MINISTRY OF TRANSPORTS AND INFRASTRUCTURE
ROMANIAN RAILWAY AUTHORITY - AFER

ROMANIAN RAILWAY INVESTIGATING BODY

INVESTIGATING REPORT

on the fire occurred at the locomotive DHC 80-0152-1

belonging to SNTFC "CFR Calatori" SA, in the running of the train no. 3008, on the current line II Chitila – Bucharest North Gr. B at the km 2+100, on the 24th of December 2010

Final EDITION

The 21st of February 2011

NOTICE

With reference to the accident consisting of a fire in the cabin of the locomotive DHC 80-0152-1, occurred on the 24th of December 2010 in the running of the train no. 3008, that had in the end the concerned locomotive, in current line wire II Ploiesti Sud – Bucharest North Gr. B, between the railway stations Chitila-Bucharest North Gr. B, at km. 2+100, 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 take 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 21st of February 2011

Approved by

Dragoş FLOROIU
Director

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

Chief Investigator
Sorin COSTANTINESCU

This approval is part of the Report for the investigation of the accident occurred on the 24th of December 2010, on the range of activity of CF Bucharest Regional Branch and of Passengers Railway Transport Bucharest Regional, in the running of the train no. 3008 belonging to SNTFC "CFR Calatori ", on the running section Chitila – Bucharest North, current line II (double line electrified), at Km 2+100, consisting of a fire at the locomotive DHC 80-0152-1.

CONTENT

I. PREAMBLE

I.1. Introduction

The fire occurred on the 24th of December 2010 in the running of the train no. 3008 at the locomotive DHC 80-0152-1 (structural subsystem-railway vehicle), placed at the end of the train, is an accident according to the art. 7, paragraph (1), letter e) from the ***Regulations for the investigation of the accidents and incidents, for the development and improvement of Romanian railway and subway safety***, approved by Government Decision no. 117/2010, hereinafter referred as "***Regulations"*** in the investigation report.

Taking into account those above mentioned and according to the art. 19, paragraph (2) from the *Law no. 55/2006 on the railway safety*, corroborated with the art. 48, paragraph (1) and art. 52, paragraph (1), letter c) of the ***Regulations***, an investigation commission was appointed by Romanian Railway Investigating Body.

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.

I.2. Investigation process

Immediately after the occurrence of this accident, Romanian Railway Investigating Body was notified operatively by the Emergency Service 112 of ASFR and in written by CN CF "CFR" SA about it. After moving to the place of the accident, it observed:

- the isolated locomotive DHC 80-0152-1, running at the end of the train no. 3008 from Ploiesti Sud to Bucharest North Gr. B, was stopped in current line II (km 2+100) between the railway stations Chitila and Bucharest North Gr. B;
- the inside of the locomotive driving cabin was affected by the fire;
- the electric installation in the locomotive driving cabin destroyed by burning;
- the line and the installations were not affected in the area of the accident.

There were no deaths or injuries.

At the accident place were present the representatives of:

- Inspectorate for Emergency Situations "Dealul Spirii" of Bucharest, Intervention Group no. 1 – Section Grozavesti ;
- Operative Department of Railway Transports Police;
- Romanian Railway Safety Authority;
- National Railway Company "CFR" SA;
- National Passenger Railway Transport Company "CFR Calatori " SA.

Through the Decision no. 42 from the 27th of December 2010, of OIFR Director, according to the provisions of the art. 19, paragraph. (2) of the *Law no. 55/2006 on railway safety*, corroborated with the art. 48(1) and the art. 52, paragraph 1, letter c) of ***Regulations***, the investigation commission was appointed, consisting of:

- Marin DRĂGHICI – investigator - main investigator
- Mircea NICOLESCU – investigator - member
- Adrian SON – Central Inspector SC – SNTFC „CFR Calatori" SA - member
- Mircea DUMITRESCU – Regional Inspector SC – RTFC Bucharest - member
- Viorel CATANESCU – Regional Inspector SC, RCF Bucharest Branch - member

A. BRIEF PRESENTATION OF THE ACCIDENT

A.1. Brief presentation

On the 24th of December 2010 the train no. 3008, that ran on the section Ploiesti Sud – Bucharest North Gr. B, with the locomotive DHC 80-0152-1 at the end, after passing through the railway station Chitila, running on the current line II towards the railway station Bucharest North Gr. B, at the km 2+100, a fire occurred in the engines box (big hood), on the left in the running direction, and expanded to the driving cabin.

To localize and extinguish the fire the locomotive driver serving the DHC 80-0152-1 and the guard Tache Adrian intervened. Because the fire has amplified, the guard called 112 asking for the intervention of the Inspectorate for Emergency Situations, the fire being extinguished by the military firemen belonging to the Inspectorate for Emergency Situations "Dealul Spirii" of Bucharest, Intervention Group no. 1 – Section Grozavesti at 10:30p.m. The intervention of the firemen necessitated closing the current lines I and II and de-energizing the contact lines on these.

The locomotive DHC 80-0152-1, running at the end of the train 3008, belongs to SNTFC "CFR Calatori" SA and was driven/served in simplified regime by the locomotive driver employee of Ploiesti Locomotive Depot.

The place of the accident is located in the area of the Km. 2+100 on the current line II Chitila – Bucharest North Gr. B, on line arranged in alignment and level, with rail type 60, sleepers BA type T17, path without joints, electrified line.
The area of the railway accident is located on the running section Ploiesti Sud – Bucharest North Gr. B, belonging to CNCF "CFR" SA - CF Bucharest Regional Branch.

A.2. Causes of the accident

A.2.1. Direct cause

The fire was initiated by the auto-ignition of the wiring insulation of the electric circuit between the dynastarter and the accumulator batteries under the conditions of operating in overload, its propagation being realized by the burning of the residual fuel deposits.

Contributing factors

The advanced sulfation and the short-circuited elements at the accumulators battery pack (type Magma), mounted in inhomogeneous composition as follows (box no. 1 – 515/**2005**, box no. 2 – 515/**2005**, box no. 3 – 515/**2005**, box no. 4 – 515/ **2005**, box no. 5 – 415/**2005**, box no. 6 – 077/**2005**, box no. 7 – 445/**2003**, box no. 8 – 167/**2003**).

A.2.2. Underlying causes

It was not complied the cycle of mandatory repairs and inspections at the locomotive, according to the provisions of the Railway Norm "Railway vehicles. Inspections and planned repairs" no. 67-005 from 2008 approved by OMT no. 364/2008, (the locomotive was due to repair type RG since May 2004, occasion on which the inappropriate wiring should have been change, the cleaning and repainting of

the hidden parts should have been performed, inclusively the mounting of a new accumulators battery pack).

A.2.3. Root causes

None.

A.3. Severity level of the accidents

According to the provisions of the ***Regulations***, the event is categorized as accident, according to the provisions of the art. 7, paragraph (1) letter e.

A.4 Safety recommendations

The safety recommendations aim to solve the next issues:

1. Inclusion in the Normative of Works of regular checking of the insulation capacity of the load cables and of the connections between the accumulators boxes, after performing the operations provided in the technological processes of maintenance and operation of the accumulators batteries for the locomotives with repair terms exceeded.

The addressees of the safety recommendations are: Romanian Railway Safety Authority and the National Passenger Railway Transport Company "CFR Calatori" SA Bucharest.

This investigation report will be sent to Romanian Railway Safety Authority, the National Passenger Railway Transport Company "CFR Calatori" SA and to the National Railway Company "CFR" SA.

B. <u>INVESTIGATING REPORT</u>

B.1. Description of the accident

On the 24th of December 2010, the train no. 3008, running on the section Ploiesti Sud – Bucharest North Gr. B, towed with the locomotive EA 892, being composed of 6 coaches and the locomotive DHC 80-0152-1 at the end, leaves from Bucharest Triaj h.c. at 8.56p.m. in the direction of the railway station Bucharest North Gr. B.

At 9.01p.m. the locomotive driver of the train 3008, who drove the locomotive EA 892, noticed a sudden decrease of the air pressure in the general pipeline, reason for which he took actions of quick braking the train and he stopped the train at the km. 2+100, thinking that the alarm had been switched on at one of the coaches in the composition of the train. When he contacted the guard, this one told him that the alarm had been switched on from the locomotive DHC 80-0152-1.

The locomotive driver who was serving the locomotive DHC 80-0152-1, noticed smoke release in the engine box (big hood), area of the dynastarter, on the left in the running direction, that had quickly spread towards the batteries niche and inside the cabin.

The driver of the locomotive DHC 80-0152-1 tried to localize the fire with the fire extinguishers in the equipment of the locomotive and together with the guards using 6 fire extinguishers associated to the train.

In the meantime the guard untied the locomotive DHC 80-0152-1 from the end of the train and together with the driver of the train 3008 distanced the train 3008 in order not to be affected by the fire.

The intervention plan of rescue and emergency services

- given the fire expansion there was called by the CFR staff of the train, around 9:15 p.m., the unique emergency number 112 asking for the intervention of the Inspectorate for Emergency Situations after untying the locomotive from the train;

- at 9:13p.m. was announced by the IDM in the railway station CFR Bucharest North the railway energy dispatch Bucharest (DEF), to interrupt the voltage in the contact wire and at 9:37 p.m. was reported the de-energizing of the contact line Chitila – Bucharest North;

- the arrival at the place of the accident of the intervention teams ISU happened according to the train CFR staff reports around 9:30 p.m.;

- at 9:15 p.m., the DEF dispatcher ordered to the District LC Bucurestii Noi to direct the pantograph trolley belonging to SC ELECTRIFICARE CFR SA and at 9:16 p.m. asked to the RC operator its inclusion in traffic;

- at 9:46 p.m., the pantograph trolley left from the railway station CFR Bucurestii Noi and arrived in current line, at the km. 2+100, at 9.54 p.m. and at 10:08 p.m. was reported the mounting of the protection shorts on all the de-energized wires, being possible starting with 10:10 p.m. the intervention of the military firemen;

- following the intervention, the fire was extinguished by the staff belonging to the Inspectorate for Emergency Situations "Dealul Spirii" of Bucharest, Intervention Group no.1 – Section Grozavesti; the fire extinguishment procedures lasted until 10:30 p.m., after about 90 minutes after initiation;

- at 10:44 p.m., was reported the end of the works by the staff on duty on the pantograph trolley and at 10:46 p.m., the DEF dispatcher re-energized all the contact lines;

- at 10:51 p.m. were reopened to railway traffic the lines I and II Bucharest North – Bucurestii Noi, the lines I and III Bucharest North – Chitila, the line 700 Bucharest North – H.M. Pajura, the line 800 Bucharest North – Rac. Pajura.

At 10:46 p.m. the locomotive DHC 80-0152-1 arrived at the railway station Bucharest North Gr. B, being towed with locomotive aid.

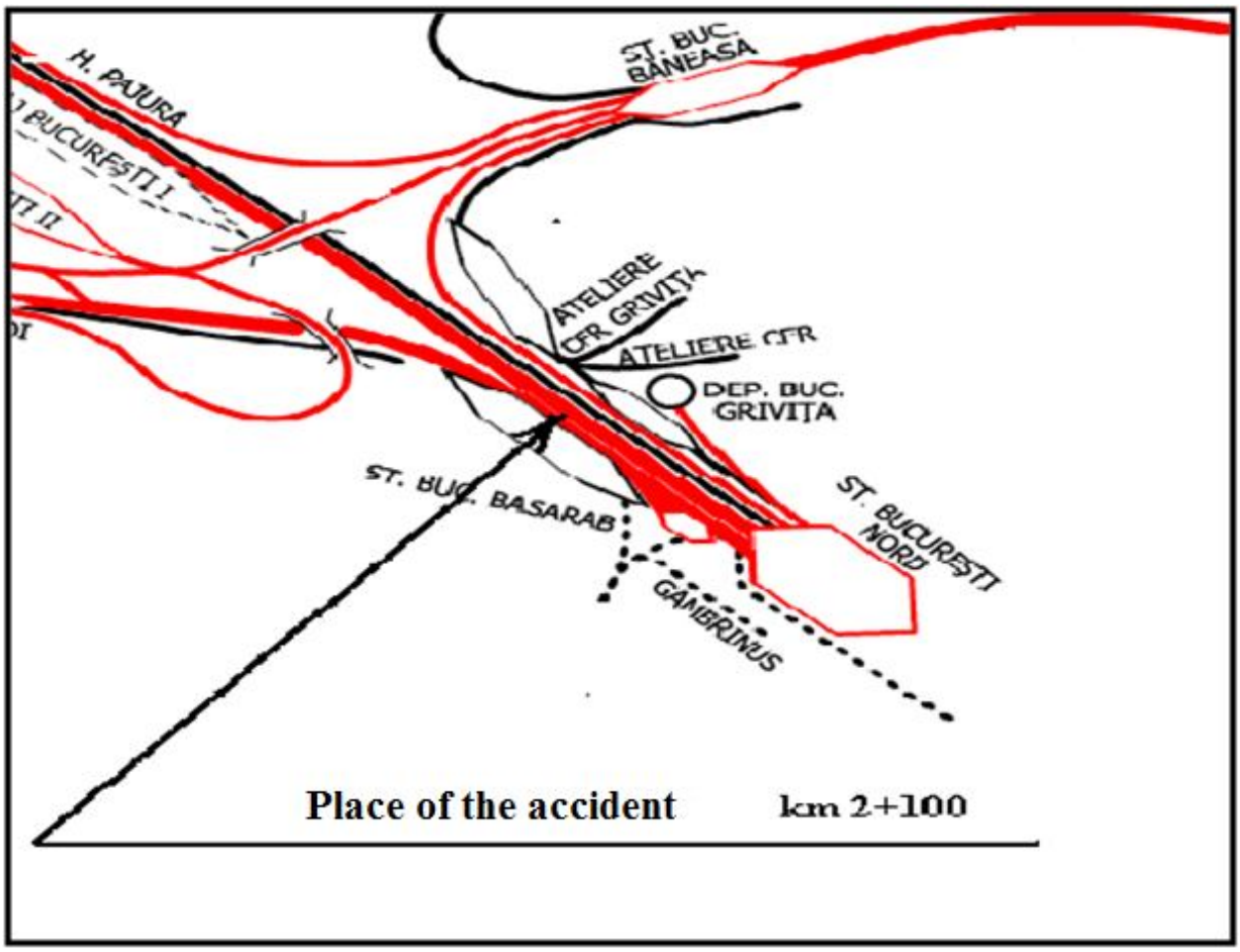
No injuries.

Place of the accident and the locomotive condition after the fire extinguishment

The current line II Chitila – Bucharest North is electrified and the trains circulation is made in the system of automatic line block (BLA).

The place of the accident is located in the area of the Km. 2+100, on the line II Chitila – Bucharest North, on line in alignment and level, with rail type 60, sleepers BA type T17, path without joints, electrified line.

Geographical location of the accident



Condition of the locomotive, at the place of the accident, after the fire extinguishment

Fire effects

Photo 1

Thermal effect of the fire in the batteries pack niche left side of the locomotive (Photo 1)

Fire effects on the equipment of command, indication and protection in the driving cabin seen from the right side of the locomotive; (Photo 2)

Photo 2

B.2. The accident circumstances

B.2.1. Involved parties

2.1.1 The involved staff belongs to SNTFC "C.F.R. Calatori "- S.A, Passenger Transport Regional Bucharest, Ploiesti Locomotive depot.

2.1.2 The locomotive DHC 80-0152-1 is the property of SNTFC "C.F.R. Calatori "- S.A. and is maintained by the staff belonging to Ploiesti Locomotive Repair Section, belonging to SC "CFR – SCRL Brasov" SA.

2.1.3 The railway infrastructure on which the accident occurred belongs to CN CF "CFR" SA and is maintained by the staff of Section L2 Bucharest.

The investigation commission questioned the employees involved in driving/serving the involved locomotive and took statements from the locomotive driver and the party of the train 3008.

B.2.2. Forming and equipment of the train

The train no. 3008 was towed with the locomotive EA 892 and was composed of 6 coaches and the locomotive DHC 80-0152-1 at the end, the driving being provided in simplified system, only by locomotive driver, and the locomotive DHC 80-0152-1 was served by team in simplified system, only by locomotive driver.
The locomotive DHC 80-0152-1 belongs to the railway undertaking SNTFC "CFR Calatori" SA.
The safety and vigilance equipment (DSV), the equipment for the point control of the speed and hitchhiking (INDUSI) of the locomotive equipment were affected by the fire.

B.2.3. Railway equipments

The involved railway infrastructure, respectively the running line II between the railway stations Chitila and Bucharest North, is managed by CN CF "CFR" SA – CF Bucharest Regional Branch and is maintained by staff of Section L2 Bucharest.

Installations signaling, centralization and blocking (SCB) between the railway stations Chitila – Bucharest North are managed by CN CF "CFR" SA – CF Bucharest Regional Branch and is maintained by staff of Section CT 1 Bucharest.

The installation of railway communications from the railway stations Chitila and Bucharest North Gr. B is managed by CN CF "CFR" SA and maintained by staff belonging to SC TELECOMUNICATII CFR S.A.

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

The installation of railway communications on the involved locomotive is the property of SNTFC "CFR Calatori" SA and maintained by staff belonging to Ploiesti Locomotives Repair Section, belonging to SC "CFR – SCRL Brasov" SA.

B.2.4. Means of communications

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

B.3. Accident consequences

B.3.1. Deaths and injuries

None.

B.3.2. Material damages

Total damages from the accident were 82 663.23 lei, divided as follows:

- at the locomotive, according to the estimate no. 14/2010 of SNTFC "CFR Calatori " SA, Bucharest Regional Passenger Transport amounted to 80 915.20 lei;
- train delays, according to the estimate no. 123/17/2011 of SNTFC "CFR Calatori " SA, Bucharest Regional Passenger Transport amounted to 1 748.03 lei ;
- at the lines – none;
- at the installations – none;
- at the environment – none;
- means of intervention – none

B.3.3. Consequences of the accident in the railway traffic

The current line, on the distance Chitila – Bucharest North was closed for railway traffic between 9.08 p.m. and 10.30 p.m. for the intervention of ISU staff and on wire II between 9.19 p.m. and 10.51 p.m. (occupied with the locomotive DHC 80-0152-1).

Train delays:

Following the occurrence of this accident 16 trains were delayed by a total of 891 min.

B.4. External circumstances

On the 24th of December 2010, at the time of the railway accident occurrence the current lines I and II between the railway stations Chitila and Bucharest North were free.

On the 24th of December 2010, at the time of the railway accident occurrence, the visibility was good, cloudy sky, no wind and the air temperature was about 2^0 C.

The accident occurred in the area of the Km. 2+100, on line in alignment and level, with rail type 60, sleepers BA type T17, path without joints, electrified line.

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

B.5. Investigation course

B.5.1. The summary of the involved staff statements
B.5.1.1. The summary of the of the railway undertaking staff and infrastructure manager statements

The locomotive driver who drove/served the locomotive DHC 80-0152-1, on the 24th of December 2010, stated as follows:

- normal driving conditions on the section Ploiesti Sud – Bucharest Triaj hc.;
- he took over the locomotive with the diesel engine on because the battery pack was not providing its start because of the lack of capacity;
- after crossing the over-ground bridge in the area Carpathians h, the locomotive driver noticed hard smoke and flame in the area of the engines box (big hood);
- he took immediate actions to stop the train;
- at the moment of noticing the beginning of the fire the train had the speed of 78 Km/h;
- he did not smell smoke before;
- he used the fire extinguishers, trying to extinguish the fire;

The locomotive driver who drove the towing locomotive of the train no. 3008, on the 24th of December 2010, stated as follows:

- he served the locomotive on the section Ploiesti Sud – Bucharest North Gr. B;
- after crossing the over-ground bridge in the area Carpathians h, he noticed a sudden decrease of the air in the general pipeline. The driver of the train 3008 takes actions to quick brake the train and to stop the train, the train being stopped at the km. 2+100 thinking that the alarm was been switched at one of the coaches in the composition of the train. When he contacted the guard, this one told him that the alarm had been switched by the driver on the locomotive DHC 80-0152-1 because it had smoke release.
- after untying the locomotive DHC 80-0152-1 from the end of the train by the guard, based on the movement signals received from him he put distance in order that the fire do not spread to the rest of the train 3008

The guard who served the train 3008, on the 24th of December 2010, stated as follows:
- after crossing the over-ground bridge in the area Carpathians h, he noticed that the train 3008 stopped;
- he got off the train and he noticed smoke release at the locomotive DHC 80-0152-1;
- he uncoupled the locomotive from the train and he gave signals to the driver of 3008 to make distance in order that the fire do not spread to the rest of the train;
- together with the conductors he went with 6 extinguishers from the coaches of the train to the locomotive DHC 80-0152-1. As the fire could not be extinguished he called the emergency no. 112 and announced RTFC Bucharest – Dispatch Service.

B.5.2. Safety management system

In carrying out their responsibilities and duties the infrastructure manager CNCF "CFR" SA and the railway undertaking SNTFC "CFR Calatori" SA had established and implemented their own safety management system providing the control of the risks associated with their activities.
In order to respond rapidly and safe in case of smoke ore flame occurrence at the locomotive, the locomotive driver will proceed to the execution of the following operations, in the order listed below:

a) The driver takes actions to stop the train, avoiding as much as possible to stop on the bridges, in tunnels or in areas without access in order to facilitate the intervention of civil or military firemen.

b) The driver communicates to the guard the reason of train stop in current line asking him to insure the train with the hand brake against moving according to the instruction and to untie the locomotive from the train, move then, if possible, the locomotive to a safe distance from the train to prevent the fire spreading from the locomotive to the coaches.

c) The driver takes actions to stop the diesel engine at LDH

d) The driver calls the guard to the locomotive.

Also he announces through radio-telephone or other available means of communication, through IDM, L agents, RC operators, the occurrence of the smoke or flame, communicating the following:

- locomotive type;
- towed train type;
- location of the locomotive;
- place (installation or aggregate) where occurred the smoke release or the flame at the locomotive;
- asks for the locomotive aid and, where appropriate, to be announced the civil or military firemen;
- asked to the IDM indications for interventions at the fire according the PTE of the concerned railway station and records the time and the name of the person who had received the communication;

He disconnects the battery pack by opening its switch.

e) the driver enters the engines box, he insulates the diesel installation by the insulation valve at LDH.

f) he finds the place of the failure depending on the smoke release or flame and on the protections signaling, prepares the place of intervention opening where appropriate covers or inspection traps and acts with the fire extinguishers or other means (water, sand) available (in the locomotive and coaches equipments) for the liquidation of the outbreak where possible. At the diesel locomotives will be used to extinguish the fire also the water in these installations, but only after eliminating all the current sources. The fire extinguishers with carbon dioxide will be used for the electric equipment and those with foam or dust and CO_2 for the rest of the equipment.

g) During the action of preparing and extinguishing the fire where will participate also the guard there will be a reciprocal supervision in order to give first aid in case of intoxication with gas or other accidents. After the fire extinguishment it is checked if there are still places that could reactivate the fire and the locomotive is prepared to be transported to the depot, being forbidden to re-put it back into service.

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

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

- minutes concluded by the commission on spot with reference to the condition of the rolling stock, lines and equipments.
- photos taken soon after the railway accident by the members of the investigation commission;
- statements of the locomotive driver assisting the DHC 80-0152-1, the locomotive driver and the guard serving the train 3008
- minutes concluded by the members of the investigation commission after the accident occurrence;
- documents on the locomotive maintenance and repair provided by the responsible with its maintenance;
- inspection and interpretation of the technical condition of the elements involved in the accident;
- questioning of the staff in charge with the operation of the involved rolling stock;
- documents of release of the train

B.5.4. Work of the rolling stock

B.5.4.1. Data found on the locomotive DHC 80-0152-1:

B.5.4.1.1. Data resulted from the checks made on the 28th of December 2010 and on the 5th of January 2011, by the investigation commission and the repair staff from Ploiesti Depot and concluded in a minutes (part of the investigation file) and photos (taken by the investigation commission)

Following the checking of the investigation commission at the locomotive, one found out:

<u>Condition of the running devices and of the brake shoes</u>

No sign of thermal influence on the shoes or bandages.

<u>Condition of the supply installation and of the fuel tanks</u>

- the main tank, the auxiliary tank and the associated pipelines were intact, without signs of recent intervention and without thermal affectation;

<u>Condition of the main aggregates</u>

- the protection covers were dismantled and checked: the compressor, the dynastarter and the transfer pump without being found causes generating fire;

Photo 3

At the initial check on the 28th of December 2010, were not found signs of short-circuit at the collector, the brush-holder crown or the flexible connections of the dynastarter (Photo 3)

Photo 4

From the examination of the thermal influence areas and the dynamic of the fire propagation, the investigation commission ordered the complete dismantling on the 5th of January 2011 in Ploiesti Depot of the dynastarter that had signs of overload operation, with thermal affectation; (Photo 4 and 5)

Photo 5

There were not found signs of short-circuit or insulation piercings at the rotor and stator windings; (Photo 4 and 5)

Condition of the niches and of the batteries pack

Given the signs of thermal influence showed an increased burning in the area on the batteries pack niches reason for which one proceeded to their check and there resulted:

Photo 6

Niche of batteries pack on the right (boxes 1-4) associated to the station A with thermal damage of the batteries boxes no. 3 and 4 affected by the fire; (Photo 6)

Photo 7

Niche of batteries pack on the left (boxes 5-8) associated to the station B has obvious signs of thermal affectation and the batteries pack boxes 5, 6, 7 and 8 are burnt at the upper side having the lead connections type H between the melted elements and the covers and the sealing materials from the upper side are totally burnt and also the insulation of the serial registration flexible connections between the boxes; (Photo 7)

Photo 8

The serial registration connection between the boxes BA no. 4 and 5 that insure the connection between the niche on the right and the niche on the left, with the insulation burnt on the entire length inclusively inside the crossing pipe under the cabin’s floor, without signs of short-circuit; (Photo 8)

B.5.4.1.2. Data resulted from the analysis of the documents asked from the railway undertaking

- the last repair type RR was made on the 29th of May 2001 at SC Remarul 16 Februarie SA Cluj Napoca;
- the locomotive DHC 80-0152-1 is due to R.G. since May 2004
- the batteries pack is type Magma , scratchy (box no. 1 – 515/2005, box no. 2 – 515/2005, box no. 3 – 515/2005, box no. 4 – 515/2005, box no. 5 – 415/2005, box no. 6 – 077/2005, box no. 7 – 445/2003, box no. 8 – 167/2003).
- the last inspection type "2R2" + CUS was made on the 22nd-23rd of December 2010 at Ploiesti Locomotives Repairs Section belonging to SC CFR SCRL Brasov according to the working unified command no. 2447;

B.6. Analysis and conclusions

B.6.1. Analysis of the fire occurrence

The fire was initiated in the area on the left of the driving cabin, inside the batteries pack niche associated to the boxes 5-8 by auto-ignition of the wiring insulation in the electric circuit between the dynastarter and the batteries pack and also of the connection linking the niche on the right with the niche on the left as consequence of the advanced sulfation of the batteries which led to the occurrence of the overload in this circuit.
Initially the fire was maintained by the air currents during the locomotive movement through the vents existing at the niche box.
The checks and findings confirmed the records in the intervention minutes no. 520/ 24.12.2010 of the Inspectorate for Emergency Situations "Dealul Spirii", that identified as possible source of the ignition (of the fire) "*the thermal effect of the electric current*" and as mean that could have produce the ignition "*alternator (dinastarter)*", determinant circumstance "*overloaded electric engine (dinastarter)*".
The subsequent propagation of the fire occurred by successive ignition of the wirings under the cabin floor, the burning being maintained by the ignition of the combustible deposits at the upper side of the batteries pack niches and in the area of the heat exchanger of the hydraulic transmission oil.
The continuation of the fire occurred mainly by burning of the combustible elements (wirings insulation, floor, trim, etc.) inside the driving cabin and diesel engine box.

B.7. The accident causes

B.7.1. Direct cause

The fire was initiated by the auto-ignition of the wiring insulation of the electric circuit between the dynastarter and the accumulator batteries under the conditions of operating in overload, its propagation being realized by the burning of the residual fuel deposits.

Contributing factors

The advanced sulfation and the short-circuited elements at the accumulators battery pack (type Magma), mounted in inhomogeneous composition as follows (box no. 1 – 515/**2005**, box no. 2 – 515/**2005**, box no. 3 – 515/**2005**, box no. 4 – 515/ **2005**, box no. 5 – 415/**2005**, box no. 6 – 077/**2005**, box no. 7 – 445/**2003**, box no. 8 – 167/**2003**).

B.7.2. Underlying causes

It was not complied the cycle of mandatory repairs and inspections at the locomotive, according to the provisions of the Railway Norm "Railway vehicles. Inspections and planned repairs" no. 67-005 from 2008 approved by OMT no. 364/2008, (the locomotive was due to repair type RG since May 2004, occasion on which the inappropriate wiring should have been change, the cleaning and repainting of the hidden parts should have been performed, inclusively the mounting of a new accumulators battery pack).

B.7.3. Root causes

None.

C. Safety recommendations

The safety recommendations aim to solve the next issues:

Inclusion in the Normative of Works of regular checking of the insulation capacity of the load cables and of the connections between the accumulators boxes, after performing the operations provided in the technological processes of maintenance and operation of the accumulators batteries for the locomotives with repair terms exceeded.

The addressees of the safety recommendations are: Romanian Railway Safety Authority and the National Passenger Railway Transport Company “CFR Calatori” SA Bucharest.

This investigation report will be sent to Romanian Railway Safety Authority, the National Passenger Railway Transport Company “CFR Calatori” SA and to the National Railway Company “CFR” SA.

According to the provisions of the Law no. 55/2006 on the railway safety, Romanian Railway Safety Authority will monitor the implementation of these recommendations.

Members on the investigation commission:

- Marin DRĂGHICI – main investigator
- Mircea NICOLESCU – member
- Adrian SON – member
- Mircea DUMITRESCU – member
- Viorel CATANESCU – member