MINISTRY OF TRANSPORTS AND INFRASTRUCTURE
ROMANIAN RAILWAY AUTHORITY - AFER
ROMANIAN RAILWAY INVESTIGATING BODY

# INVESTIGATING REPORT

of the serious railway accident
occurred on the 16th of October 2013, in the activity of the Branch of the CREIR Cluj, between the railway stations Monor Gledin and Rapa de Jos


*Final edition*
*03rd of March 2013*

## SUMMARY

## A. PREAMBLE

### *A.1. Introduction*

The Romanian Railway Investigating Body, hereinafter reffered as OIFR, performed an investigation, according to the provisions of the *Law no. 55/2006 on the railway safety, hereinafter referred as Law for Railway Safety* and the *Investigation Regulation for the investigation of accidents and incidents, development and improvement of railway safety on the railway and the metro network in Romania,* approved by the Government Decision no. 117/2010, hereinafter referred as *Investigation Regulation*.

The investigation action of OIFR aims to improve the railway safety and to prevent the railway incidents or accidents.

OIFR's investigation is performed independently of any inquiry and does not aim to establish the guilt or the responsibility.

### *A.2. Investigation process*

According to the art 19, paragraph 2 from the *Railway Safety Law*, corroborated with the art. 48 from the *Investigation Regulation for the investigation of accidents and incidents, development and improvement of railway safety on the railway and the metro network in Romania,* OIFR, in case of occurrence of railway accidents and incidents, has to start an investigation and make investigation commissions for gathering and analyzing the technical information, establishment of the occurrence conditions, including the causes definition and, if case, issuing safety recommendations for the prevention of some similar accidents and for the improvement of the railway safety.

Taking into account the informative note of the General Traffic Safety Inspectorate from CNCF „CFR" SA, from the 16th of August 2013, as well as the notification paper of the Regional Traffic Safety Inspectorate from the Branch of the Regional Center for Railway Operation, Maintenance and Repairs Cluj, hereinafter referred as CREIR Cluj, concerning the serious accident occurred on the 16th of March 2013, in the activity of the CREIR Cluj, through the overtaking and hitting of the rear wagon from the freight train no. 50473-2 (belonging to the railway transport operator SC Unicom Tranzit SA) by the train no. 48924 belonging to District LC – ELF Saratel, which run on the section Saratel – Rapa de Jos, with the result the derailment of the tower wagon from the second axle in the running direction and the injury of the 16 persons being on the tower wagon and taking into account that the railway event is defined as serious accident according to the provisions of the art. 7, paragraph (2), letter a) from the *Investigation Regulation for the investigation of accidents and incidents, development and improvement of railway safety on the railway and the metro network in Romania,* OIFR director decided to start an investigation and to appoint an investigation commission.

Through the Decision no. 128-I, from the 28th of October 2013 of OIFR director, according to the provisions of art. 19, paragraph (2) from the Law no. 55/2006 for railway safety, the investigation commission was appointed, as follows:

- Eugen ISPAS - OIFR's Chief investigator - main investigator;
- Eduard STOIAN - OIFR's Head of department - member;
- Vladimir MACICASAN - OIFR's investigator - member;
- Stefan CIOCHINA - OIFR's investigator - member;
- Catalin Doru TOADER - OIFR's investigator - member;
- Matei Gigel MAHALEAN - ISF Cluj territorial inspector - member;
- Elena Madalina CIOBANESCU - OIFR's psychologist - member.

## B. INVESTIGATION REPORT BRIEF PRESENTATION

On the 16th of August 2013, at around 08,40 o'clock, in the activity of the Branch of CREIR Cluj, in open line at km 33+300, between the railway station Monor Gledin – Rapa de Jos, running section Saratel - Deda, simple, electrified line, the tower wagon DP 58 which run on the available train path of the freight train no. 48924, belonging to SC ELECTRIFICARE CFR SA, overtaking that and violently end-collision the rear wagon from the freight train no. 50473-2 belonging to SC UNICOM TRANZIT SA.
The tower wagon DP 58 belonging to SC ELECTRIFICARE CFR SA (district LC - EA – ELF Saratel) was dispatched from the railway station Saratel to the railway station Rapa de Jos in the conditions set in the timetable for the train no. 83282.
Following the accident was produced the derailment of the second axle of the tower wagon DP 58, damages of the rolling stock were recorded, the serious injury of 13 persons and perturbation in the railway traffic.

### *The direct cause, contributing factors*

***The direct cause*** of the occurrence of this serious accident is the failure to stop the tower wagon DP 58 which run on the available train path of the freight train no. 48924, at signal BL 6 from BLA Monor Gledin – Rapa de Jos which, being on danger, fact which led to the overtaking and the hitting of the rear wagon from the freight train no. 50473-2, the derailment of the tower wagon from the second axle in the running direction and the injury of a number of 16 persons from the tower wagon.

### *Contributing factors*

- the abundant vegetation existent in the area of the entry color light signal of the automatic line block BL 6, which stopped its visibility;
- the technical state of the color light signal BL 6 which had the bulb burned out and at the back up red signal light;
- the enhanced fatigue of the driver, generated through the fact that he was working under the confinement at the working place, in conditions in which he hadn't the resting time foreseen in the Confinement Regulation and neither that foreseen between two successive presences on duty;
- the noninsurance at District LC – EA – ELF Saratel of the optimal number of posts for the position driver tower wagon, fact which led to the uncovering of the necessary authorized employees, even though the adopted confinement regime.

### *Underlying cause*

None respecting the provisions of art. 89, paragraph (1) and paragraph (2) from the Signaling Regulation no. 004/2006 referring to the driver's obligations in the case he's meeting an off passing light signal of the automatic line block.

### *Root cause*

- the inconsistency between art. 13, paragraph (1) from the Instruction 340/2001 (according to which the guiding and the traffic UAM is made based on free track) and art. 208, paragraph (3) from the Regulation 005/2005 (according to which UAM can be dispatched after a train – which is shunting safe – at a block sector);
- the lack of provisions from the Confinement Regulation referring to the assuring of the authorized personnel to drive the tower wagons after the interventions which are interrupting the rest period.

***Safety recommendations***

- completing the regulation frame with provisions referring at the training, examination and authorization mode of the accompanying agent of the tower wagon;
- completing the *Confinement Regulation* with provisions referring to the authorized personnel assuring for driving the tower wagon after the interventions which interrupted the rest period;
- correlation of the provisions from the Instruction 340/2003 and those from the Regulation 005/2005 referring at the guiding and traffic of the UAM.

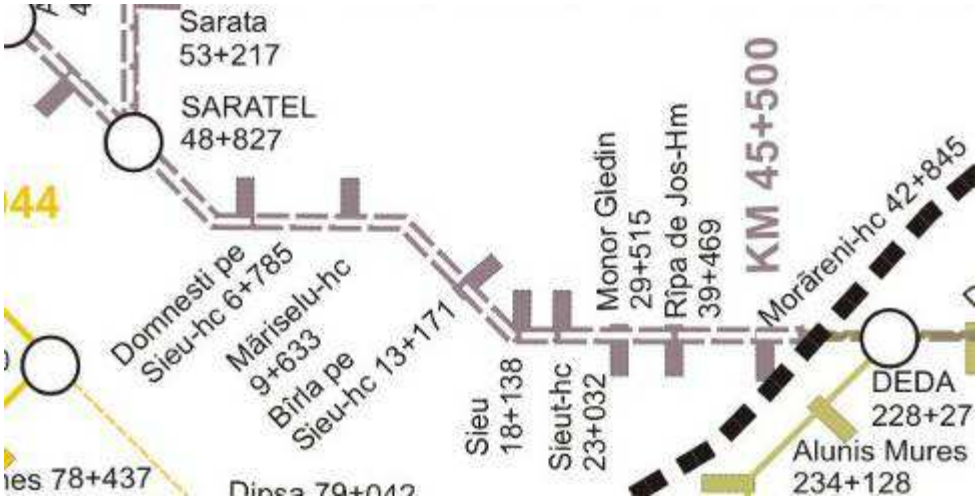



**Image no. 1: Geographical position of the accident site**

## C. INVESTIGATING REPORT

### *C.1. Accident presentation*

On the 15th of October 2013, at 20,30 o'clock the freight train no. 50473-2 hauled by the locomotive EA 179 (belonging to the freight railway undertaking SC Unicom Tranzit SA) was dispatched from the railway station Zalau Nord having as destination the railway station Calarasi. The personnel which deserved the locomotive was belonging to the same freight railway undertaking.

The freight train no. 50473-2 consist of: 20 wagons (loaded with iron waste), 80 axles, 1362 brut tonnage, 912 net tonnage, automatic braked tonnage necessary/real – 681/856 tones, hand braked tonnage necessary / real – 136/353 tones, 316 m length.

On the distance Zalau Nord – Monor Gledin were none problems recorded in the train running.

In the railway station Monor Gledin the train arrived on the 16th of October 2013 at 07,50 o'clock where it was received and stationed on line 4 for the passing of the passenger train no. 366-1.

At 08,02 the freight train no. 50473-2 was dispatched to the railway station Rapa de Jos.

On the 16th of October 2013, at 07,30 o'clock the tower wagon DP 58 was dispatched from the railway station Saratel to the railway station Rapa de Jos in the conditions stated by the timetable for the train no. 83282, according to the traffic order no. 59036 from the railway station Saratel, where the personnel from the LC-ELF District Saratel had to participate at the de-energize works of the catenary wire between the railway station Monor Gledin and Rapa de Jos, to perform periodical repair works with heavy track machinery and cleaning of the broken stone prism (RPMG+Ci), according to the telegram no. 210/30th of September 2013 from Closures Command of Traffic Division from the Branch CREIR Cluj.

The tower wagon DP 58 arrived in the railway station Monor Gledin at 08,22 where it was received and stationed at line 3.

The transport of the L and TTR personnel which had to participate at the RPMG+Ci works, respectively the assuring of the function of the transceiver systems was also performed with this

tower wagon, so that in the moment in which it was dispatched from the railway station Monor Gledin to the railway station Rapa de Jos, on the tower wagon was a number of 16 persons.
At 08,32 o'clock the tower wagon DP 58 was dispatched from line 3 from the railway station Monor Gledin to the railway station Rapa de Jos.
After it run a section of about 1100 m in the running of the freight train no. 50473-2 (belonging to SC Unicom Tranzit SA) arose problems in the locomotive wheels adherence, making difficult the running of the entire train. In these conditions the driver stopped the train communicating the movement inspector from the railway station Monor Gledin this fact and that he will continue the running with a reduced speed to the railway station Rapa de Jos, after taking the necessary measures for the start (sand distribution of the line).
Stationing in the area the section X2AD from the command desk from the movement office of the railway station Monor Gledin indicate "OCCUPIED" on the track diagram, the movement inspector from the railway station Monor Gledin performed the entry route and stabling on line 3 for the tower wagon DP 58.
After the release of the section X2AD by the freight train no. 50473-2, the movement inspector from the railway station Monor Gledin contacted the driver of that train which confirmed that the train continued the running to the railway station Rapa de Jos.
In this conditions, at 08,32 o'clock, the movement inspector from the railway station Monor Gledin could perform the exit route from line 3 and the dispatch to the railway station Rapa de Jos for the tower wagon DP 58.
At around 08,40 o'clock, at km 33+300 between the railway station Monor Gledin and Rapa de Jos, the tower wagon DP 58 caught up and violent buffered the last wagon from the freight train no. 50473-2 (belonging to the railway railway transport operator SC Unicom Tranzit SA) which was at 110 m after the BL6 signal.

After the occurrence of this accident the railway traffic was not affected.

There were no damages at the line

The accident did generate serious injuries at a number of 13 persons.



Following the notification of this railway accident, made according to the provisions of the specific regulations, at the accident place presented the specialists of OIFR, Romanian Railway Safety Authority, and representatives of the public railway infrastructure manager CNCF „CFR" SA and the railway transport operator SC UNICOM TRANZIT SA.

According to the classification of the accidents stipulated in the *Investigation Regulation for the investigation of accidents and incidents, development and improvement of railway safety on the railway and the metro network in Romania*, the collision between the two trains and which had as

result the serious injury of 13 persons is defined as **serious railway accident,** according to the **art. 7, point (2), letter a.**

### *C.2. Accident circumstances*

#### *C.2.1. Involved parties*

The involved personnel belongs to CNCF "CFR" SA – Branch CREIR Cluj, SC ELECTRIFICARE CFR SA, SC Intretinere Mecanizata a Caii Ferate SA, SC TELECOMUNICATII CFR SA and SC UNICOM TRANZIT SA.

The tower wagon involved in the railway accident is property of SC ELECTRIFICARE CFR SA, the repairs and maintenance of it being assured by own employees.
The infrastructure involved, respectively the current line Monor Gledin – Rapa de Jos is administrated by CNCF „CFR" SA – Branch CREIR CLUJ and is maintained by the employees of the Lines District Sieu from the L8 Section Bistrita.
The signaling installations from the running section Saratel – Deda are administrated by CNCF „CFR" SA and maintained by the employees of Branch CREIR Cluj.
The freight wagon from the train, involved in the railway accident is owned by the railway transport operator SC UNICOM TRANZIT Bucuresti SA, the repairs and maintenance of it being assured by own employees.
The communication equipment from the locomotive is owned by the railway transport operator SC REGIOTRANS SRL Brasov and maintained by its employees.
The communication equipment from the involved locomotives are owned by SC UNICOM TRANZIT Bucuresti SA and id maintained by its employees.

#### *C.2.2.The consist and the equipments of the train*

The freight train no. 50473-2 was consist of: 20 wagons (loaded with iron waste), 80 axles, 1362 brut tonnage, 912 net tonnage, automatic braked tonnage necessary/real – 681/856 tones, hand braked tonnage necessary / real – 136/353 tones, 316 m length and was hauled by the locomotive EA 179 (belonging to the railway transport operator SA UNICOM TRANZIT SA).
The locomotive was droved and deserved by the locomotive employees belonging to SC UNICOM TRANIT SA.
The vigilance and safety device (DSV) and the INDUSI from the hauling locomotive were active and functioned instructionally and the automatic brake was active.
The freight train no. 48924 was composed from the tower wagon DP 58 belonging to LC – ELF District Saratel.

#### *C.2.3. Presentation of the railway equipments involved in the accident*

##### *C.2.3.1 Lines*

The involved railway infrastructure, respectively the railway line is managed by CNCF „CFR" SA – Branch CREIR CF Cluj, being maintained by Line District SIEU – L8 Section Bistrita.

- in the area of the accident occurrence (km 33+003) the track is in curve with a radius of R=345 m;
- abundant vegetation on the track embankment, especially on the right side in the running direction, hindering the visibility of the signals;

- after the occurrence of this accident were non damages recorded at the line.

The profile in length where the accident occurred is on an area with a declivity of 2‰ (ramp in the running direction of the train.

*C.2.3.2 Installations*

The traffic from the railway station Monor Gledin to the railway station Rapa de Jos is based o BLA.

- BL6 signal was off;
- the bulbs red and back-up red were burned;
- the red fire was fed with 11 V tension;
- the yellow bulb was broken;
- the green bulb was intact;
- after the accident occurrence were no damages recorded at the SCB installations.

*C.2.3.3 Rolling stock*

Technical characteristics of the tower wagon DP 58:

- distance between the buffer faces: 10.240 mm;
- distance between the axles: 5.000 mm;
- wide (in the transport position): 3.000 mm;
- maximum height, without technological equipment: 4.650 mm;
- wheels diameters with flange: 646 mm;
- number of driving axles: 2 buc.;
- maximum running speed: 60 km/h;
- diesel engine power: 135 CP;
- loading capacity: 1,5 tones;
- **maximum number of persons which can be transported in the cab, beside the driver 9 persons**;
- weight, without technological equipment: 13,5 tones;
- maximum admitted load on the axle: 7,5 tones;
- rotation angle of the platform: 360°


**Photo no. 5: The derailed tower wagon DP 58**

*C.2.4 Communication means*

The communication between the driver and the movement inspectors was ensured through radio-telephone equipments.

*C.2.5. Start of the railway emergency plan*

Soon after the railway accident, the intervention plan for the removal of the damages and for the restoration of the traffic was made in accordance with the information flow stipulated in the Investigation Regulation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety, approved by the Government Decision no. 117/2010, according which, at the accident place came the representatives of the railway public infrastructure administrator CNCF „CFR" SA, of the railway transport operator SC UNICOM TRANZIT SA and of the Romanian Railway Authority – AFER.

***C.3. Accident consequences***

*C.3.1. Fatalities and injuries*

After this railway accident were no dead, but 16 persons which were on the tower wagon were injured.
The injured persons belonged as follows:

| | |
|---|---|
| - L8 Section Bistrita | 9 persons; |
| - SC ELECTRIFICARE SA, LC – ELF District Saratel | 4 persons; |
| - SC TELECOMUNICATII CFR SA | 2 persons; |
| - SIMC Cluj | 1 persons. |

From the 16 injured persons, 3 refused the hospitalization, having superficial wounds.
The rest of the persons were transported at the hospitals from the towns Bistrita and Targu Mures.

*C.3.2. Material damages*

- at the tower wagon: 1.786,57 lei

according to estimation no. 2/4/2/1/163 D/2013 from SC ELCTRIFICARE CFR SA – Electrification Centre Dej;

- at the involved wagon: 1.008,48 lei

according to estimation no. 1570/05.11.2013 from SC UNICOM TRANZIT SA;

- at lines: VACAT

according to estimation no. 814/136/2013 from L8 Section Bistrita;

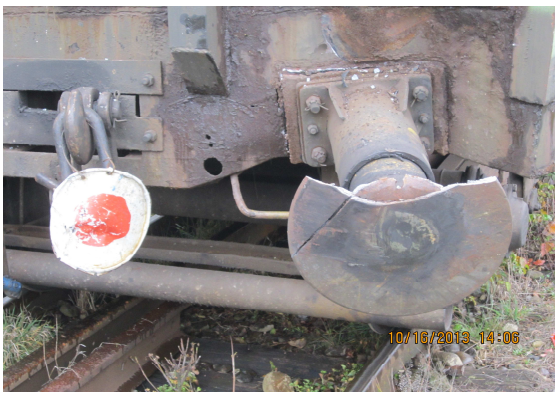
- at environment: none;
**Total:** **2.795,05 lei.**

*C.3.3. Consequences of the accident in the traffic*

Following of the accident occurrence happened the derailment of the second axle of the tower wagon DP 58 were recorded damages of the rolling stock, injured persons, perturbations in the railway traffic as follows:
*Closed lines:* the current line between the railway stations Monor Gledin and Rapa de Jos was closed on the 16th of October 2013 from 09,07 o'clock until 16,02 o'clock.

*Delayed trains:* Following of this accident occurrence was recorded one delayed train. The freight train no. 50473-2 was stopped, following this accident occurrence, in the railway station Rapa de Jos, and was dispatched with a delay of 1.085 minutes.

*Damages at wagon no. 3535304679-0, the last from the freight train no.50473-2:*




- the headstock was deformed in the buffers fixing area;
- approximatively a third from the buffer of the right side in the running direction was broken, the rupture being new.

*Damages at the tower wagon DP 58*


- the front left buffer was fallen;
- the front right buffer gear was damaged;
- the headstock was damaged;
- the front bogie solebar was deformed;
- the front protection hand rail was deformed;
- the front headlamp was broken;
- pantograph was moved and broken from welding;
- the suspension spring from the back had the main leaf broken;
- the diesel engine was moved;
- the driving belts from the compressor and ventilator were broken;
- the front windows were broken;
- journal cross from the gear box to the gearing-down device was torn from coupling;
- the rollers which assured the rotation of the platform were damaged;
- two guiding rollers from the tower were broken;
- the protection net of the tower was dislocated;
- the fastening system of the working bench from the back platform had the screws broken;
- the banks from the rear platform were broken from the fastening system.

### *C.4. External circumstances*

On the 16th of October 2013, at the time of the accident occurrence, the visibility was of 2,500 m (clouded sky), without wind and the temperature was of $+10^0$ C.

The visibility of the passing light signals from the automatic line block was not in accordance with the provisions of the specific regulations in force.

### *C.5 Investigation course*

*C.5.1 Summary of the involved staff testimonies*

- **The movement inspector** on duty from the railway station Monor Gledin, stated:
- the freight train no. 50473-2 departure from the station from line 4 to the railway station Rapa de Jos;

- the driver of the freight train communicate through TF station that he has adherence problems and because of that he didn't performed the passing route for the train no. 48924 (tower wagon);
- after the release of the section BLA – 2 AD he contacted through RTF station with the freight train driver which communicate him that he is continuing the running;
- at 08,32 o'clock the tower wagon was dispatched from the station with Y III light green signal;
- at around 08,40 o'clock he was advised through mobile telephone that the train no. 50473-2 was caught-up by the tower wagon, existing injured persons;
- he advised the traffic controller operator and the station manager;
- at the hour of the accident occurrence was no fog in the railway station Monor Gledin.

- **The movement inspector** on duty from the railway station Rapa de Jos, stated:
- at 07,56o'clock he got the departure order for the train 50473-2 from the railway station Gledin;
- at 08,32 he got the departure order for the train 48924 from the railway station Monor Gledin;
- at around 08,40 o'clock he was advised by the movement inspector from the railway station Monor Gledin, through the local installation, that the tower wagon buffered in the back the freight train 50473-2;
- he contacted through mobile phone [redacted] which asked him to call the emergency services at 112, because he and the others from the tower wagon are seriously injured;
- the RTF station from the railway station was defect from the 15th of October 2013;
- he went to the heavy track machinery which were on line 4 and through the RTF station from the heavy track machinery he communicated the driver from the train 50473-2 that he remains at the entry signal, being buffered from the back by the tower wagon;
- the visibility was good, no fog.

- **The driver** which deserved the freight train no. 50473-2 stated:
- he hauled the freight train no. 50473-2 on the route Dej Triaj - Siculeni;
- after the departure from the railway station Monor Gledin he run very bad with the train due the low adherence;
- after the passing of the first passing signal BLA with green light, at about 400-500 m he stopped, he couldn't advance;
- he contacted the movement inspector from the railway station Monor Gledin that he stopped the train and that he will try to continue running after he will put sand on the line;
- all the BLA passing signals met had green light, until the presignal from the entry signal of the railway station Rapa de Jos, which indicate yellow light;
- he stopped in the front the railway station Rapa de Jos which indicate red light;
- he was announced by the movement inspector from the railway station Rapa de Jos that he will stationed there until the arrival of the investigation commission, because he was caught up and buffered by a tower wagon;
- the visibility was good, no fog;
- every time he stopped the train he assured the train against running with the automatic brake.

- **The driver's assistant** from the locomotive of the freight train no. 50473-2 stated:
- he hauled the freight train no. 50473-2 on the route Dej Triaj - Siculeni;
- the exit signal from the railway station Monor Gledin and all the BLA passing signals had green light;
- they continue running until the entry signal from the railway station Rapa de Jos which indicate red light;

- he was announced by the movement inspector from the railway station Rapa de Jos that he will stationed there until the arrival of the investigation commission, because he was caught up and buffered by a tower wagon;
- he didn't felt the moment of the end-on collision.

- **The driver** from the tower wagon DP 58 stated:
- he departure from the railway station Monor Gledin from line III with free green light exit signal;
- the next signal had yellow indication and for that he reduced the speed;
- the next signal he couldn't observed than from a very small distance because of the abundant vegetation, very dense, due the fog conditions and it didn't had any indication;
- he asked the colleagues from the DP cab if they noticed any indication of the signal, those confirming that it was off;
- he didn't had the rest time before la presentation at duty because he was programmed at the periodical professional examination;
- in the rest period foreseen in the program instruction, between the hours 22,00 – 06,00 o'clock he participated at an interruption between the hours00,20 – 03,40 o'clock;
- it is not foreseen in the regulations to recover the rest hours in the same duty shift in the situation that where it participates in the interruption during the 8 hours of rest;
- there were other intervention cases at interruptions in the time of the rest hours.

- **The electro-driver and the attendant** of the tower wagon DP 58 stated:
- at around 07,10 o'clock DP 58 departed from the railway station Saratel to the railway station Rapa de Jos to perform an de-energizing;
- in the driving cab were another 2 electro-drivers IFTE and another 2 persons from TTR;
- in the railway station Marisel got in another 4 persons from L8 Section Bistrita;
- in the station Sieu got in 2 persons from the L8 Section Bistrita;
- in the station Monor Gledin got in other persons from L8 Section Bistrita;
- they departed from the railway station Monor Gledin to the railway station Rapa de Jos with indication green of the exit signal;
- the first BLA passing signal met had yellow indication, fact which he communicated to the driver;
- the next BLA passing signal couldn't be observed than for about 100-150 m because of the abundant vegetation, of the curve and the fog and that was off, fact which he communicated to the driver;
- the driver braked, but because the rails were wet due the rain the braking was effective and happened the end-on collision with the last wagon from the freight train from the front;
- he was authorized as attendant agent;
- the arrangement of the personnel in DP didn't influenced the correct perception of the BLA signals signification;
- on the route he didn't heard communications on the radio station.

- **The electro-driver III IFTE** stated:
- he was in the cab of the tower wagon, in the back, on the bench and he didn't observed nothing, just felt the shock of the end-on collision;

- **The electro-driver IFTE** stated:
- at the departure from the railway station Saratel, the LC district manager ordered to take with them some workers from the TTR and L Section;
- at the departure from the railway station Monor Gledin the exit signal was on free with green light;
- on the route was abundant vegetation and fog and after a curve he noticed in short the freight train which was stopped;

- the driver braked, but too late and happened the end-on collision of the last wagon from the train;
- the crews from AMBULANCE and SMURD which take care of the wounded.

- **The driver of the heavy track machinery I** from the SIMC Cluj stated:
- he departed with DP from the railway station Saratel to the railway station Monor Gledin and on the route got in the tower wagon other colleagues from the L Section;
- at the departure from the railway station Monor Gledin the exit signal was on free with green light;
- he didn't observed the line nor the indications of the passing signals;
- after the impact he noticed that in front was a freight train;
- after the departure from the railway station Monor Gledin the tower wagon didn't stop until the end-on collision occurrence.

- **The technician** from the SC TELECOMUNICATII SA stated:
- he departed with DP from the railway station Saratel to the railway station Rapa de Jos to repair the defect RTF station;
- at the departure from the railway station Monor Gledin the exit signal was on free with green light;
- after a few minutes he heard screaming the word "the train!" and noticed in front a freight train which was stopped;
- after a few seconds happened the violent end-on collision;
- the wounded were transported to the hospital.

- **The principal technician** from the SC TELECOMUNICATII SA stated:
- at around 07,30 he departed with a colleague with DP from the railway station Saratel to the railway station Rapa de Jos at a derangement;
- on the route the tower wagon stopped in the railway stations Marisel, Sieu and Monor Gledin to take other workers
- at the departure from the railway station Monor Gledin he noticed that the first signal was green, the second was yellow and at the third he didn't paid attention;
- in a curve without visibility the tower wagon caught up a freight train which was running reverse;
- the driver of the tower wagon braked, but the rails being wet the end-on collision couldn't be avoided;
- on the tower wagon were 15 or 16 persons which were injured.

- **The worker maintenance art works I** stated:
- on the 16$^{th}$ of October 2013 he went to the work place with the tower wagon from the railway station Marisel to the railway station Rapa de Jos;
- on the route happened a very strong impact with a freight train caught up;
- after the impact with the freight train he couldn't remember anything.

- **The worker maintenance art works I** stated:
- he got in the tower wagon cab from the railway station Marisel;
- after the departure from the railway station Marisel, in the area of km 15 on the tower wagon got in other 2 colleagues;
- he heard at the RTF station that the driver from the freight tain was noticing that the train is running very slow on the ramp;
- the tower wagon departed from the railway station Monor Gledin with green indication on the exit signal;
- in the area of km 33, at the entry in the curve, he noticed at a distance of about 20/30 m, the rear of the freight train with red disc on the traction hook of the last wagon;

- the persons from the tower wagon cab screamed “freight!” and then happened the end-on collision;
- they were transported at the hospital.

- **Track maintenance foreman** from district L Sieu stated:
- at around 08,30 o’clock, in the railway station Monor Gledin got on the tower wagon platform were where another 4 colleagues;
- when they arrived at km 33+000 he heard a colleague screaming that there is a train in front and “stop!” moment in which happened the end-on collision.

- **Track maintenance foreman** from district L Sieu stated:
- at around 07,30 o’clock, at km 14+900 got on the tower wagon platform to go to work;
- between the railway stations Monor Gledin and Rapa de Jos run on the tower wagon platform with other 4 colleagues;
- at a moment he noticed in short time the last wagon from the freight train and occurred the end-on collision.

- **Track maintenance worker II** stated:
- at around 08,00, he got on the tower wagon platform to go to work;
- when he was on the tower wagon platform with other 3 colleagues, after the departure from the railway station Monor Gledin at the entry in a curve, someone screamed that there is a train in front and immediately after that happened the end-on collision.

- **Tractor driver** from district L Sieu stated:
- he got on the tower wagon from the railway station at around 08,00 o’clock;
- from his place he didn’t had any visibility in front;
- at the moment happened the end-on collision with the freight train and he was thrown on the diesel motor of the tower wagon;
- he stayed there until the arrival of the rescue teams.

- **Track maintenance worker I** stated:
- he got in the tower wagon cab in the railway station Marisel;
- in the current line between the railway stations Marisel and Sieu got on the platform another 2 colleagues;
- after the departure from the railway station Monor Gledin, before with about 300-400 m from the tunnel someone screamed that there is a train in front and immediately after that happened the end-on collision;
- he was transported to the hospital.

- **Track maintenance worker I** stated:
- at around 07,30 o’clock he got in he tower wagon from the current line with another colleague;
- after the departure from the railway station Monor Gledin, in the curve area, before the tunnel, the driver raised from the chair and screamed “train”, moment in which happened the end-on collision with the freight train;
- he couldn’t remember anything until he was put on the stretcher.

- **Track maintenance worker II** stated:
- he got in the tower wagon cab from the railway station Marisel;
- on the route got on the tower wagon other colleagues;
- he didn’t paid attention at the route;
- outside was a rainy, foggy weather;
- in the curve from the area km 33+000, at about 30 m in the front he noticed the rear of the freight train and immediately happened the end-on collision;

- he called through mobile phone the police and ambulance.

- **The Head of the Electrification Centre Dej** stated:
- the tower wagon DP 58 didn't had a running authorization on the public railway infrastructure in Romania;
- the last authorization of the tower wagon DP 58 (series AVF no. 1198/2009) was valid until 26th of October 2010;
- the practical instruction of the tower wagon driver was performed by a person which didn't had adult training methodology course and was not certificated by AFER;
- the management of Branch Electrification Cluj requested the management of SC Electrificare CFR SA, without any result, the authorization of own tower wagons;
- the Confinement Program from LC EA ELF District was made according to the own regulation of SC Electrificare CFR SA;
- the presence on the tower wagon DP 58 of the personnel from the lines happened due the missing of transport means and those necessity to get to the programmed lines works;
- the job duties of the attendant agent were recorded in the job description.

- **The District Head IFTE Saratel** stated:
- he participated with an intervention team with the tower wagon DP 58 and the DP driver [redacted] (employee at the LC EA ELF district office) on the 16th of October 2013 between the hours 00,50 – 04,00 at the repair of a derangement at the IFTE installation;
- he guided on the 16th of October 2013 at around07,10 o'clock his subordinated staff with the tower wagon DP 58 to the railway station Rapa de Jos for technical assistance necessary for the works which had to be performed on the distance Monor Gledin – Rapa de Jos;
- the practical and theoretical instruction of the tower wagon driver and his attendant agent was organized and performed by the specialized personnel from the Electrification Centre Dej;
- he organized after the accident occurrence and the re-railing of this tower wagon, its transportation in the railway station Monor Gledin;
- on the 16th of October 2013 the personnel structure at the district LC EA ELF Saratel was composed from 12 employees from which only 2 drivers and one electro driver I IFTE were authorized to drive an motor coach;
- in the night of 15/16th of October 2013 he participated between the hours 00,10 – 03,40 o'clock at a derangement with the DP driver which was in the rest time foreseen by the Confinement Regulation;
- he didn't had the possibility to replace the driver with another driver at the DP.

- **The District Head SCB Bistrita** stated:
- the periodical inspection of the signals from BLA Monor Gledin – Rapa de Jos was programmed and made at the time intervals foreseen in the Instruction 351;
- with the occasion of the last inspection at the BLA installations between Monor Gledin – Rapa de Jos were no irregularities found at the installation;
- the bulbs from the light BLA signals are replaced at blowning;
- he didn't get any written or oral advice about the visibility of BL 6 signal;
- the visibility of the signal BL6 from BLA Monor Gledin – Rapa de Jos was affected by the abundant vegetation from the area;
- the orally advised about the abundant vegetation the management from L8 Section Bistrita and also the CT Section 2 Dej to take measure.

- **The telecommunications technician** stated:
- for the removal of the derangement from the RTF station from the railway station Rapa de Jos he ordered to the telecommunication [redacted] to go on the 16th of October 2013 with the tower wagon from the railway station Saratel to the railway station Rapa de Jos;

- he ordered the movement with the tower wagon because mornings, on the route Saratel – Rapa de Jos isn't other passenger railway conveyance;
- for the movement to inspections and interventions at derangements was used, according to the schedule, the intervention car from Dej.

*C.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 system, according to the provisions of the Law for 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, no. ASA 09002 – by which Romanian Railway Safety Authority, from Romanian Railway Authority – AFER agrees the acceptance of the safety management system of the railway infrastructure manager;
- Safety Authorization – Part B, no. ASB 09007 – 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 ensure the railway infrastructure safety, in the designing, maintenance and operation, including if case, maintenance and operation of the system for the traffic control and signaling.

At the moment of the accident occurrence, SC UNICOM TRANZIT SA, as railway undertaking had implemented its own railway safety management, according to the provisions of the *Law for Railway Safety* and of the Minister of Transports' Order no. 535/2007 for the approval of the norms for the granting of the railway transport licenses and the safety certificates in order to perform railway transport on Romanian railways, getting:

- License for the performing of passenger and freight railway transport services no. 47/01st of January 2013;
- Safety Certificate – Part A, no. RO1120120031 valid from 27th of December 2012 – by which Romanian Railway Safety Authority, from Romanian Railway Authority – AFER agrees the acceptance of safety management system of the railway undertaking, in accordance with the national legislation;

- Safety Certificate – Part B, no. RO1220130086, valid from 17th of June 2013 – 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 national legislation.

At the moment of the accident occurrence, SC ELECTRIFICARE CFR SA, as authorized economic agent, critical railway services provider, got followings:

- Authorization as Railway Provider series AF no. 4715 released on the 10th of August 2010 valid until the 09th of August 2015, with a valid visa until the 09th of August 2014 for the following activities:
- maintenance, repairs and constructions - mountings for the contact line;
- maintenance, repairs and constructions – mountings for the remote control and energy supply installations;
- maintenance, repairs and constructions – mountings for the energy supply installations;
- planned maintenance and repairs of the tower wagons for electrification;
- electrification installations design;
- measurements and electrical verifications.
- Technical Agreement series AT no. 233 released on the 13th of March 2013 valid until 12th of March 2015 for the current repairs and maintenance works activities for the contact line (LC) from the electrified railways 25 KV, 50 Hz;

- Technical Agreement series AT no. 887 released on the 25th of September 2013 valid until 24th of September 2015 for the accidental repairs and planned accidental repairs at the tower wagons type DP 66 (86) UD, DP, UAM 215 E (MARUB).
- Authorization series AVF no. 1198/2009 released on the 27th of October 2009, with **expired validity** from the 26th of October 2010 for the running of the tower wagon type DP no. 058 on the public railway infrastructure from Romania.

*C.5.3 Norms and regulations. Sources and references for the investigation*

In the investigation of the railway accident one took into account the next *norms and regulations*:

- Railway Technical Operation Regulation no. 002, approved through the Order of the Minister Of Transports, Constructions and Tourism no. 1186 from 29th of August 2001;
- Signaling Regulation no. 004 approved through OMTCT no. 1482 from 04th of August 2006;
- Instructions for the locomotive personal activities in the railway transport no. 201 approved through OMTCT no. 2229 from 23rd of November 2006;
- Instructions for the running of machinery for the construction and maintenance of tracks and contact lines no. 340/2003, approved through OMLPTL no. 1187 from 29th of August 2001;
- Instruction for the technical maintenance and repairs of the contact lines installations from the electrified railway track no. 353/1972 approved through OMTTC no. 230 from 23rd of February 1972;
- Reading from the Instruction for the technical maintenance and repairs for signaling centralizing and block installations (SCB) no. 351/1988 approved through OMTCT no. 342 from 26th of October 2005;
- Norms for the technical verification of the railway vehicles belonging to the economical agents approved through OMT no. 342 from 28th of June 1999.

In the investigation of the railway accident one took into account the next s*ources and references:*

- photos taken soon after the railway accident by the members of the investigation commission;
- documents on the maintenance of the tracks, provided by the persons in charge with their maintenance;
- results of the measurements made soon after the accident at the superstructure and at the derailed tower wagon;
- questionnaires of the employees involved in the accident;
- Minutes and measurements made immediately after the occurrence of the railway accident by the members of the investigation commission;
- examination and interpretation of the technical condition of the elements involved in the accident (infrastructure, railway installations and tower wagon);
- the reading of the BDV Minutes.

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

*C.5.4.1 Data found out on the lines*

***Technical state of the line before the railway accident occurrence***

The end-on collision happened between the railway stations Monor Gledin and Rapa de Jos in current line at km 33+003, because of the caught up and hitting of the last wagon from the freight train no. 50472-2 from the train no. 48924 formed from the tower wagon DP 58.
The line section was in curve with a right deviation with a radius of R = 345 m.
At the date of the railway accident occurrence the track superstructure was made of rails type 60, on wooden sleepers, indirect fastening type K, in active and complete state.
The broken stone prism was complete and not choked.
The line traffic speed was of 70 km/h.

***Findings and measurements made at the line, after the derailment occurrence and the re-railing of the tower wagon***

After the performance of the line measurements with the measuring gauge type "Lugoj" from 2,5 to 2,5 m in 4 measuring points before point "0" which represent the derailment place and in 4 measuring points after that, resulting values on the gauge (E) and the crosslevel (N) recorded in the Minutes.
There were performed measurements at arrow from 20 to 20 m, in points "-4", "0" and "4" to determine the track position in plan, resulting the values recorded in the Minutes.
Also were measurements performed with the rails wear measuring calipers in the points in which were the embankment and the level measured to determine the vertical wear "Uv" and the lateral wear "$U_L$"of the rails resulting the values recorded in the Minutes.
The running direction of the train was from point "4" to point "-4".
From the interpretation of the measured values resulted the fact that in all verified points the embankment values are in the provisions of Article 1, point 13 and Article 19, point 2 from the instructions no. 314/1989 and the crosslevel values are also in the provisions of Article 2, point 2, respectively 19, point 6 from the same instruction.

*C.5.4.2 Data found out on the installations*

The running of the trains on the railway line Monor Gledin – Rapa de Jos is made based on automatic line block (BLA).
After the performed investigations immediately after the accident occurrence were found a series of irregularities at signal BL6, as follows:

- the BL 6 signal was off;
- the bulbs red and back-up red were blown;
- the yellow bulb was broken;
- after the derailment occurrence were none damages at the SCB installations.

The last inspection of BL 6 signal was performed on the 29$^{th}$ of May 2013 with the occasion of the planned periodical inspection and was recorded in the records from the signal box.
The installation was found and let in good functioning condition.

C.5.4.3 *Data on the operation of the rolling stock and its technical equipments*

<u>Findings at the tower wagon DP 58</u>

Because the tower wagon DP 58 was damaged after the violent end-on collision, it couldn't be any test performed on its functioning.

Simultaneously, due the braking of the driving system of the air compressor it couldn't be performed the functioning test of the air brake.

Findings at wagon no. 33535304679-0 end-on collision by the tower wagon

- the frontal rigid structure was deformed in the buffers fixing area;
- approximatively a third from the buffer of the right side in the running direction was broken, the rupture being new.

C.5.5 *Interface man-machine-organization*

The serious accident occurred on 16th of October 2014 in the activity of Branch CREIR Cluj, between the railway stations Monor Gledin and Rapa de Jos, consisting of catching up and end-on collision of the last wagon of the freight train no. 50473-2 by tower wagon DP 58, was due to human error represented by the overcoming of the BLA signal which showed no light indication.

This human error was due to a combination of factors that have affected the tower wagon driver's ability to perceive and interpret the signal indication being modified his vigilance and the reaction time. Impairment of these abilities was due to a pronounced fatigue, while the tower wagon driver was working in the Confinement Regulation at the workplace. The Confinement Regulation shift work requires a 24-hour periods of work, in which thee work and rest periods succeed so: 4 hours of activity between the hours 18 and 22, followed by 8 hours of continuity sleep in the interval 22 – 6 and 12 hours of activity in the range 6-18. The driver's fatigue can be explained by the fact that during sleep continuity was interrupted by the need to travel to a intervention between the hours 23.50 - 4.00 and in addition, the driver entered the shift at 18 o'clock after participating in the periodical professional checking that was scheduled in the CENAFER Cluj. The driver has not received the rest period required to restore physical and mental capacities before participating in the work of de-energizing the catenary between the railway stations Monor Gledin and Rapa de Jos, for the performing of periodical repair works with heavy track machines and sifting the broken stone prism, works scheduled for the day.

Failure the natural alternation of work and rest periods was determined by the impossibility of the head of the district which was unable to assure replacement staff for the tower wagon driver. The personnel structure of District LC.EA-ELF Saratel includes two tower wagon drivers, one electro-driver I, authorized the tower wagon driver and head of the district, also authorized as a tower wagon driver. At the time of the accident the tower wagon driver involved in the accident and the head of the district entered the shift immediately after returning from periodical professional checking, replacing their off-duty driver and the fourth tower wagon driver didn't promote the exam from CENAFER and therefore could not be required as tower wagon driver.

Personal situation of the District and the need to participate in the de-energize work of the line voltage, previously scheduled have determinate the head of the district to use the tower wagon driver, although it does not perform any hours of sleep provided the Confinement Regulation in the workplace.

It should be noted that the intervention works that took place between 23.50 - 4.00 only attended only the head of the district and the tower wagon driver involved in the accident, which caused physical and mental exertion of these human operators.

Another factor which contributed to pass BL6 signal was the lack of visibility of the signal, due to the absence of an light indication of its, combined with the presence of abundant vegetation around the signal. In the tower wagon was a large number of human operators, consisting both district staff Saratel and lines staff that run with the tower wagon because the tower wagon drivers belonging to the lines districts were also programmed at the periodical professional checking at CENAFER,

being unable to operate. The large number of human operators being in the tower wagon (16 people) and strong background noise of the tower wagon system lowered the vigilance of the driver and the attendant agent, so they later noticed that the signal is not present light indications. In addition, the tower wagon driver's fatigue and a state of confusion created by the absence of a light indications of the BL6 signal extended the time required for processing the information collected and the reaction time, so that it has initiated braking maneuver too late and could not avoid impact of the freight train, which was traveling difficult, being at a distance of 110 meters after the signal.

The lack of good communication between the organizations involved in the professional checking of the railway staff on the need to adapt the examination program at the schedules of the periodical repairs work of the lines represent an organizational deficiency, as it reduces the number of staff available to provide tour in the Confinement Regulation. This situation added to the fact that the personnel structure of the district LC.EA-ELF was minimal and did not allow replacing the tower wagon driver to allow time for rest and to face unforeseen circumstances, such as the one described above. Enhanced fatigue status of the tower wagon driver led to reduced mental and physical capacity of the human operator, who could not perform the task work in safety conditions.

## C.6 Analysis and conclusions

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

Taking into account the findings presented in the chapter C.5.4, Functioning of the technical installations of the infrastructure, one can state that the technical condition of the lines and installations could not influenced the derailment.

### *C.6.2 Conclusions on the technical condition of the railcar from the train*

The tower wagon type DP no. 58 has the AUTHORIZATION series AVF no. 1198/2009 valid until the 26th of October 2010, having the **validity period expired.**

The technical state of the rolling stock could not influence the accident occurrence.

### *C.6.3 Analysis and conclusions on how the accident occurred*

*a) Referring to the conditions in which the tower wagon DP 58 run between the railway stations Monor Gledin and Rapa de Jos*

On the 16th of October 2013, at 08,32 the movement inspector from the railway station Monor Gledin dispatched the tower wagon DP 58 from line 3 to the railway station Rapa de Jos, as train no. 83282.

The regulatory framework on how the running of the heavy track machinery for the contact line is made, respectively the Instructions for the running of the machinery for the track and line contact construction and maintained nr.340/2003 approved by OMLPTL no. 1187 of 29th of August 2001, providing in Article 13 that their running is based on a free track.

They are contrary to the provisions of Art. 208, paragraph (3) of the Regulation for the running of trains and railway vehicles maneuver no. 005 approved by OMTCT no. 1816 of 26th of October 2005, which states that running can be made at the sector block after a train that shunts safely.

Speedometer of a tower wagon driving cab did not work, which is why tower wagon driver could not know exactly with which speed he was running.

The route track was curved, and signals visibility was affected by abundant vegetation.

In the tower wagon driving cabin was noise of engine operation.

BL6 signal units had all the lights off.

Prior to the dispatch of the tower wagon was dispatched the freight train no. 50473-2, which was stopped by the driver through the locomotive wheel adhesion problems, arising from the accumulation of the effects given by the line ramp, the train tonnage, and resistances due moisture

on the running surface of the rails. The last wagon of the train is at a distance of about 110 m after the signal BL6 which had all lights off.
At the time of the accident the driver who drove the tower wagon did not receive rest periods provided in the Rules for staying at the workplace.
All these aspects have made tower wagon driver noticing BL6 signal with delay and the fatigue prolonged the time required for a decision on stopping the tower wagon.

*b) Referring to the authorizing of the attendant agent of the tower wagon*

According to Article 6, paragraph 1 of the Instructions for the running of machinery for the track and catenary construction and maintenance no. 340/2003 on the tower wagon was an attendant agent.
Article 11, paragraph 2 of the Instructions for the running of machinery for the track and catenary construction and maintenance no. 340/2003 states that the accompanying the authorized attendant agent must be trained, examined and authorized as attendant agent, according to the regulations in force.
The Investigation Commission found that the authorized attendant agent is not provided in OMTI no. 815/2010, Annex 2 which lists the functions of traffic safety responsibilities that form, qualify, refine and periodical professional check at CENAFER and there are no other regulations that determine how should be trained, examined and licensed the attendant agent of the tower wagon.

*c) Referring to consignment at the working place of the workplace of the staff on duty*

In Annex 1 of the Disposal no. 1/2010 of the General Director of SC ELECTRIFICARE CFR SA, which includes the Regulation for the consignment at the working place of the staff on duty from SC ELECTRIFICARE CFR SA, is not foreseen the way in which is assured the authorized personnel for driving the tower wagons in the case the rest period is interrupted.

After analyzing the findings found at the accident occurrence place, the technical state of the infrastructure and the involved rolling stock, also from the testimonies of the involved employees, one can conclude that the accident occurred due a human error.

## D. ACCIDENT CAUSES

### *D.1. Direct cause, contributing factors*

***Direct cause:***

***The direct cause*** of the occurrence of this serious accident is the failure to stop the tower wagon DP 58 which run on the available train path of the freight train no. 48924, at signal BL 6 from BLA Monor Gledin – Rapa de Jos which, being on danger, fact which led to the overtaking and the hitting of the rear wagon from the freight train no. 50473-2, the derailment of the tower wagon from the second axle in the running direction and the injury of a number of 16 persons from the tower wagon.

***Contributing factors***

- the abundant vegetation existent in the area of the entry color light signal of the automatic line block BL 6, which stopped its visibility;
- the technical state of the color light signal BL 6 which had the bulb burned out and at the back up red signal light;
- the enhanced fatigue of the driver, generated through the fact that he was working under the confinement at the working place, in conditions in which he hadn’t the resting time foreseen in the Confinement Regulation and neither that foreseen between two successive presences on duty;

- the noninsurance at District LC – EA – ELF Saratel of the optimal number of posts for the position driver tower wagon, fact which led to the uncovering of the necessary authorized employees, even though the adopted confinement regime.

***D.2. Underlying cause***

None respecting the provisions of art. 89, paragraph (1) and paragraph (2) from the Signaling Regulation no. 004/2006 referring to the driver's obligations in the case he's meeting an off passing light signal of the automatic line block.

***D.3. Root causes***

- the inconsistency between art. 13, paragraph (1) from the Instruction 340/2001 (according to which the guiding and the traffic UAM is made based on free track) and art. 208, paragraph (3) from the Regulation 005/2005 (according to which UAM can be dispatched after a train which is shunting safe – at a block sector);
- the lack of provisions from the Confinement Regulation referring to the assuring of the authorized personnel to drive the tower wagons after the interventions which are interrupting the rest period

**E. ADDITIONAL OBSERVATIONS**

During the investigation was found a deficiency, but without relevance for the conclusions of the causes, as follows:

- the use of the tower wagon DP 58 with the validity period of the AVF authorization expired.

**E. SAFETY RECOMMENDATIONS**

- completing the regulation frame with provisions referring at the training, examination and authorization mode of the accompanying agent of the tower wagon;
- completing the *Confinement Regulation* with provisions referring to the authorized personnel assuring for driving the tower wagon after the interventions which interrupted the rest period;
- correlation of the provisions from the Instruction 340/2003 and those from the Regulation 005/2005 referring at the guiding and traffic of the UAM.

***This Investigating Report will be transmitted to the Romanian Railway Safety Authority, to the public railway infrastructure administrator CNCF „CFR" SA, SC ELECTRIFICARE CFR SA, SC TELECOMUNICATII SA, SC Intretinere Mecanizata a Caii Ferate SA and to the railway transport operator SC UNICOM TRANZIT SA.***

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