causes

During the investigation of the serious railway accident was found out a series of problems, concerning the operation staff without causality connection with its occurrence, happened before the accident as follows:

- The running on the main track of the switch 7 over the area with the wing of the check rail broken is kept until the finishing in the railway station Comarnic of the rehabilitation works of the tracks and switches, works that will be performed on the pan-European main track 4:
- Keeping on the track of the curved points and of the right stock rail of the switch 7, with an up wear limit, and after a year after the accident occurrence, when the double slip points 5/9 is closed for the traffic until the finishing of the rehabilitation of the tracks and switches, works that will be performed on the pan-European main track 4

10. Other findings

10.1 All the measurements performed after the curved tip of switch no. 7 were performed after the derailment, and the measurements values allowing to be influenced by the derailment effect.

10.2 The last two measurements at cross level performed before the derailment and written in the district book for the checking of the switches exceed systematically the value ±5 mm, stipulated at the art. 19, point 6 from the Instruction no. 314/1989, with values situated between 1 and 5 mm. These deviations are not pointed out every time by encircling, in the checking book of the switches.

10.3 At the last checking of the hidden parts (VPA), performed on the 28th of November 2007, according to the notes from the checking book of the switches, on the switch no. 7 the values measured at cross level exceed the limits in the points heel of points on main track and on deflecting section , common crossing and double crossing. The result was that one did not comply with the technological process stipulated in the Order 33/34-1978 of the Tracks Division Bucuresti annex 2, that at the preparing works imposed the rectification of the switch plan position, and replacement of the unsuitable screws.

10.4 The finding minute drawn up after the derailment by the investigation commission does not report either on the situation of the sleepers on the checked switch or on the wear level of its metallic parts.

10.5 On the all curve length in deflection of the switch no. 7 the fastening of the metallic plates on the sleepers is influenced by the polyethylene additions put under the axle of the curved stock rail base, this can influence, under the vertical loads given by the rolling stock, change of the points and respective stock rail position.

10.6 From the daily sheet, part II of the building site book, does not result that the work for the removal of the failure level 3 was accepted by the district permanent way head inspector, this does not comply with the provisions from the chapter 6, point 6.7 from the Instruction for the testing and recording car no. 329/1995.

10.7 Exceeding of the limits at the cross level is registered especially in the tip of points, crossings and deflecting section. Exceeding of the accepted limit value is ±5 mm, for the switches of the arrival-departure tracks, is not pointed out in the checking book, by encircling.

11 Recommendations

11.1 Performance of an analysis concerning the wear situation of the metallic parts of the switches used especially in the passenger traffic on the main tracks and for arrival-departure in order to establish a priority concerning the order and the opportunity of their replacement.

11.2 Performance of an analysis concerning the way to keep and improve the technical and practical abilities of the staff responsible with the management, maintenance and repairing of the switches, by training.

11.3 Re-analysis the opportunity to establish some additional works and a sever surveillance of the switches whose use follows to increase because of the increase of the traffic following the closing of some directions requested by the technological process for the performance of some modernization and rehabilitation of the tracks and railway stations.

The final report will be sent to CN CF "CFR" SA, SNTFC "CFR Calatori" SA and to the Romanian Railway Safety Authority.
The Romanian Railway Safety will follow the achievement.