



## INVESTIGATING REPORT

of the railway accident occurred in the railway station Halmeu,  
on the 28<sup>th</sup> of May 2010



Final edition  
The 5<sup>th</sup> of August 2010

## NOTICE

With reference to the railway accident occurred on the **28<sup>th</sup> of May 2010**, at **17,15** hour, in the **Branch of the Railway County Cluj**, in the railway station Halmeu, consisting in the **derailment of the first bogie in the running direction of the wagon no. 67573287** (the wagon belonging to the State Administration for Ukrainian Railway Transport – UZ), of the **freight train no. 70728** (belonging to the railway undertaking SC GRUP FERROVIAR ROMAN SA), over the switch no. 23 from the end X of the railway station, 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 to be taken corrective measures 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 9<sup>th</sup> of July 2010

*Approved by,*  
Dragos Floroiu  
**Director**

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

**Chief Investigator**  
Sorin CONSTANTINESCU

***This approval is part of the Investigating Report of the accident occurred on the 28<sup>th</sup> of May 2010, at 17,15 hour, in the Branch of the Railway County Cluj, in the railway station Halmeu, consisting in the derailment of the wagon no. 67573287 from the freight train no. 70728.***

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## **PREAMBLE**

### **1.1. Introduction**

Concerning the railway accident happened on **the 28<sup>th</sup> of May 2010, at 17,15 hour, in the Branch of the Railway County Cluj**, in the **railway station Halmeu**, consisting in the **derailment of the first bogie in the running direction of the wagon no. 67573287** (the wagon belonging to the State Administration for Ukrainian Railway Transport – UZ), from the freight train no. 70728 (belonging to the railway undertaking SC GRUP FERROVIAR ROMAN SA), over the switch no. 23 from the end X of the railway station, 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.

### **1.2. Investigation process**

On the 28<sup>th</sup> of May 2010, General Inspectorate for the Traffic Safety from CNCF “CFR” SA notified Romanian Railway Investigating Body about the railway accident happened on the 28<sup>th</sup> of May 2010, at 17,15 hour, in the Branch of the Railway County Cluj, in the railway station Halmeu, in the running of the freight train no. 70728 (belonging to the railway undertaking SC GRUP FERROVIAR ROMAN SA), consisting in the derailment of the first bogie in the running direction of the wagon no. 67573287, the 5<sup>th</sup> from the locomotive.

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, corroborated with the art. 48, paragraph 1 of the Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by the Government Decision 117/2010, Romanian Railway Investigating Body decided to start an investigation.

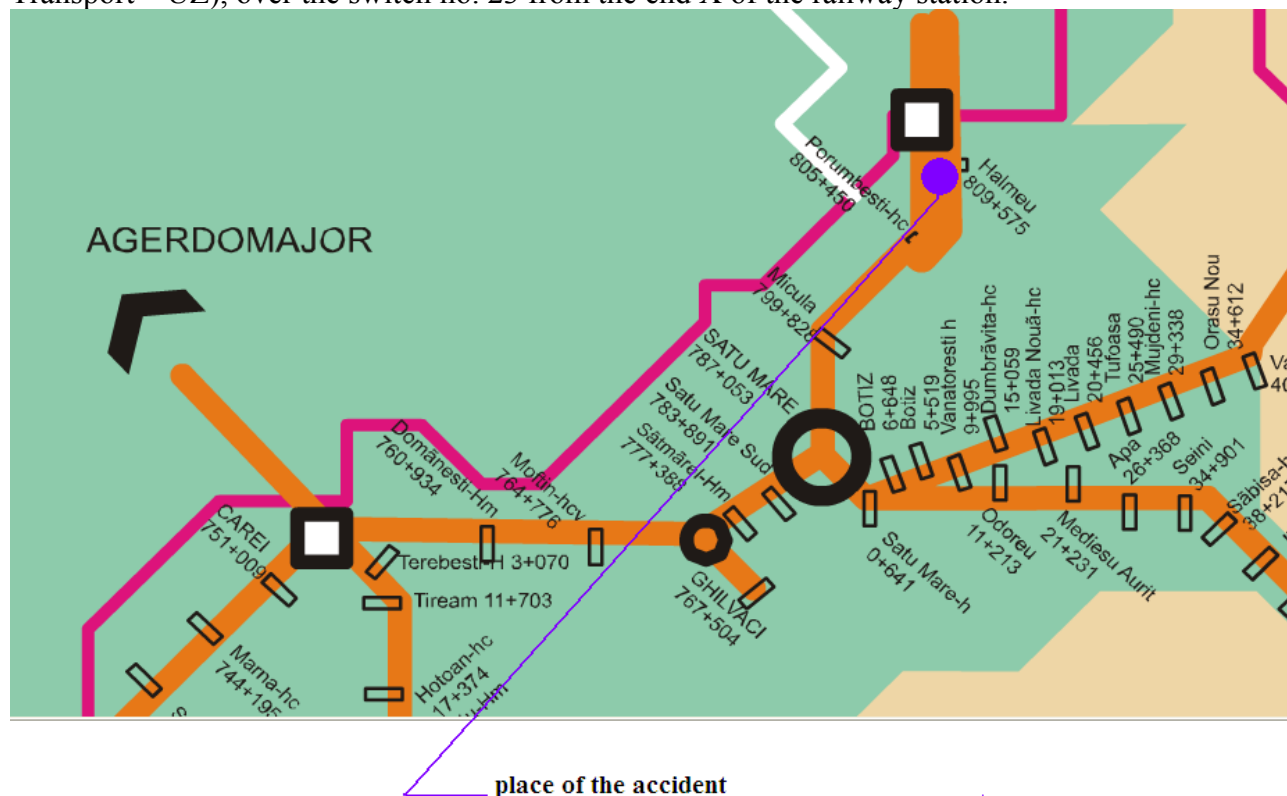
So, through the Decision of OIFR director, no. 23 from the 31<sup>st</sup> of May 2010, was appointed the investigation commission, consisting in:

- Zamfirache Marian - main investigator
- Nicolescu Mircea - investigator
- Groza Cristian - investigator
- Drăghici Marin - investigator
- Pascu Gabriel - head of the Regional Inspectorate for the Traffic safety Cluj, from CNCF “CFR” SA
- Crăciun Stelian - head of Traffic Safety Department from SC GRUP FERROVIAR ROMAN SA

## A. ACCIDENT RESUME

### A.1. Brief presentation

On the 28<sup>th</sup> of May 2010, at 17,15 hour, in the **Branch of the Railway County Cluj**, in the railway station **Halmeu**, in the running of the **freight train no. 70728** (belonging to the railway undertaking SC GRUP FERROVIAR ROMAN SA Bucuresti), at its exit from the line no. 5 (deflecting section), happened the **derailment of the first bogie in the running direction of the wagon no. 67573287** (the wagon belonging to the State Administration for Ukrainian Railway Transport – UZ), over the switch no. 23 from the end X of the railway station.



The freight train no. 70728 consisted in 28 wagons (from which 26 loaded with coal), 2 guard wagons, 112 axles, 2149 tons, length 455 m and was hauled by the locomotive DA 60-1527-7 (belonging to the railway undertaking SC GRUP FERROVIAR ROMAN SA).

The freight train no. 70728 was dispatched at 17,10 hour from the railway station Halmeu to Porumbesti, with destination the railway station Mintia (consignee SC Electrocentrale Deva SA).

This accident did not generated damages at the lines and railway equipments.

Also, there were no loss or casualties.

### A.2. Accident causes

#### A.2.1. Direct cause

**The direct cause** of the accident is the climbing of the curved points of the switch no. 23 by the first wheel (from the left side in the running direction) of the axle no. 1 from the first bogie of the wagon no. 67573287 (the 5th of the freight train no. 70728), following the exceeding of the derailment stability limit because of the increase of the guiding strength at the contact between this wheel and the curved points. The increase of the guiding strength appeared following the increase

of the friction force between those 2 parts of the centre casting from the first bogie in the running direction of the wagon no. 67573287, because of the lack of lubrications between the upper and lower centre casting.

#### **A.2.2. Underlying cause**

There were no identified underlying causes of the accident occurrence.

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

**The root cause** of this accident is that the common regulations on the freight transports concluded between the State Administration for Ukrainian Railway Transport (UZ) and SC GRUP FERROVIAR ROMAN SA is not stipulated the lubrication of the centre casting during the movement of the freight wagons from the bogies with large gauge on bogies with standard gauge.

#### **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 defined 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 addressee of the safety recommendations is SC GRUP FERROVIAR ROMAN SA, as railway undertaking.

The safety recommendation aims to solve the next issue:

SC GRUP FERROVIAR ROMAN SA, as railway undertaking, will ask the State Administration for Ukrainian Railway Transport (UZ) to update the common regulations on the freight transports, that is these regulations stipulate the lubrication of the centre casting during the movement of the freight wagons from the bogies with large gauge on bogies with standard gauge.

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 GRUP FERROVIAR ROMAN SA

## B. INVESTIGATING REPORT

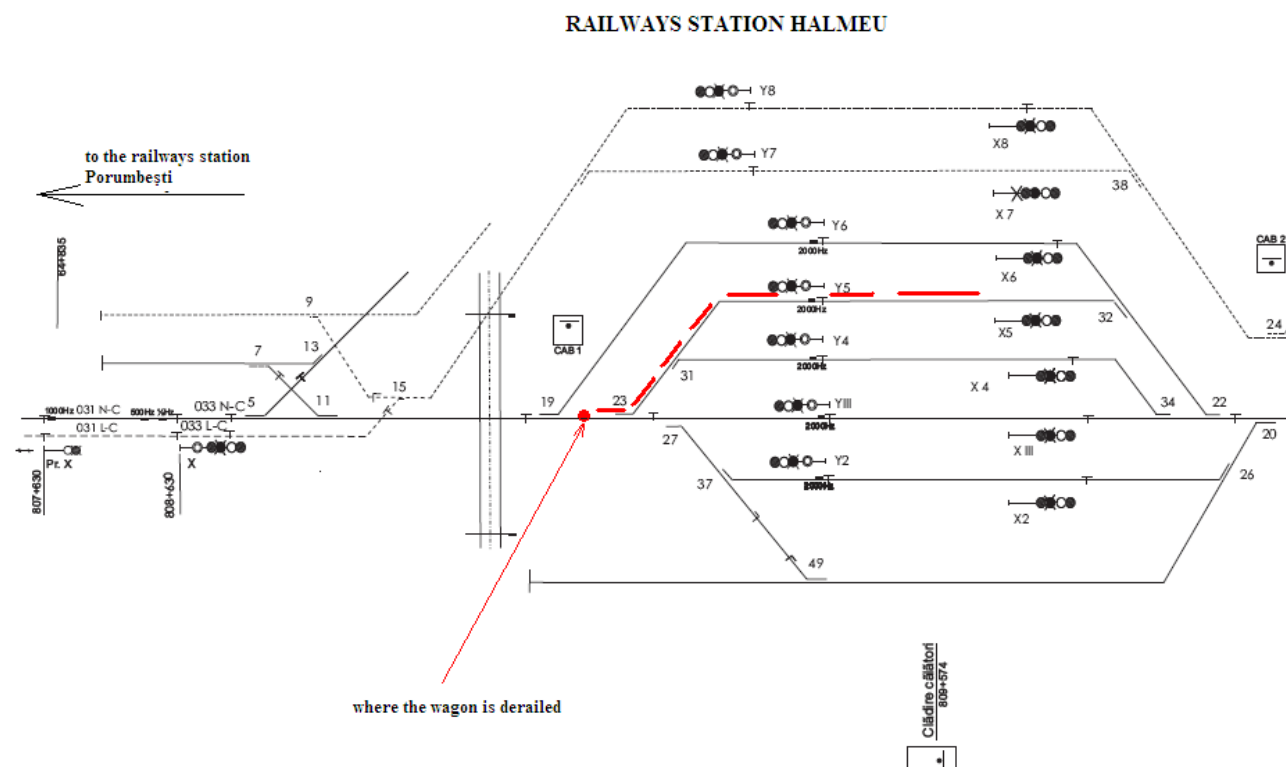
### B.1. Accident presentation

On the 28th of May 2010, through the order no. 3587, the Central Office for the Management of the Railway Traffic scheduled for running the freight train no. 70728, belonging to the railway undertaking SC GRUP FERROVIAR ROMAN SA, that was to run as shuttle service train loaded with coal between Halmeu and Mintia, in accordance with the running telegram no. 42/28.05.2010, given by the railway station Halmeu, on the approval for running, given through the telegram no. 21 from the 2<sup>nd</sup> of February 2010 by the Traffic Division from the Branch of the Railway County Cluj.

The freight train no. 70728 was formed in the railway station Halmeu from the wagons of the train no. 79461 arrived from the State Administration for Ukrainian Railway Transport – UZ, on the 28<sup>th</sup> of May 2010.

The freight train no. 70728, consisting in 26 wagons loaded with coal, 2 empty wagons (guard wagons), 112 axles, 2149 tons, length 455 m, hauled by the locomotive DA 60-1527-7 (belonging to the railway undertaking SC GRUP FERROVIAR ROMAN SA) was dispatched from the direct line V from the railway station Halmeu, at 17,10 hour.

At the moment of the departure of the freight train no. 70728 from the railway station Halmeu to the railway station Porumbesti, at the end X of the railway station, at the passing over the switch 23, trailed the point, the first bogie of the wagon no. 67573287 (the 5<sup>th</sup> in the train formation) derailed, at a speed of 12 km/h.



At the accident place, one found out that the first bogie of the wagon no. 67573287 (the 5<sup>th</sup> of the train) was derailed in the running direction and situated at about 1.5 m left most against the rail head from the right side of the running direction.



The air valve of 5 atm. of the wagon no. 67573287 was broken, the pressure in the general air pipe of the braking equipment being 0 atm. and the distance between this wagon and the one in front of it was about 5 m.

The rest of the train wagons rested on the line, coupled. All train wagons had the automatic brake in service, the brake shoes being applied on the wheels.

The traces of the derailment indicated that the derailment happened on the switch no. 23, the derailed wagon running in this condition up to the switch no. 19, where it stopped.

## **B.2. 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 infrastructure and superstructure are administrated by CNCF “CFR” SA and maintained by the employees of the District 4 Halmeu from the Track Section L6 Satu Mare, Branch of the Railway County Cluj.

The interlocking system from the railway station Halmeu are administrated by CNCF “CFR” SA and maintained by the employees of the Section CT 2 Satu Mare, Branch of the Railway County Cluj.

The communication equipment from the locomotive is owned by the railway undertaking SC GRUP FERROVIAR ROMAN SA and maintained by its employees.

The locomotive DA 60 – 1527-7, hauling the train no. 70728, is owned by SC GRUP FERROVIAR ROMAN SA and the derailed wagons are owned by State Administration for Ukrainian Railway Transport (UZ).

The investigation commission questioned the employees involved in the technical inspection during the train forming, the driver, the employees in charge with the lines maintenance in the railway station Halmeu, as well as the staff involved in the train dispatching and the handling of the switches, over which passed the train no. 70728.

### **B.2.2. Train forming and equipments**

The freight train no. 70728 consisted in 26 wagons, loaded with coal, and 2 empty wagons (guard wagons), 112 axles, 2149 tons, length 455 m, hauled by the locomotive DA 60-1527-7.

The automatic brake was active, the safety and vigilance equipments (DSV), the equipment for the punctual control of the speed (INDUSI) of the hauling locomotive were in service and operated according to the instructions, being sealed.

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

#### ***Route presentation***

The switches from the end X of the railway station Halmeu are placed in alignment and gradient (slope) of 0.5 ‰.



The derailment happened on the switch no. 23, with the next characteristics: rail type 49, radius R=300 m, tangent 1:9, left deviation, sleepers type 49, indirect fastening type K.

According to the records from the running order, drawn up by the movements inspector on duty in the railway station Halmeu, the accepted running speed on the deflecting section, over the switches, had to be 15 km/h maximum.

The track bed is complete, the fastening system of the metallic parts on the sleepers complete and active.

In order to dispatch the train from the deflecting section no. 5, the switch no. 23 was operated on “deflecting section” position and trailed the point, the train trailing the point.

### ***Suprastructure presentation***

The switches and lines in the derailment area consist in superstructure type 49, welded track, wooden sleepers and indirect fastening type K.

### ***Presentation of the safety equipments for the traffic management***

The railway station Halmeu is endowed with interlocking system type CEM FT, light signals and BLASR.

### ***Train forming and equipments***

The freight train 70728 consisted in 26 CSI wagons, moved on bogies with standard gauge (1435 mm), loaded with coal and 2 empty wagons (guard wagons), 112 axles, gross tonnage 2149 tons, net tonnage 1527 tons, length 455 m, automatic braking according the time-table 860 tons, real 972 tons, plus 112 tons against the time-table, hand-braking according the time-table 236 tons, real 240 tons ( from which 22 hand stop-block), plus 4 tons against the time-table and was hauled by the locomotive DA 60-1527 (belonging to the railway undertaking SC GRUP FERROVIAR ROMAN SA). The train run from the railway station Halmeu to the railway station Mintia.

The hand brake of the train was in service, the safety and vigilance devices (DSV), the equipment for the punctual control of the speed (INDUSI) from the hauling locomotive were in service and operated according the instructions.

## **B.2.4. Communication means**

The communication between the driver and the movements inspectors, as well as between the driver and the head guard 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 provisions of the Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by Government Decision 117/2010.

Following of these, at the accident place came the representatives of the railway infrastructure administrator CNCF „CFR” SA – branch of the Railway County Cluj, of the involved railway undertaking SC GRUP FERROVIAR ROMAN 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 train specialized intervention with hydraulic jacks and crane EDK of 125 tf belonging to SC Intervenții Feroviare SA – District Cluj Napoca.

### **B.3. Accident consequences**

#### **B.3.1. Losses and casualties**

Following this accident were not casualties or injuries.

#### **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 DA 60 – 1527-7	none;
▪ at the wagons according to the estimation no. 257/02.06.2010 the Inspection Point from Halmeu	164.48 lei;
▪ at the lines	none;
▪ at the equipments	none;
▪ at the intervention equipments according to the estimation no. 3/333/03.06.2010 of the Track Section L3 Cluj.	1,948.20 lei
<b>Total value of the damages</b>	<b>2,112.68 lei</b>

#### **B.3.3. Accident consequences for the railway traffic**

The traffic between the railway stations Halmeu and Porumbesti was re-started after re-railing the derailed wagon and performing the tests at the track, on the 29<sup>th</sup> of May 2010, at 11,40 hour.

Following the accident resulted the next situations in the trains running:

- the passenger train no. 4410, belonging to the railway undertaking SNTFC “CFR Calatori” SA from the 28<sup>th</sup> of May 2010 was cancelled between Halmeu and Satu Mare;
- the freight train no. 42739 from the 28<sup>th</sup> of May 2010, belonging to the railway undertaking SNTFM “CFR Marfa” SA was cancelled between Dej and Halmeu.

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

On the 28<sup>th</sup> of May 2010, between the hours 12,00 and 18,00, the visibility was good, cloudless sky, the temperature was about 20<sup>o</sup> 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. Summary of the involved staff testimonies**

**The driver** of the locomotive DA 60-1527-7, hauling the freight train no. 70728 stated:

- he took the locomotive from the line V of the railway station Halmeu, after the inspection and test performed by the movements inspector on duty in the railway station Halmeu, at around 15,15 hour;
- after testing the hand brake and signing the route sheet by the wagon examiner, he received the train documents and the running;
- at 17,10 hour the train started to run at the position of the exit signal “green-yellow”;

- the running speed was about 8 – 10 km/h, on about 350 m, then he observed that the pressure in the general pipe decreased suddenly;
- he braked and after stopping, he checked the train and found out that the first bogie of the wagon 5 from the locomotive was derailed, being at about 4 – 5 m from the front wagon, the automatic coupler being opened and the air valve of 5 atm. broken;
- he notified the head of the working point about these.

**The wagon examiner**, who examined the train at the routing from the railway station Halmeu, stated:

- the train no. 70728 consisted from the wagons of the train no. 79461 arrived from the State Administration for Ukrainian Railway Transport – UZ, in the UZ railway station Diacovo was performed the examination during the forming and the braking test with the hauling locomotive;
- he did not found out failures that could affected the traffic safety of the examined wagons, including also the derailed wagon, that is the wagon no. 6757328-7;
- during the checking he could not observed that the breadth of the part that replaced the tyre from the first axle, in the running direction of the derailed wagon performed, was under the sizes stipulated in the PGV Regulations, because he had no requisite in order to be able to measure these geometrical elements;
- on that the wagon no. 67573287 has no vaseline in the centre casting and there were dry friction traces, he explained that the movement on bogies with standard gauge was not made in the UZ railway station Diacovo, where was performed the examination during the forming, so one could not saw the condition of the centre casting;
- he examined visually the train no. 70728 at its dispatching from the railway station Halmeu at about a half from its wagons up to the sudden braking of the train and observed that the 5<sup>th</sup> wagon of the train derailed.

**The switchman** on duty on the 28<sup>th</sup> of May 2010 in the cabin no. 1 of the railway station Halmeu stated:

- at 17,05 he received the exit order for the dispatching of the train no. 70728, from the line 1;
- after checking the route, he informed that the exit route was performed, then he received the order from the interlocking cabin and ensured the route;
- he stand up in front of the cabin window no. 1 for the visual examination of the train no. 70728 and observed that the 5<sup>th</sup> wagon of the train derailed between the switches 23 and 19;
- he tried to contact by radio station the driver of the hauling locomotive and because he did not answered, he called the inner movements inspector.

**The guard** on duty on the 28<sup>th</sup> of May 2010 in the freight train no. 70728 stated:

- he took, from commercial point of view, the wagons of the train no. 79461 in the UZ railway station Diacovo, when he did not find out problems on the safety.

**The gang foreman** from the Track District 4 Halmeu stated:

- from its appointment as gang foreman, there was no work for the replacement of the switch no. 23 from the railway station Halmeu;
- during the tests with the ultrasonic failure detectors, one did not found out any metallic parts out of order in the switch no. 23 of the railway station Halmeu;
- during last time he did not receive any complaint either from the locomotive staff or from the track examiner concerning the existence of some failures at the switch no. 23 of the railway station Halmeu;
- at the last checking with the gauge ORE one did not found wears at the points or stock-rails over the tolerances accepted by the Instruction of norms and tolerances for the track construction and maintenance – lines with standard gauge no. 314/1989.

**The head** of the Track District 4 Halmeu stated:

- the switch no. 23 from the railway station Halmeu was fitted up in 1983;
- since his appointment in this position he did not found out wears or failures at the metallic parts, either during the checking with the ultrasonic failures detector or during the checking of the hidden parts;
- once he was notified on the difficult operation of the switch no. 23 during the winter 2009 – 2010, appeared because of the frost;
- during last time he did not receive notifications either from the gang foreman or from the track examiner on the metallic parts with wears over the tolerances accepted at the switch no. 23 of the railway station Halmeu;
- at the last checking with the gauge ORE one did not found wears at the points or stock-rails over the tolerances accepted by the Instruction of norms and tolerances for the track construction and maintenance – lines with standard gauge no. 314/1989.

### **B.5.2 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 designing, 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 GRUP FERROVIAR ROMAN SA, as railway undertaking was in process of implementation of 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. 535/2007 on the granting of the safety certificate in order to perform railway transport on Romanian railways.

On the 6<sup>th</sup> 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 0014 – by which Romanian Railway Safety Authority, from Romanian Railway Authority – AFER agrees the acceptance of safety management system of the railway undertaking;
- Safety Certificate – Part B, identification number CSB 0097 – by which Romanian Railway Safety Authority, from Romanian Railway Authority – AFER agrees the acceptance of the dispositions taken by the railway company in order to comply with the specific requirements necessary for the safety operation on the relevant network, in accordance with the Directive 2004/49/EC and with the applicable national legislation.

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

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

#### *norms and regulations*

- Regulations for the use of the freight wagons in the international traffic - PGV;
- Regulations for the fastening of the goods on the open wagons – annex no. 14 of the Convention for the International Railway Freight Traffic - SMGS;
- Convention concluded between the State Administration for Ukrainian Railway Transport – UZ and SC GRUP FERROVIAR ROMAN SA on the freight transport;
- Instruction of norms and tolerances for the track construction and maintenance – lines with standard gauge no. 314/1989.

#### *sources and references*

- minutes concluded following the findings on the train locomotive, derailed wagon and railway infrastructure;
- routing sheet of the train hauling locomotive;
- records of the speed equipment of the train hauling locomotive and the minute for the analysis of these records;
- train consignment documents;
- movements records from the railway station Halmeu;
- photos taken soon after the railway accident by the members of the investigation commission;
- photos taken in the railway station Halmeu from the wagon involved in the railway accident after its lift from the bogies;
- documents on the lines maintenance, supplied by the persons in charge with their maintenance;
- results of the measurements performed soon after the railway accident at the track superstructure and derailed wagon;
- inspection and interpretation of the technical condition of the elements involved in the accident: infrastructure, railway equipments and train;
- questioning of the employees involved in the railway accident.

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

#### **B.5.4.1. Data on the lines**

##### ***Technical condition of the line before the railway accident***

The switches from the end X of the railway station Halmeu are placed in alignment and gradient (slope) of 0.5 ‰. The derailment happened on the switch no. 23, with the next characteristics: rail type 49, radius R=300 m, tangent 1:9, left deviation, sleepers type 49, indirect fastening type K.

##### ***Presentation of the track superstructure***

The switches and the lines from the exit route of the freight train no. 70728, from the deflecting section no. 5 over the switch no. 23 consist from superstructure type 49, welded track, wooden sleepers, indirect fastening type K.

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

The derailment happened on the curved point of the switch no. 23, from the heel to the tip of it.



The fastening parts were complet and active, the track bed complete and chocked about 25%.

The wooden sleepers were in good condition, excepting the sleeper no. 20, numbered from the switch tip that did not ensure a proper fastening between the metallic plate and an end of the wooden sleeper.

The first joint of the heel of points of the switch no. 23 presented deposits of chocked broken stone, having ensured the drainage of water at the sleepers end.

Following the checking of the gauge (E) and of the track crossing level (N) with the gauge template, one found out:

- at the switch no. 23, in the characteristics point resulted the next measurements:

Characteristic points of the switch	Pj (first joint )	Vac (point of switch tip)	Cdir (heel of points direct line)	Cab (heel of points deflecting section)	Cm ( middle of the curve)	Idir ( crossing fog direct line	Iab (crossing fog deflecting section)
	1	2	3	4	5	6	7
<b>E(mm)</b>	5	14	4	2	2	3	4
<b>N(mm)</b>	14	10	2	3	0	4	3

- on the curve from the switch no. 23 at the longitudinal basis of 2,5 m, on the derailment adjacent areas, resulted the next values:

Measurement points	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
<b>E(mm)</b>	1	5	5	10	30	40	40	36	5	2	0	4	5	5	5	4
<b>N(mm)</b>	10	7	9	6	6	9	8	5	3	0	0	1	2	3	3	2

Remarks: the points from -6 to 2 on the derailment area

The running direction of the derailed wagon was from the point „0” to the point „-6” and the point „0” was at 3,6 m from the heel of switch to the rail stock. The point „0” is the first derailment trace of the wagon, in the running direction.

Following the checking of the points and stock rails wears with the gauge ORE, one found out that those were not in accordance with the tolerances stipulated in the Instructions of norms and tolerances for the track construction and maintenance – lines with standard gauge no. 314/1998.

#### **B.5.4.2. Data found out on the operation of the rolling stock and its technical equipment**

According the provisions of the convention concluded between the the State Administration for Ukrainian Railway Transport – UZ and SC GRUP FERROVIAR ROMAN SA, the movement of the freight wagons of the train no. 70728 was made in Ukraina, in the railway station Eseni.

The wagon no. 67573287 is open four axle wagon, with automatic braking type Matrosov and automatic couplings. Also, the transposed wagon had bogies type Diamond CSI with the wheel base of 1,80 m and with axles with cast wheels of standard gauge (1435mm ).

The wagon had plane centre casting, without wer plate as are endowed the wagons with hemispherical centre casting.

The wagons was submitted to the last repair type RP on the 8th of December 2010, it being valid for 2 years, and its bogies were submitted the last periodical repair type RB in August 2008, it being valid for 2 years.

Following the measurements performed by the investigation commission at the geometrical parts of the derailed bogie wheels (bogie no. 1), resulted the next values:

Measured geometrical parts	Axle no. 1		Axle no. 2		Limit values according to the annex no. V PGV
	Right wheel in the running direction	Left wheel in the running direction	Right wheel in the running direction	Left wheel in the running direction	
Quota q <sub>r</sub>	7	6,6	8	7	> 6,5 mm
Height of the flange	27,5	29	27,5	29	min 25 mm max 36 mm
Thickness of the flange	27,5	26,5	27	28,5	min 22 mm
Breadth of the part that serves as tyre	131,5	132	137	135,5	min 133 mm max 140 mm
Dfi at 0°	1358,6		1362,8		1360 ± 3 mm
Dfi at 120°	1356,6		1362,1		
Dfi at 240°	1356,6		1362,7		
Dfe at 0°	1411,7		1418,5		min 1410 mm
Dfe at 120°	1411,3		1417,8		max 1426 mm
Dfe at 240°	1411,6		1418,3		

where: **Dfi** is the distance between the inner sides of the wheels of a axle  
**Dfe** is the distance between the outer sides of the wheels of a axle

During the lift of the wagon from the bogies, at the centre casting from the derailed bogie there were found out:



- lack of vaseline at the centre casting;
- the upper and lower centre casting had contact traces on about 1/3 from the surface, on the right side in the running direction;
- wear traces on the shoulder of the upper centre casting.



In the common regulations on the freight transports concluded between the State Administration for Ukrainian Railway Transport – UZ) and SC GRUP FERROVIAR ROMAN SA is not stipulated the lubrication of the centre casting during the movement of the freight wagons from the bogies with large gauge on bogies with standard gauge.

Following the checking of the loading condition (coal) from the derailed wagon, one found out that it was uniformly distributed and in accordance with the provisions of the Regulations for the fastening of the goods on open wagons – annex no. 14 of the Convention on the International Railway Freight Transport – SMGS.

After the accident, the derailed wagon was inspected, weighing it on the weighing machine of the railway station Halmeu, resulting the next values:

- gross value 85300 kg;
- tare value 22400 kg;
- nett value 62900 kg.

According to the data state in the train consignment documents, the weight of the derailed wagon had the next values:

- gross value 84600 kg;
- tare value 21050 kg;
- nett value 63550 kg.

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

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

The values of the gauge and of the cross level, measured in the area before the first trace of derailment were between the maximum limits accepted by the Instruction of norms and tolerances for the track construction and maintenance – lines with standard gauge no. 314/1989, corresponding to the maximum speed accepted in the derailment area.

The values of the points and stock-rails wears, checked at the switch no. 23 were between the tolerances stipulate by the Instruction of norms and tolerances for the track construction and maintenance – lines with standard gauge no. 314/1989.

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

The lack of lubrication and the presence of rust at the centre casting of the derailed wagon led to the conclusion that this ensemble was not lubricated at the movement of the involved wagon from the bogies with large gauge to bogies with standard gauge.

The lack of the lubrication between the upper and lower centre catings led in time to the appearance of the rust in the centre casting and also to the appearance of dry friction between those two parts of this essemble. It led to the increase of the friction forces and implicitly to the very high increase of the friction moment.

So, following of this, the torque of this bogie increased and implicitly the guidance force that driven the right wheel in the running direction of the first axle, at the contact between this wheel and the curved point of the switch no. 23.

The breadth of the part that replaces the tyre from the wheels of the first axle from the derailed bogie was 131,5 mm at the left wheel in the running direction and 132 mm at the right wheel in the running direction, these values being under the minimum accepted limit – 133 mm, stipulated at the point 2.3 from the annex no. 5 of the Regulations for the use of the freight wagons in the international traffic – PGV.

The distance between the inner surfaces of the parts that replace the tyre at the same axle from the derailed bogie, at 2 from those 3 measuring points, was 1356,6 mm, values that were under the minimum accepted limit – 1357 mm, stipulated at the point 2.2 from the annex no. 5 of the Regulations for the use of the freight wagons in the international traffic – PGV of 133 mm.

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

From the analysis of the findings from the railway accident place, concerning the technical condition of the derailed wagon, resulted from the photos taken from the derailment place, as well as from the testimonies of the involved employees, resulted that the derailment had the next occurrence dynamic:

- because of the lack of the lubrication between the upper and lower centre catings at the first bogie in the running direction led to the appearance of a dry friction and implicitly to the very high increase of friction moment between those two parts of this essemble;
- so, following of this, the torque of this bogie increased and implicitly the guidance force that driven the left wheel in the running direction of the first axle;
- following the increase of the guidance force at the contact between this wheel and the rail, during the running over the curved points of the switch no. 23, the ratio between this force and the load on the first wheel exceeded the derailment stability limit;
- because of the exceeding of the derailment stability limit, the first wheel (from the left side in the running direction) climbed the curved points of the switch no. 23 and then the right stock rail of the same switch, falling outside the track;
- on the same time with the climbing of the curved point, the right wheel of the first axle fell between the right points and the curved stock rail;
- after the falling outside the track of the left wheel, in the running direction, the derailed first axle generated the derailment of the second axle from the first bogie in the running direction of the involved wagon;

- following the derailed running of the involved wagon, the traction forced increased very much, ot leading to the uncoupling of the automatic coupler between it and the fourth wagon of the train and then to the breakage of the air valve of 5 atm. from the derailed wagon;
- following the breakage of the air valve from the derailed wagon, the air pressure from the general air pipe of the train decreased, it leading suddendly to the emergency breaking of the train and then to its stop.

## **B.7. Accident cause**

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

**The direct cause** of the accident is the climbing of the curved points of the switch no. 23 by the first wheel (from the left side in the running direction) of the axle no. 1 from the first bogie of the wagon no. 67573287 (the 5th of the freight train no. 70728), following the exceeding of the derailment stability limit because of the increase of the guiding strength at the contact between this wheel and the curved points. The increase of the guiding strength appeared following the increase of the friction force between those 2 parts of the centre casting from the first bogie in the running direction of the wagon no. 67573287, because of the lack of lubrications between the upper and lower centre casting.

### **B.7.2. Underlying cause**

There were no identified underlying causes of the accident occurrence.

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

**The root cause** of this accident is that the common regulations on the freight transports concluded between the State Administration for Ukrainian Railway Transport (UZ) and SC GRUP FEROVIAR ROMAN SA is not stipulated the lubrication of the centre casting during the movement of the freight wagons from the bogies with large gauge on bogies with standard gauge.

### **C. SAFETY RECOMMENDATIONS**

The addressee of the safety recommendations is SC GRUP FERROVIAR ROMAN SA, as railway undertaking.

The safety recommendation aims to solve the next issue:

SC GRUP FERROVIAR ROMAN SA, as railway undertaking, will ask the State Administration for Ukrainian Railway Transport (UZ) to update the common regulations on the freight transports, that is these regulations stipulate the lubrication of the centre casting during the movement of the freight wagons from the bogies with large gauge on bogies with standard gauge.

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 GRUP FERROVIAR ROMAN SA.

Members of the investigation commission:

- |                     |  |
|---------------------|--|
| ▪ Zamfirache Marian | - main investigator  |
| ▪ Nicolescu Mircea  | - investigator   |
| ▪ Groza Cristian    | - investigator   |
| ▪ Drăghici Marin    | - investigator   |
| ▪ Pascu Gabriel     | - head of the Regional Inspectorate for the<br>Traffic safety Cluj, from CNCF “CFR” SA |
| ▪ Crăciun Stelian   | - head of Traffic Safety Department from SC<br>GRUP FERROVIAR ROMAN SA                 |