



WMSC Commissioner Brief: W-0147 – Evacuation for Life Safety Reasons – Yellow Line – October 22, 2021

Prepared for Washington Metrorail Safety Commission meeting on March 8, 2022

Safety event summary:

An electrical failure led to a smoke event and the automatic application of emergency braking on a six-car 3000 Series train carrying riders between Mount Vernon Square and Gallery Place stations at 2:11 p.m. on Friday, October 22, 2021. Later, some riders self-evacuated from the train and walked to the Gallery Place Station platform. Other riders were led onto the roadway and to the platform in a controlled evacuation that followed.

Initially, the Train Operator reported a brake problem. When the operator, with the permission of the Rail Operations Control Center (ROCC), went toward the third car as part of troubleshooting efforts, the Train Operator reported at 2:13 p.m. that there was smoke coming from the train. Riders on the second car were walking through the doors at the end of the car toward the first car of the train to move away from the smoke. The Train Operator returned to the lead car to shut off the HVAC system. A rider on the train also reached the ROCC via phone and reported smoke coming from the fifth car of the train. The ROCC activated ventilation fans in accordance with the configuration requirements of the playbook for this scenario.

A Car Maintenance Road Mechanic and a Rail Supervisor already at Gallery Place Station received foul time and entered the roadway at 2:15 p.m. Third-rail power remained energized, as allowed under Metrorail procedures. They attempted troubleshooting for approximately 10 minutes, beginning with an attempt to cut out trucks on cars 3282 and 3283 (this would allow the train to move if the sole issue for the train was that brakes on that particular pair of cars were stuck on). They did not identify or directly address the source of the smoke.

At 2:18 p.m., the ROCC Assistant Superintendent called the D.C. Office of Unified Communications (911 call center) to report smoke on a train carrying customers in the tunnel near Gallery Place Station. At 2:19 p.m., a Rail Operations Information Center (ROIC) Specialist called a Metro Transit Police Department (MTPD) dispatcher to report the event. MTPD had also just received a call via 911 from a rider on the train.

At approximately 2:34 p.m., 23 minutes after the train stopped, some riders began self-evacuating. Third-rail power was de-energized by ROCC approximately 35 seconds after the self-evacuation was reported by a Rail Supervisor on the platform at Gallery Place Station. However, neither Rail Supervisor on scene had a hot stick as required by Metrorail policy.

D.C. Fire and Emergency Medical Services (FEMS) personnel did have a hot stick, and they verified at 2:39 p.m. that third rail power was de-energized. D.C. FEMS also placed Warning Strobe and Alarm Devices (WSADs) that provide warning if the third rail is re-energized. ROCC de-energized power on the adjacent track at approximately 2:41 p.m.

Metro Transit Police Department (MTPD) personnel had arrived at Gallery Place Station at 2:26 p.m. According to the MTPD hot wash, an officer boarded the train at approximately 2:41 p.m. MTPD reported after the event that radio transmissions were difficult to hear.

The controlled evacuation was completed at approximately 2:58 p.m.



Following the evacuation, Metrorail personnel attempted to move the train, however that led to a solid motor overload on four of the cars. The train then had to be coupled to another train to move it to a rail yard. This process did not include any communication regarding the use of the reverse stretch procedure that Metrorail began requiring for such couplings in spring 2021.

Data reviews and further investigation determined that the train had been moving approximately 35 mph when the emergency braking system activated on the middle two cars of the train. At the same time, battery voltage dropped in the trailing car, leading to the battery circuit breaker tripping. This caused the train to apply brakes, and stopped the trailing cars from recording additional data in the vehicle monitoring system (VMS).

Among the items identified during a post-event inspection of the cars were:

- Evidence of arcing and flashing on the drawbar ground strap, car-to-car cannon plugs and cover plate hardware of the external event recorder box connectors on car 3282
- Melted sockets and connectors, broken wires due to overcurrent, a damaged and perforated cover plate of event recorder junction box connectors, and damaged cannon plugs and conduit on car 3283, including melted connectors containing wiring needed to provide battery voltage and negative return throughout the train

The inspection suggested that at least one cable may have been partially melted prior to this event, and that there was extensive rust on one of the connectors suggesting that the connector shell was not providing required electrical integrity and protection from water or other intrusion, with insulation that therefore appears to have been damaged prior to this event. The smoke was caused by short circuiting of battery power wires, which led to significant heat that burned plastic conduit in car 3283's ER box. The method of installation or maintenance of the wires may have contributed to this. The WMSC required the information related to this analysis to be included in this investigation report to ensure the report was sufficient.

Probable Cause:

The probable cause of this event was Metrorail's insufficient railcar maintenance and inspection practices, including the failure to identify corrosion and other deterioration of electrical cables and connectors.

Corrective Actions:

Vehicle Engineering is revising Periodic C inspections to include inspections of cables inside the ER box and to include checks of cable terminal lugs to carbody ground continuity.

Metrorail provided hot sticks and high voltage safety gloves to all rail supervisors who do not have the safety equipment, and reiterated the importance of carrying this safety equipment.

WMSC staff observations:

Metrorail operational personnel on scene provided differing locations for the train, ranging from 100 feet to 400 feet from the station platform. Metrorail chain markers are placed every 100 feet on the roadway to provide specific location and distance information. The WMSC has transmitted a draft Rail Operations Audit to Metrorail for technical review. This audit included an assessment of training and related requirements for operations personnel.



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Following the evacuation, Metrorail did not follow its reverse stretch procedure that it implemented in 2021 following a runaway train near Rhode Island Ave. Station (W-0116).

Staff recommendation: Adopt final report.



Washington Metro Area Transit Authority
Department of Safety and Environmental
Management (SAFE)
FINAL REPORT OF INVESTIGATION A&I E21513

Date of Event:	10/22/2021
Type of Event:	Evacuation for Life Safety Reasons
Incident Time:	14:11 hours.
Location:	Between Gallery Place and Mt Vernon Station's, Track 2
Time and How received by SAFE:	14:16 hours. SAFE/IMO On-call Phone
WMSC Notification Time:	14:16 hours.
Responding Safety Officers:	WMATA SAFE: Yes WMSC: No Other: N/A
Rail Vehicle:	Train ID 302 L-3040-3041.3091-3090. 3283-3282-T
Injuries:	No
Damage:	Car 3040 Interior Windscreen Glass Broken, Extensive Over-Heated Damage to Cables and Wires on Car 3283, and Signs of Arc Flash on Car 3282.
SMS I/A Incident Number:	20211022#96319MX

Gallery Place Station
Evacuation for Life Safety Reasons
October 22, 2021

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Abbreviations and Acronyms

AIMS	Advanced Information Management System
ARS	Audio Recording System
BIE	Brakes-In-Emergency
CCTV	Closed-Circuit Television
CENV	Vehicle Program Services
CM	Chain Marker
COMR	Office of Systems Maintenance, Office Radio Communications
CMOR IIT	Office of Chief Mechanical Officer Incident Investigation Team
CMNT	Office of Car Maintenance
DCFEMS	District of Columbia Fire and Emergency Medical Services
ER	Event Recorder
ESR	Event Scene Release
IC	Incident Commander
ICP	Incident Command Post
ICS	Incident Command System
IMO	Incident Management Official
MOC	Maintenance Operation Center
MSRPH	Metrorail Safety Rules and Procedures Handbook
MTPD	Metro Transit Police Department
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
OSC	On-Scene Commander
PA	Public Address
ROCC	Rail Operations Control Center
ROIC	Rail Operations Information Center
RTC	Rail Traffic Controller
RTRA	Office of Rail Transportation
SAFE	Department of Safety and Environmental Management
SMS I/A	Safety Measurement System Incidents/Accidents
SOP	Standard Operating Procedure
VDC	Volts of Direct Current
VMS	Vehicle Monitoring System
WMATA	Washington Metropolitan Area Transit Authority

WMSC
WSAD

Washington Metrorail Safety Commission
Warning Strobe Alarm Device

Executive Summary

On Friday, October 22, 2021, at approximately 14:11 hours, Train Operator of Yellow Line Train ID 302 [L3040-3041.3091-3090.3283-3282T] operating outbound experienced a Brakes-In-Emergency (BIE) condition on approach to Gallery Place Station, Track 2. The incident occurred in the tunnel with customers aboard between Gallery Place Station and Mount Vernon Square Station. During the virtual interview, Train ID 302 Train Operator stated that the disabled consist was approximately 100 feet away from the platform limits when the incident occurred. As a result, the Rail Operation Control Center (ROCC) initiated emergency notifications to the respective internal and external departments, including the District of Columbia Fire and Emergency Medical Services (DCFEMS), for support during investigative efforts. There were no reported injuries as a result of this event.

Audio Recording System (ARS) playback revealed that at approximately 14:11 hours, Train ID 302 Train Operator contacted the ROCC Radio Rail Traffic Controller (RTC) and reported that the train lost brake pipe pressure approaching Gallery Place Station and they were unable to recharge the train from the lead car. The Radio RTC instructed the Train ID 302 Train Operator to key the train down and recharge the train from the third car. At approximately 14:13 hours, Train ID 302 Train Operator contacted the RTC and reported smoke was visible from the second rail vehicle, Car 3041, and customers were walking to the lead car inside the consist. Based on the Advanced Information Management System (AIMS) playback, at approximately 14:14:40 hours, the ROCC activated the ventilation fans. The FF1 fan was configured in supply mode moving fresh air into the tunnel system. The FE1 fan was configured in exhaust mode, moving air out of the tunnel system, which mirrors the playbook for this situation. At approximately 14:15 hours, a customer aboard the incident train contacted the ROCC and reported that the train had been stopped for approximately 30 seconds, and smoke was emitting from Car 3282. At approximately 14:15 hours, Office of Car Maintenance (CMNT) Road Mechanic One and the Office of Rail Transportation (RTRA) Supervisor One entered the roadway from Gallery Place Station Track 2 under Foul Time (FT) protection to perform troubleshooting activities. The Office of Rail Car Maintenance (CMNT) Road Mechanic could not diagnose the failure nor confirm any evidence of smoke. The WMATA personnel performed troubleshooting activities for approximately 10 minutes in an attempt to normalize the consist, however, they were unable to air isolate the consist due to the valves' proximity to the third rail.

At approximately 14:26 hours, a Metro Transit Police Department (MTPD) officer assumed On-Scene Commander (OSC) responsibilities. Additional MTPD personnel and DCFEMS arrived at approximately 14:32 hours and established Unified Command. Based on ARS playback, at approximately 14:34 hours, RTRA Supervisor Two contacted the Radio RTC and reported that customers began self-evacuating the train on Track 2. The MTPD report indicated that approximately ten customers self-evacuated by climbing out of the operator's cab window. AIMS playback data showed that third rail power was energized on Track 2 at Gallery Place Station when customers began self-evacuating and that approximately 35 seconds elapsed before third rail power was de-energized on Track 2 at Gallery Place Station. At approximately 14:39 hours, the DCFEMS confirmed third rail power was de-energized. Additional MTPD leadership arrived on scene and OSC responsibilities were transferred several times without issue. MTPD boarded the disabled train to communicate with the customers and check for any possible injuries and prepare for customer evacuation to the safety walk. At approximately 14:46 hours, the fire department installed Warning Strobe Alarm Devices (WSADs) to evacuate the remaining

customers from the incident train to the catwalk and safely onto the platform. At approximately 14:57 hours, the customer evacuation was completed. MTPD reported that 109 passengers were safely evacuated. At approximately 15:09 hours, an inspection of the tunnel was conducted to ensure no other customers were on the roadway and the tunnel was confirmed to be clear. At approximately 15:18 hours, DCFEMS turned the scene over to the MTPD OSC. At approximately 15:20 hours, Track 1 was re-energized to begin single-tracking and servicing the station. At approximately 15:36 hours, the scene was turned over to RTRA. Based on ARS playback, at approximately 17:40 hours, normal service resumed. There were no reported injuries as a result of this event (See Appendix A).

After reviewing the ARS, there did not appear to be any communication deficiencies with the radio system. Additionally, the MTPD report revealed that there were no reported injuries as a result of this incident. The Department of Safety and Environmental Management's (SAFE) Incident Management Official (IMO) issued an Event Scene Release (ESR) at approximately 14:54 hours in coordination with the On-call Safety Manager.

The Office of Chief Mechanical Officer (CMOR) Incident Investigation Team's (IIT) analysis of the downloaded Vehicle Monitoring System (VMS) and Event Recorder (ER) data revealed that at approximately 14:10:30 hours, Train ID 302, Lead Car 3040, was traveling at approximately 35 mph when belly cars' 3090-3091 emergency brakes activated. The trailing vehicle of the incident train was Car 3282. CMOR IIT reported that at this time, the battery voltage in Car 3282 dropped to 24.83 Volts of Direct Current (VDC), which triggered the battery breaker to trip on Car 3282. This caused the brake pipe on Cars 3090 and 3091 to dump, resulting in the emergency relay to open and enforcing a BIE condition. The breaker tripping also caused all equipment on cars 3282 and 3283 to stop recording on the VMS.

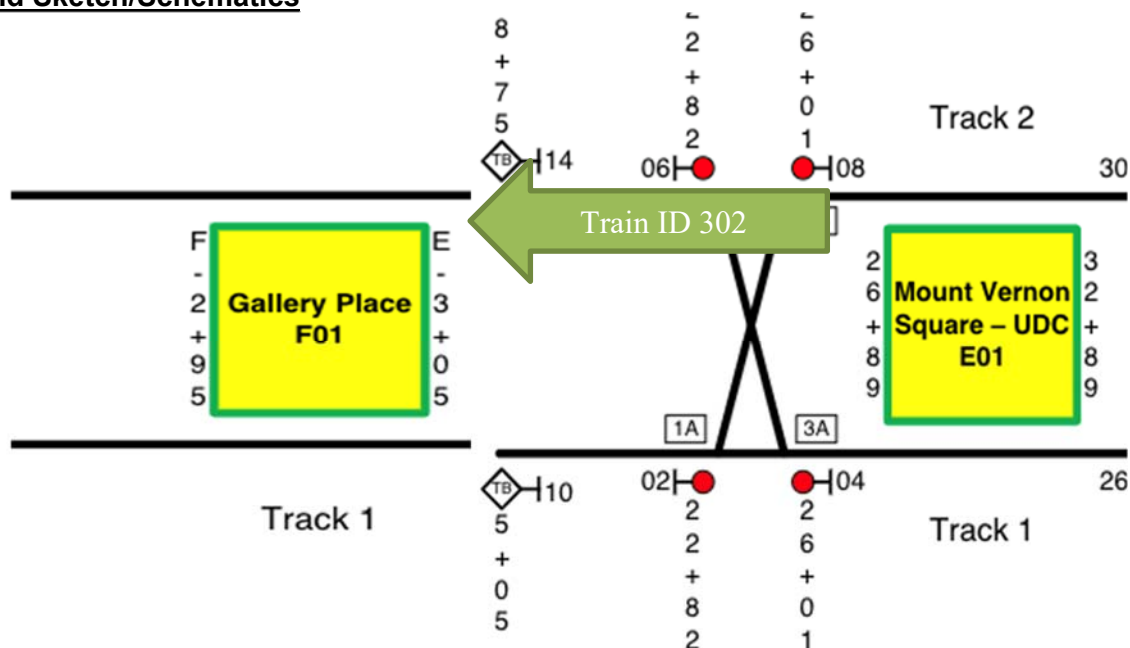
After reviewing the ARS, there did not appear to be any communication deficiencies with the radio system. Additionally, the MTPD report revealed that there were no reported injuries as a result of this incident.

The probable cause of the Evacuation for Life Safety Reasons event was an electrical event on rail car 3283 that resulted in an immobile train. The smoke condition was caused by several cables and inter-car conduit melting, caused by a failure that occurred in the ER box of car 3283. The short circuit was identified and isolated to a connector/jumper that connects the battery power bus (positive and negative) from B car to A car. The root cause of the failure remains undetermined. A possible contributing factor is corrosion conditions found within the ER box during post-incident inspection.

Incident Site

Outside Gallery Place Station, Track 2.

Field Sketch/Schematics



Purpose and Scope

The purpose of this incident investigation and candid self-evaluation is to collect and analyze available facts, determine the probable cause(s) of the incident, identify contributing factors, and make recommendations to prevent a recurrence.

Investigative Methods

The investigative methodologies included the following:

- Formal Interview – SAFE performed one interview as part of this investigation:
 - Train Operator
- Informal Interviews – Collected through conversations with individuals during the investigation to provide background and supporting information.
- Documentation Review – A collection of relevant work history information and process documentation in Metro systems of record. These records include:
 - Employee Training Procedures & Records
 - Metro Safety Rules and Procedures handbook (MSRPH)
 - Metro Transit Police Department (MTPD) Hot Wash Summary
 - National Oceanic and Atmospheric Administration (NOAA) Data Review
 - Office of Chief Mechanical Officer (CMOR) Incident Investigation Team (IIT) Data Review
 - Office of Car Maintenance (CMNT) Periodic and Post Incident Inspection Data Review
 - Vehicle Program Services (CENV) Data Review

- Rail Operations Control Center (ROCC) Incident Report
- System Data Recording Review – A collection of information contained in Metro Data Recording Systems. This data includes:
 - Audio Recording System (ARS) playback [Radio and Phone Communications]
 - Advanced Information Management System (AIMS) playback
 - Closed Circuit Television (CCTV)

Investigation

On Friday, October 22, 2021, at approximately 14:11 hours, Train Operator of Yellow Line Train ID 302 [L3040-3041.3091-3090.3283-3282T] operating outbound experienced a BIE condition on approach to Gallery Place Station, Track 2. The incident occurred in the tunnel with customers aboard the disabled train between Gallery Place Station and Mt. Vernon Square Station. During the virtual interview, Train ID 302 Train Operator stated that the disabled consist was approximately 100 feet away from the platform limits when the incident occurred. As a result, the ROCC initiated emergency notifications to the respective internal and external departments, including the DCFEMS, for support during investigative efforts. There were no reported injuries as a result of this event.

ARS playback revealed that at approximately 14:11 hours, Train ID 302 Train Operator contacted the ROCC Radio RTC and reported that their train lost brake pipe pressure approaching Gallery Place Station and were unable to recharge the train from the lead car. The Radio RTC instructed the Train ID 302 Train Operator to key the train down and recharge the train from the third car. At approximately 14:13 hours, Train ID 302 Train Operator contacted the Radio Rail Traffic RTC and reported smoke was emitting from the second rail vehicle, Car 3041, and customers were walking to the lead car inside the consist. Based on the Advanced Information AIMS playback, at approximately 14:14:40 hours, the ROCC activated the ventilation fans. The FF1 fan was configured in supply mode moving fresh air into the tunnel system. The FE1 fan was configured in exhaust mode, moving air out of the tunnel system, which mirrors the playbook for this situation. At approximately 14:15 hours, a customer aboard the incident train contacted the ROCC and reported that the train had been stopped for approximately 30 seconds, and smoke was emitting from Car 3282. At approximately 14:15 hours, CMNT Road Mechanic One and the RTRA Supervisor One entered the roadway from Gallery Place Station Track 2 under FT protection to perform troubleshooting activities. The CMNT Road Mechanic could not diagnose the failure nor confirm any evidence of smoke.

At approximately 14:26 hours, a MTPD officer assumed OSC responsibilities. Additional MTPD personnel and DCFEMS arrived at approximately 14:32 hours and established Unified Command. Based on ARS playback, at approximately 14:34 hours, RTRA Supervisor Two contacted the Radio RTC and reported that customers began self-evacuating the train on Track 2. AIMS playback data showed that third rail power was energized on Track 2 at Gallery Place Station when customers began self-evacuating. Approximately 35 seconds elapsed before third rail power was de-energized on Track 2 at Gallery Place Station. At approximately 14:35 hours, the Radio RTC contacted the first two responding RTRA Supervisors to hot stick the third rail to confirm power was de-energized. At approximately 14:39 hours, the DCFEMS confirmed third rail power was de-energized.

The MTPD hot wash revealed that at approximately 14:19 hours, a call for service was dispatched for a disabled Train ID 302 at Gallery Place Station. An MTPD officer arrived at the station and

confirmed Train ID 302 was disabled and had a line of sight of the train from the platform. At approximately 14:26 hours, MTPD assumed OSC responsibilities. The MTPD report revealed that approximately ten customers self-evacuated by climbing out of the operator's cab window. At approximately 14:34 hours, MTPD Sergeant arrived on the scene, assumed OSC, and assigned the initial responding MTPD Officer as the Forward Liaison and another MTPD Officer as the Accountability Officer. MTPD reported that the customers that self-evacuated made it to the platform on their own. At approximately 14:41 hours, MTPD Captain arrived on the scene and assumed OSC. ROCC remotely de-energized third power on track 1 due to a report of customer self-evacuation and suspended rail service. MTPD boarded the disabled train to communicate with the customers and check for any possible injuries. At approximately 14:46 hours, the fire department installed WSADs to evacuate the remaining customers from the incident train to the catwalk and safely onto the platform. At approximately 14:57 hours, the customer evacuation was completed. MTPD reported that 109 passengers were safely evacuated. At approximately 15:09 hours, an inspection of the tunnel was conducted to ensure no other customers were on the roadway, and the tunnel was confirmed to be clear. At approximately 15:12 hours, MTPD reported that all personnel and equipment were clear from the roadway. At approximately 15:18 hours, DCFEMS turned the scene over to the MTPD OSC. At approximately 15:20 hours, Track 1 was re-energized to begin single-tracking and servicing the station. At approximately 15:36 hours, the scene was turned over to RTRA. Following the customer evacuation, ROCC RTC requested the Road Mechanic to verify the status of the handbrake. The CMNT Road Mechanic reported that the handbrake was not applied. ROCC then instructed the Road Mechanic to apply the handbrake on car 3040. Based on ARS playback, at approximately 17:40 hours, normal service resumed. There were no reported injuries as a result of this event (See Appendix A).

CMNT Road Mechanic One remained on scene and assessed the reported failure. The incident train had to be recovered by a non-revenue consist. The incident train was sent to Greenbelt Yard for further investigation. The CMOR IIT analysis of the VMS and ER data revealed that at approximately 14:10:30 hours, Train ID 302, Lead Car 3040, was traveling at approximately 35 mph when the belly cars' (3090-3091) emergency brake activated. The trailing vehicle of the incident train was Car 3282. CMOR IIT reported that at this time, the battery voltage in Car 3282 dropped to 24.83 VDC, which triggered the battery breaker to trip on Car 3282. This caused the brake pipe on Cars 3090 and 3091 to dump, resulting in the emergency relay to open and enforcing a BIE condition. The breaker tripping also caused all equipment on cars 3282 and 3283 to stop recording on the VMS.

After reviewing the ARS, there did not appear to be any communication deficiencies with the radio system. Additionally, the MTPD report revealed that there were no reported injuries as a result of this incident. The SAFE IMO issued an Event Scene Release (ESR) at approximately 14:54 hours in coordination with the on-call safety manager.

Chronological Event Timeline

A review of ARS playback, i.e., phone, ambient, and radio communications, revealed the following:

Time	Description
14:11:33 hours	<p><u>Train ID 302 Train Operator</u>: Contacted Radio RTC and reported that the train lost brake pipe pressure approaching Gallery Place Station, Track 2, and could not recharge from the lead car.</p> <p><u>Radio RTC</u>: Acknowledged and asked, "what's your lead car?"</p> <p><u>Train ID 302 Train Operator</u>: Responded, "the lead car is 3040."</p> <p><u>Radio RTC</u>: Instructed the Train ID 302 Train Operator to key the train down/up and to attempt to recharge from the third car. The Radio RTC then dispatched RTRA Supervisor One to assist. [Ops 3]</p>
14:13:23 hours	<p><u>Train ID 302 Train Operator</u>: Contacted Radio RTC and reported smoke emitting from the second rail vehicle, car 3041, and customers were walking to the lead car.</p> <p><u>Radio RTC</u>: Acknowledged and instructed Train ID 302 Train Operator to return to the lead car to shut off the environmental system. Note: The ROCC activated the ventilation fans based on the AIMS display at 14:14:40 hours. [Ops 3] **Note: Fan activation was in alignment with playbook scenario.</p>
14:14:08 hours	<p><u>CMNT Road Mechanic One</u>: Contacted the Radio RTC and reported they are at Gallery Place Station. [Ops 3]</p>
14:15:13 hours	<p><u>RTRA Supervisor One</u>: Contacted the Radio RTC and reported they are at Gallery Place Station platform and the incident train is within line of sight.</p> <p><u>Radio RTC</u>: Acknowledged. The Radio RTC then contacted CMNT Road Mechanic One and stated that the E01-08 signal is red, prohibit exits, block calls, cancellation of automatic signals, blue block, and human form status are in place. "At this time, you have permission to enter the roadway under FT protection and advise the ROCC when you are relinquishing your FT protection."</p> <p><u>CMNT Road Mechanic One</u>: Acknowledged. [Ops 3]</p>
14:15:23 hours	<p><u>Customer</u>: Contacted Rail Operations Information Center (ROIC) Specialist and reported they are on a train that just departed Mt. Vernon Square Station in approach to Gallery Place Station and the train came to a halt. The customer said the train had been stopped for approximately 30 seconds, and smoke was emitting from the car in front of them and were wondering what they should do. The customer said they are on the train with approximately 25 to 30 people in car 3282.</p> <p><u>ROIC Specialist</u>: Responded, "we do have an emergency on the roadway, and we are troubleshooting the incident train as we speak."</p> <p><u>Customer</u>: Responded, "so what do you want me to do, stay put?"</p> <p><u>ROIC Specialist</u>: Responded, "yes, please do not evacuate the train." [Phone]</p>
14:16:37 hours	<p><u>Radio RTC</u>: Contacted the RTRA Supervisor and stated, "you have permission to enter the roadway, the E01-08 signal is red." [Ops 3]</p>

Time	Description
14:16:44 hours	<u>ROIC Specialist</u> : Contacted ROCC RTC and reported a customer called and reported smoke was emitting from Train ID 302, car 3282. [Phone]
14:17:39 hours	<u>Train ID 302 Train Operator</u> : Contacted Radio RTC and reported that one of the car's emergency door handles had been opened. <u>Radio RTC</u> : Instructed Train ID 302 Train Operator to perform a ground walk around. [Ops 3]
14:18:19 hours	<u>ROCC Assistant Superintendent</u> : Contacted DC Emergency Administration 911 Center and reported smoke on Yellow Line Train ID 302 outside Gallery Place Station in the tunnel. The ROCC Assistant Superintendent indicated that customers are on the incident train, and at this time, there are no reported injuries. [Phone]
14:18:20 hours	<u>RTRA Supervisor One</u> : Contacted ROCC RTC and reported Train ID 302 lead car is approximately 400 feet away from the platform. Note: During the virtual interview, Train ID 302 Train Operator stated that the disabled consist was approximately 100 feet away from the platform. [Phone]
14:19:01 hours	<u>Radio RTC</u> : Contacted the RTRA Supervisor and asked, "do you see anyone on the roadway?" <u>RTRA Supervisor One</u> : Responded, "that's a negative. No one is on the roadway." <u>Radio RTC</u> : Acknowledged and instructed the RTRA Supervisor to board the affected train under FT protection, E01-08 is red. <u>RTRA Supervisor One</u> : Acknowledged. [Ops 3]
14:19:36 hour	<u>ROIC Specialist</u> : Contacted MTPD and reported Train ID 302 experienced a BIE outside Gallery Place Station, Track 2. Also, a customer aboard the incident train contacted the ROCC and reported smoke on the incident train. <u>MTPD Communication</u> : Responded, "they just received a call from a customer aboard the incident train that came through a 911 call. The fire department has been dispatched because the customer reported smoke on one of the cars, but no flames are showing." [Phone]
14:19:54 hours	<u>CMNT Road Mechanic One</u> : Contacted Radio RTC and reported lower blue and white light symptoms on car 3283. ** Note: Blue light symptoms indicate a stuck brake [brake control pipe] will not release. White light is 20 psi between cars and two white lights indicates low air. <u>Radio RTC</u> : Acknowledged and instructed CMNT Road Mechanic to cut the trucks aboard that car and verify green brake indicator lights. [Ops 3]
14:21:14 hours	<u>RTRA Supervisor Two</u> : Contacted the Radio RTC and reported they are at the Gallery Place Station platform. <u>Radio RTC</u> : Acknowledged. The Radio RTC then appointed RTRA Supervisor One as the OSC and designated the RTRA Supervisor Two as the RTRA Forward Liaison. [Ops 3]
14:24:08 hours	<u>CMNT Road Mechanic</u> : Contacted Radio RTC and reported that they cut the trucks and are now aboard Car 3283 and working on Car 3282. [Ops 3]

Time	Description
14:25:40 hours	<p><u>CMNT Road Mechanic</u>: Contacted Radio RTC and reported that they cut the trucks aboard Car 3282 but could not identify green brake indicator lights.</p> <p><u>Train ID 302 Train Operator</u>: Contacted Radio RTC and reported they attempted to recharge the train, and the train could not hold a charge.</p> <p><u>Radio RTC</u>: Acknowledged and instructed CMNT Road Mechanic to isolate both cars. [Ops 3]</p>
14:27:20 hours	<p><u>RTRA Supervisor Two</u>: Contacted the Radio RTC and reported that MTPD and the fire department were on scene.</p> <p><u>Radio RTC</u>: Acknowledged [Ops 3]</p>
14:21:14 hours	<p><u>RTRA Supervisor One</u>: Contacted the Radio RTC and reported approximately 100 plus customers aboard the incident train.</p> <p><u>Radio RTC</u>: Acknowledged and asked if anyone needed any medical support. [Ops 3] Note: There was no response to this request for information.</p>
14:30:36 hours	<p><u>Radio RTC</u>: Contacted RTRA Supervisor Two and instructed them to let MTPD know they needed assistance aboard the incident train due to irate customers.</p> <p><u>RTRA Supervisor Two</u>: Acknowledged. [Ops 3]</p>
14:33:09 hours	<p><u>RTRA Supervisor One</u>: Contacted the Radio RTC and reported no evidence of smoke on or around the incident train. [Ops 3]</p>
14:34:05 hours	<p><u>RTRA Supervisor Two</u>: Contacted the Radio RTC and reported that customers began self-evacuating the train on Track 2. [Ops 3]</p>
14:35:48 hours	<p><u>Radio RTC</u>: Contacted the RTRA Supervisor One and asked, "do you have a working hot stick to confirm that third rail power is de-energized?"</p> <p><u>RTRA Supervisor One</u>: Responded, "no, I don't have a working hot stick with me."</p> <p><u>RTRA Supervisor Two</u>: Contacted Radio RTC and reported that the customers who exited the train said that smoke was emitting.</p> <p><u>Radio RTC</u>: Acknowledged and asked the RTRA Supervisor Two, "do you have a working hot stick?"</p> <p><u>RTRA Supervisor Two</u>: Responded, "no, that's a negative." [Ops 3]</p>
14:38:37 hours	<p><u>Radio RTC</u>: Contacted RTRA Supervisor Two and asked, "do you see any customers on Track 1 or Track 2 at Gallery Place Station?"</p> <p><u>RTRA Supervisor Two</u>: Responded, "there are no customers on Track 1, but MTPD is evacuating customers from Track 2." [Ops 3]</p>
14:39:32 hours	<p><u>CMNT Road Mechanic</u>: Contacted Radio RTC and reported they isolated car 3090. [Ops 3]</p>
14:38:44 hours	<p><u>RTRA Supervisor Two</u>: Contacted the Radio RTC and reported that the fire department does have a hot stick.</p> <p><u>Radio RTC</u>: Responded, "can you have the fire department confirm third rail power is de-energized with their working hot stick?"</p> <p><u>RTRA Supervisor Two</u>: Acknowledged. [Ops 3]</p>
14:41:28 hours	<p><u>CMNT Road Mechanic</u>: Contacted Radio RTC and reported they isolated car 3283. [Ops 3]</p>

Time	Description
14:43:44 hours	<u>RTRA Supervisor Two:</u> Contacted the Radio RTC and reported that the fire department has confirmed that third rail power was de-energized and is installing safety equipment. <u>Radio RTC:</u> Acknowledged. [Ops 3]
14:54:27 hours	<u>RTRA Supervisor One:</u> Contacted the Radio RTC and reported that the Emergency Response Team (ERT) arrived on scene. [Ops 3]
14:58:35 hours	<u>RTRA Supervisor One:</u> Contacted the Radio RTC and reported that the incident train was clear, and all customers were safely on the Gallery Place Station platform. <u>Radio RTC:</u> Acknowledged. [Ops 3]
15:08:36 hours	<u>RTRA Supervisor Two:</u> Contacted the Radio RTC and reported that all personnel and equipment are clear of the roadway at Gallery Place Station, Tracks 1 and 2. [Ops 3]
15:15:19 hours	<u>Radio RTC:</u> Alerted all Ops 3 personnel and made power restoration announcements for Track 1 between Archives Station and Mt. Vernon Square Station. [Ops 3]
15:20:41 hours	<u>Train ID 302 Train Operator:</u> Contacted Radio RTC and reported that on car 3040, the interior windscreen glass was broken on door 7. [Ops 3]
15:30:00 hours	<u>CMNT Road Mechanic Two:</u> Contacted Radio RTC and reported they had arrived on scene and were ready to enter the roadway to board the incident train at the ROCC's request. <u>Radio RTC:</u> Acknowledged and said E01-08 is red, blue block, and the human form are still in place; you do have permission to enter the roadway at Gallery Place Station, Track 2. <u>CMNT Road Mechanic Two:</u> Acknowledged. [Ops 3]
15:32:08 hours	<u>CMNT Road Mechanic Two:</u> Contacted Radio RTC and reported they are safe aboard the incident train. <u>Radio RTC:</u> Acknowledged. [Ops 3]
15:37:27 hours	<u>Radio RTC:</u> Contacted the CMNT Road Mechanic Two and asked are the handbrakes applied to the lead car. <u>CMNT Road Mechanic Two:</u> Responded, "no handbrakes applied at this time. We are currently waiting for a power check." <u>Radio RTC:</u> Acknowledged and instructed CMNT Road Mechanic Two to apply the handbrake to the lead car. <u>CMNT Road Mechanic Two:</u> Responded, "we will apply a handbrake on lead car 3040." [Ops 3]
15:38:40 hours	<u>CMNT Road Mechanic Two:</u> Contacted Radio RTC and reported that the handbrake is now applied on lead car 3040. <u>Radio RTC:</u> Acknowledged. [Ops 3]
15:41:30 hours	<u>RTRA Supervisor One:</u> Contacted the Radio RTC and reported that MTPD turned the incident scene back over to RTRA. <u>Radio RTC:</u> Acknowledged. [Ops 3]
15:41:50 hours	<u>Radio RTC:</u> Alerted all Ops 3 personnel and made power restoration announcements for Track 2 between L'Enfant Plaza Station and Mt. Vernon Square Station. [Ops 3]

Time	Description
15:49:54 hours	<p><u>CMNT Road Mechanic Two:</u> Contacted Radio RTC and reported that the train had been normalized, good indication on the console, the handbrakes had been released, and “we are getting brakes off.”</p> <p><u>Radio RTC:</u> Responded, “RTRA Supervisor One, will you be operating the incident train?” Also, Radio RTC asked CMNT Road Mechanic One “will you remain on the incident train for support?”</p> <p><u>RTRA Supervisor One:</u> Responded, “that’s affirmative.”</p> <p><u>CMNT Road Mechanic One:</u> Responded, “that’s affirmative.”</p> <p><u>Radio RTC:</u> Responded, “verified brakes are off by performing a rolling brake test.”</p> <p><u>RTRA Supervisor One:</u> Acknowledged. [Ops 3]</p>
15:57:20 hours	<p><u>CMNT Road Mechanic One:</u> Contacted Radio RTC and reported a solid motor overload on cars 3040-3041-3091-3090 with no reset and no current to the train. The CMNT Road Mechanic One then requested train recovery.</p> <p><u>Radio RTC:</u> Responded, “that’s a good copy, standby.” [Ops 3]</p>
16:52:24 hours	<p><u>Radio RTC:</u> Contacted Train ID 700 Train Operator departing Greenbelt Yard and instructed them to be the rescue train at Gallery Place Station. [Ops 3]</p>
17:21:17 hours	<p><u>Radio RTC:</u> Contacted Train ID 700 Train and instructed them to make safety stops, cut out the rate lines, and make the add to the disabled train.</p> <p><u>Train ID 700 Train Operator:</u> Acknowledged. [Ops 3]</p>
17:33:12 hours	<p><u>RTRA Supervisor One:</u> Contacted Radio RTC and reported Train ID 700 made the add to the disabled train, and all trucks were cut out.</p>
17:36:20 hours	<p><u>CMNT Road Mechanic One:</u> Contacted Radio RTC and reported a good rolling brake test on Train ID 700. [Ops 3]</p>
17:38:18 hours	<p><u>Radio RTC:</u> Contacted Train ID 700 Train Operator and granted them a permissive block to Columbia Heights Station. [Ops 3]</p>
17:40:09 hours	<p><u>ROCC Radio RTC:</u> Alerted all Ops 3 Train Operators and concerned personnel. Normal service resumed between L'Enfant Plaza Station and Mount Vernon Square Station, Tracks 1 and 2. [Ops 3]</p>

***Note: Times above may vary from other system's timelines based on clock settings.*

Advanced Information Management System (AIMS)

The images below depict the ROCC AIMS screen display during the incident sequence. These images are enlargements of a small portion of a controller's display screen and do not represent the actual view available to the ROCC controller.



Diagram 1 - Based on the AIMS display at 14:11:20 hours, revenue Train ID 302 Train Operator came to a halt right before entering Gallery Place Station, Track 2.

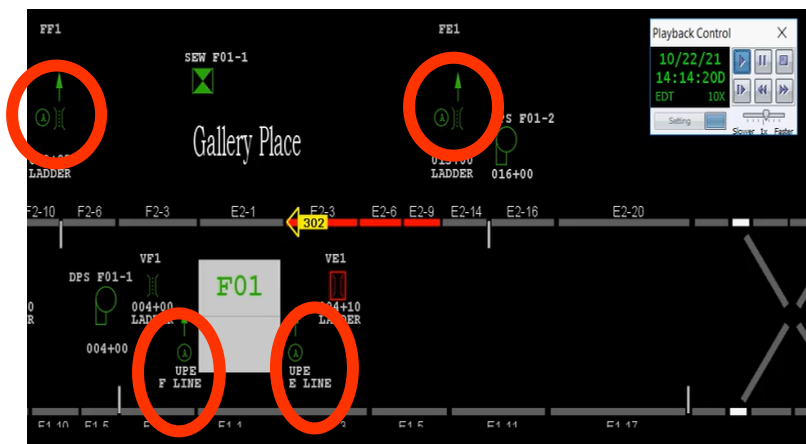


Diagram 2 - Based on the AIMS display at 14:14:20 hours, the FF1, FE1, F Line, and E Line fans were configured in auto on exhaust mode.

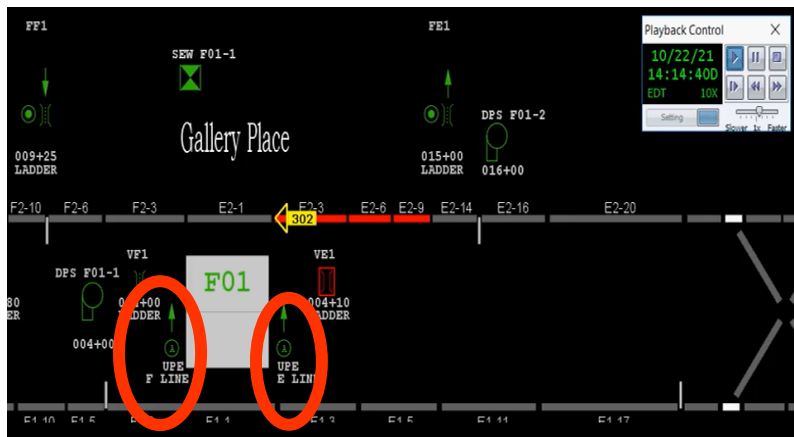


Diagram 3 - Based on the AIMS display at 14:14:40 hours, the ROCC activated the ventilation fans. The FF1 fan was configured in supply mode moving air in the system. The FE1 fan was configured in exhaust mode, moving air out of the system.

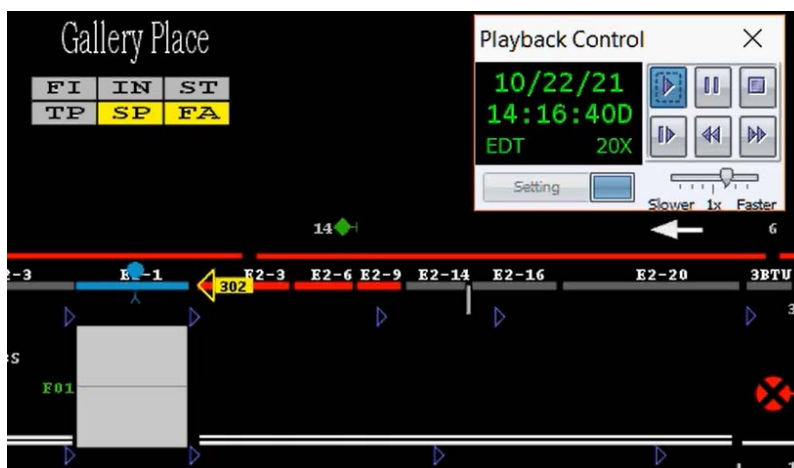


Diagram 4 - Based on the AIMS display at 14:16:40 hours, human form status representing the WMATA personnel was in place at Gallery Place Station Track 2.



Diagram 5 - Based on the AIMS display at 14:23:20 hours, the ROCC activated the F Line and E Line platform fans in supply mode, moving air in the system.

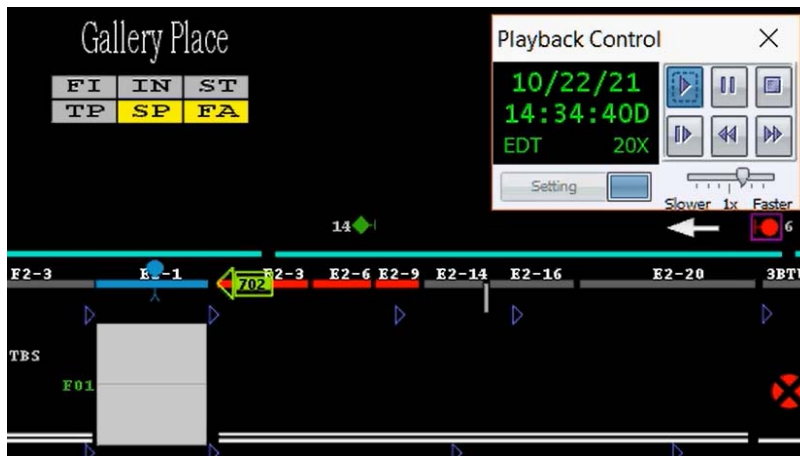


Diagram 6 - Based on the AIMS display at 14:34:40 hours, it showed blue block status was in place, and third-rail power was de-energized at Gallery Place Station Track 2.

Post-Incident Inspection Photos



Figure 1 – Incident Cars 3282 and 3283.



Figure 2 - Over-heated damage to cables and wires on Car 3283.



Figure 3 – Car 3040 broken interior windscreen glass.



Figure 4 - Based on the CCTV footage at approximately 14:35 hours, the first self-evacuated customers safely entered the Gallery Place Station platform. The other self-evacuated customer entered the platform shortly after.



Figure 5 - Based on the CCTV footage at approximately 14:47 hours, customers started to enter the Gallery Place Station platform escorted by the emergency responders.

Vehicle Program Service (CENV)

Adopted from CENV Final Report

The OCC desk was notified on Friday October 22, at approximately 14:15 hours, that Train ID 302 CONSIST: L 3040/41 X 3091/90 X 3283/82 reported a B.I.E in approach to Gallery Place Station Track#2 and were unable to recharge the Brake Pipe. The road mechanic boarded the train and verified the exterior battery indicator light, white light, and bottom blue light on car 3283 were illuminated. Train ID 302 was unable to move and had to be recovered by a non-revenue train. There was a report of smoke in a rail car; however, the road mechanic was unable to confirm this during the inspection. The train was moved and arrived at Greenbelt (Track #5) at approximately 18:30 hours. The road mechanic reported smoke coming out from the rear, right side of car 3283 (near the ER box) but dissipated quickly upon walk around.

Factual Findings

1. The burnt cable ET007-10 (one of the negative wires) was found to have black marks in the wire strands. These wire strands may have been partially melted prior to this incident. Refer to Figure 9 below.
2. The J7-P7 connector shell has signs of extensive discoloration, in comparison to other connectors in ER box. Refer to Figure 10 below. The aspect of the burnt connector suggests the electrical integrity of the connector shell had been compromised.
3. The excessive heat from current imbalance, contributed to the deterioration of the J7-P7 connector, which is located outside the ER Box, underneath the car.
4. This circuit is designed with two parallel 1/0-gauge copper cables (2 for negative and 2 for the positive) that must hold the full load at normal temperature. With the ET007-10 cable area being damaged, prior to the incident (Refer to Figure 9), this cable became the weak point of the circuit. Under the previously mentioned conditions, high temperatures are generated and transmitted thereby damaging the cable insulation within the connector.

NOTE: Wires where insulation is missing or exposed (positive and negative), when they touch one another or the positive of these wires comes in contact with the car body system, will cause a short circuit and/or overheating of the wires.

Conclusion

The train failure and the smoke reported with this incident was caused by the short circuiting of the battery power wires and the plastic conduit burning (within the ER box of car 3283) due to the heat associated with the short circuiting.

The short circuit was isolated to the J7-P7 connector/jumper that connects (transmit) battery power bus (positive and negative) from B car to A car; however, the actual root cause (i.e. source of the short circuit) was not identifiable due to the extent of the damage to all of wiring and connectors.

Based on the history of recent ER box failures, the circumstances surrounding this failure is considered an isolated incident CENV will review, with CMNT, the PI procedures to require the addition of steps to inspect and verify the integrity of the wiring/circuitry involved in this unusual occurrence. *Refer to Appendix D for full report*

Office of Chief Mechanical Officer (CMOR) / Incident Investigation Team (IIT)

Event Recorder (ER) Data Graph/Sequence of Events

CMOR IIT analysis of the downloaded VMS and ER data revealed that at approximately 14:10:30 hours, Train ID 302, Lead Car 3040, was traveling 35 MPH. The consist brake pipe on Car 3040 did not dump, but the belly cars' (3090-3091) brake pipe had dumped. The trailing vehicle of the incident train was Car 3282. CMOR IIT reported that at this time, the battery voltage in Car 3282 dropped to 24.83VDC, which triggered the battery breaker tripping on Car 3283. As a result, the brake pipe on Cars 3090 and 3091 had dumped, causing the emergency relay to open, which forced a BIE condition and caused all equipment on Car 3282 to go dark. CMOR IIT reported it appeared that the battery voltage being fed through the car wiring and trainline box from Car 3091 to Car 3283 has a ~4VDC drop. The VMS measured 28.7VDC on the B Car and only 24.8VDC on the A Car. CMOR IIT reported that the battery voltage on Car 3283 was not being charged by the LVPS. On Car 3091, the battery voltage was measured at 36.1VDC, and the battery voltage on Car 3090 was 33.5VDC. All VMS signals on Cars 3282 and 3283 had flatlined as soon as the battery breaker tripped.

Office of Car Maintenance (CMNT)

CMNT conducted a ground walk-around inspection of the affected consist at the incident site and assessed the reported failure. CMNT could not diagnose the failure and confirm any evidence of smoke. Therefore, the incident train had to be recovered by a non-revenue consist. The incident train was sent to Greenbelt Yard for further assessment. At Greenbelt Yard, CMNT performed an under-car inspection and found no apparent foreign object damage. However, CMNT identified extensive over-heated damage to the trainline junction box cabling and wires in Car 3283 and signs of arcing and flashing at the drawbar ground strap and car-to-car cannon plugs at the trainline junction box of Car 3282.

Metro Transit Police Department (MTPD)

The Metro Transit Police Department (MTPD) report revealed that at approximately 14:19 hours, a call for service was dispatched for a disabled Train ID 302 at Gallery Place Station. An MTPD officer arrived at the station and confirmed Train ID 302 was disabled and had a line of sight of

the train from the platform. At approximately 14:26 hours, MTPD assumed OSC responsibilities. MTPD also advised approximately ten customers had self-evacuated by climbing out of the operator's cab window. At approximately 14:34 hours, MTPD Sergeant arrived on the scene, assumed OSC, and assigned the MTPD Officer as the Forward Liaison and another MTPD Officer as the Accountability Officer. MTPD reported that the customers that self-evacuated made it to the platform on their own. At approximately 14:41 hours, MTPD Captain arrived on the scene and assumed OSC.

MTPD boarded the disabled train to inform the customers and check for any possible injuries. At approximately 14:46 hours, WSADs and emergency personnel were in place to evacuate the remaining customers from the incident train to the catwalk and safely onto the platform. MTPD's report revealed there were no reported injuries. At approximately 14:57 hours, the customer evacuation was completed. MTPD reported that 109 passengers were safely evacuated. At approximately 15:09 hours, an inspection of the tunnel was conducted to ensure no other customers were on the roadway and was confirmed to be clear. At 15:12 hours, MTPD reported all personnel and equipment were clear from the roadway. At approximately 15:18 hours, DCFEMS turned the scene over to the MTPD OSC Captain. At approximately 15:20 hours, Track 1 was re-energized to begin single-tracking and servicing the station. At approximately 15:36 hours, the scene was turned over to RTRA, and single-tracking was still in effect at that time. **Note:** MTPD reported that teamwork and communication between DCFEMS and MTPD were smooth and provided for the safe evacuation of the customers from the train to the platform.

Office of System Maintenance Office of Radio Communication (COMR)

COMR personnel performed a comprehensive radio operational test from Gallery Place Station to L'Enfant Plaza Station, Tracks 1 and 2. The test was successful, and the signal was at an optimal level.

SAFE Incident Management Official (IMO) Incident Log

The SAFE IMO Incident Log revealed that at approximately 14:10 hours, the ROCC received a notification that Train ID 302 emergency application of the brakes dumped causing the train to stop abruptly and smoke emitted from the rail vehicle. At approximately 14:11 hours, the ROCC activated ventilation fans. The SAFE IMO reported that at approximately 14:34 hours, third rail power was de-energized, and approximately five customers had self-evacuated. The SAFE IMO reported that the disabled train was approximately 50 to 100 feet from the platform. MTPD and DCFEMS responded and arrived on the scene. MTPD and DCFEMS began to assist the customers off the disabled train and safely to the platform without incident. The SAFE IMO reported that a bus bridge was established between L'Enfant Plaza Station and Mt. Vernon Square Station. At approximately 14:57 hours, all passengers were evacuated from the disabled train. At approximately 15:17 hours, DCFEMS transferred the scene to MTPD, and at approximately 15:40 hours, MTPD transferred the scene to RTRA. There were no reported injuries as a result of this incident.

Interview Findings

SAFE conducted one interview via Microsoft Teams. The virtual interview identified the following key findings associated with this event:

During the virtual interview, the Train Operator stated they have been a WMATA employee for seventeen years with approximately twelve years of experience as a Train Operator. The employee's last Rail Certification was in February 2021. This employee has no history of sleep issues to report.

During the virtual interview, the Train Operator stated they were on their last trip of the day and had already completed three and a half round trips. The Train Operator stated that they had no train malfunctions before the incident while operating on the mainline. While on approach to Gallery Place Station, Track 2, their consist emergency application of the brakes dumped causing their train to stop abruptly. The Train Operator keyed up the train to recharge the train brake pipe and check for brakes off but was unsuccessful. The Train Operator contacted the ROCC, and the Radio RTC instructed them to try and recharge the train from a different car and check the train. The Train Operator stated they conducted a radio check with their handheld radio, made an announcement to the customers, and secured the operator's cab door. The Train Operator stated they secured the train by only keying down and did not apply handbrakes to the consist but believed the RTRA Supervisor applied handbrakes when they boarded the train. As the Train Operator walked to the fourth or fifth car, they informed the customers of the train malfunction and stated emergency responders were on the way. The Train Operator stated they notified the ROCC of smoke at the fourth or fifth car, and customers were also reporting smoke emitting from the rail vehicle. The Train Operator stated they reported the smoke conditions to the ROCC and then moved the customers to the lead car away from the smoke. When the smoke dissipated, the incident train was keyed down. The Train Operator stated that CMNT and an RTRA Supervisor boarded the train to perform troubleshooting efforts. While on the lead car, the Train Operator stated that they heard over the radio that customers had self-evacuated onto the roadway. The fire department then arrived on the scene and evacuated the remaining customers on the train.

Weather

At the time of the incident, NOAA recorded the temperature at 66° F, broken clouds, and 44% humidity. (Weather source: National Oceanic and Atmospheric Administration – Location: Washington, DC.)

Human Factors

Fatigue

Based on SAFE's review of the Train Operator 7-day work history, the employee's 7-day work schedule leading up to the incident was compliant with WMATA's Policy/Instruction 10.6/1 Hours of Service Limitations for Prevention of Fatigue. It did not present a risk of impairment due to fatigue.

Evidence of Fatigue

The incident data was evaluated, and no signs or symptoms of fatigue were detected from the available data.

Fatigue Risk

The incident data was evaluated for fatigue risk factors. Risk factors for fatigue were not present. The incident time of day did not suggest an increased risk of fatigue-related impairment. The Train

Operator's off-duty period was 13.01 hours, which provides an opportunity for 7-9 hours of sleep. The employee reported 7 hours of sleep in the 24 hours preceding the incident. The employee reported no issues with sleep.

Findings

- RTRA Supervisor Two contacted the Radio RTC and reported that customers began self-evacuating the train on Track 2 approximately twenty minutes after troubleshooting efforts began.
- MTPD reported that approximately ten customers self-evacuated by climbing out of the operator's cab window and independently making it to the platform.
- AIMS playback revealed that when customers self-evacuated, they were on the roadway for approximately 35 seconds before third rail power was de-energized on Track 2 at Gallery Place Station.
- Based on ARS playback, the Radio RTC contacted the first two responding RTRA Supervisors to hot stick the third rail to confirm power was de-energized. Neither of the responding RTRA Supervisors had a WMATA hot stick and a pair of Metro-issued electrical safety gloves.
- While the train was secured by the Train Operator prior to departing the cab to investigate, handbrakes were not applied prior to customer evacuation operations, as required by SOP #4.
- MTPD reported that 109 passengers, including those who self-evacuated, were safely evacuated onto the roadway and to the platform. No injuries were reported on-scene.

Immediate Mitigation to Prevent Recurrence

- CMNT inspected the affected consist, and the disabled train was removed safely from the mainline to Greenbelt Rail Yard using a recovery non-revenue train for further inspection.
- MTPD reported that an inspection of the tunnel was conducted to ensure no other customers were on the roadway.

Probable Cause Statement

The probable cause of the Evacuation for Life Safety Reasons event was an electrical event on rail car 3283 that resulted in an immobile train. The root cause of the malfunctioning rail vehicle was due to cables and inter-car conduit burning when a short circuit occurred at the ER box of car 3283. The short circuit was identified and isolated to the J7-P7 connector/jumper that connects the battery power bus (positive and negative) from B car to A car. The root cause of the short circuit is undetermined; CENV is still investigating the root cause. Some possible contributing factors are a burnt cable ET007-10 (one of the negative wires) was found to have black marks in the wire strands. These wire strands may have been partially melted before this incident. The P7 connector shell has signs of extensive rust compared to other connectors within the ER box. Two parallel 1/0-gauge cables (2 for negative and 2 for the positive) must hold the full load at normal temperature. With approximately 60-70% of the ET007-10 cable being damaged, this cable becomes the weak point of the circuit. Under the previously mentioned condition, high temperatures are generated and transmitted during the incident, thereby damaging the cable's insulation within the connector.

SAFE Recommendations/Corrective Actions

The following are the recommendations and corrective actions identified as a result of this investigation. These recommendations and corrective actions are tracked using WMATA's Safety Measurement System Incidents/Accidents (SMS I/A) Module and are verified by SAFE upon completion. The responsible department is identified in the corrective action code, and the respective departmental Safety Risk Coordinator (SRC) will manage the mitigation. Refer to the SMS I/A Module for additional information.

Corrective Action Code	Description	Estimated Completion Date
96319_SAFECAPS_RTRA_001	(RC-1) Shall develop and distribute a Lesson Learned to emphasize the importance of why the RTRA Supervisors are required to carry hot sticks and gloves. Campaign to issue hot sticks and high voltage gloves to all remaining supervisory personnel.	Completed
96319_SAFECAPS_CENV_001	(RC-1) Complete failure and hazard analysis for root cause of electrical failure within the E/R box.	Completed
96319_SAFECAPS_CENV_002	(RC-1) Adopted from CENV Report: Revise Periodic C type Inspection procedures to include inspection of the cables inside the ER Box as well as cable terminal lugs to carbody ground continuity checks.	6/30/2022

Appendices

Appendix A – Interview Summaries

The narratives below are summaries of the interviews with SAFE and represent the statements made by the involved individuals. As such, times and details may present a conflict with the data contained in systems of record.

Office of Rail Transportation (RTRA)

Train Operator

The Train Operator is a WMATA employee with seventeen years of service and approximately twelve years of experience as a Train Operator. The employee's last Rail Certification was in February 2021. This employee has no history of sleep issues to report.

During the virtual interview, the Train Operator stated they were on their last trip of the day and had already completed three and a half round trips. The Train Operator stated that they had no train malfunctions before the incident while operating on the mainline. While on approach to Gallery Place Station, Track 2, their consist emergency application of the brakes dumped, causing their train to stop abruptly. The Train Operator keyed up the train to recharge the train brake pipe and check for brakes off but was unsuccessful. The Train Operator contacted the ROCC, and the Radio RTC instructed them to try and recharge the train from a different car and check the train. The Train Operator stated they conducted a radio check with their handheld radio, made an announcement to the customers, and secured the operator's cab door. The Train Operator stated they secured the train by only keying down and did not apply handbrakes to the consist but believe the RTRA Supervisor applied handbrakes when they boarded the train. As the Train Operator walked to the fourth or fifth car, they informed the customers of the train malfunction and stated emergency responders were on the way. The Train Operator stated they notified the ROCC of smoke at the fourth or fifth car, and customers were also reporting smoke emitting from the rail vehicle. The Train Operator stated they reported the smoke conditions to the ROCC and then moved the customers to the lead car away from the smoke. When the smoke dissipated, the incident train was keyed down. The Train Operator stated customers were irate as they continued to try and keep the customers calm. The Train Operator stated that CMNT and an RTRA Supervisor boarded the train to perform troubleshooting efforts. The Train Operator stated they did not recall seeing the CMNT Mechanic and RTRA Supervisor with a working hot stick. While on the lead car, the Train Operator stated that they heard over the radio that customers self-evacuated onto the roadway. The fire department then arrived on the scene and evacuated the remaining customers on the train. The Train Operator stated they don't recall if an emergency ladder was securely positioned between the car's end door and the roadway for the customers to be assisted down the ladder by the emergency responders. The Train Operator stated that when they exited the train, they keyed off to the walkway and walked to the platform on the safety walk. The Train Operator stated they were no more than 100 feet away from the platform when the train stopped.

Appendix B – MTPD Hot Wash Report



Metro Transit Police Department Hot Wash Summary



ADMINISTRATION HANDLING INSTRUCTIONS

This report will be completed after a debriefing or "hot wash" in accordance with applicable department policies/directives and procedures; at the request of the Chief of Police or designee or following any incident or event requiring the activation of the Incident Command System (ICS). The purpose of the report is to provide information, assess response, identify training, equipment needs, and to identify areas that may require improvement. After completion of this report, it should be forwarded to the Deputy Chief through the chain of command for review.

This report and any attachments are classified as For Official Use Only. This report may be used for emergency incidents, special events, and exercises. **Items marked with an asterisk (*) will be completed by the last official designated as the Incident Commander (IC) as there may be more than one IC during the incident.**

INCIDENT SUMMARY			
Incident Requiring ICS Activation:		GALP Disabled Train	
*Incident Commander (IC):		DCFD Battalion [REDACTED]	
MTPD CCN:	2021-05110	Local CCN:	
*Date ICS Initiated:	10222021	*Time ICS Initiated:	1426 hours
*Date ICS Terminated:	10222021	*Time ICS Terminated:	1543 hours
*Duration of Incident:	1 hour 17 minutes	*Service Disrupted (Type and Time):	1419-1520 hours no Green line service at GALP
Incident Location:	Track 2 Lower-level Green-line at GALP	Command Post Location:	top-side 7th & H street NW
MTPD On-Scene Commander (OSC):	Captain [REDACTED]	Command Aid for OSC:	none
Forward Liaison:	Sergeant [REDACTED]	Unified Command:	Yes
OCC Liaison:	IMO [REDACTED]	Alternate Channel:	MTPD 2X
Single Tracking (Time & Track No.):	began at 1520 hours on Track 1	Bus Bridge Established (From /To):	1454 -1532 hours
Inner and/or Outer Perimeter:	None	Power De-energized:	Yes 1419-1520 hours
OSC Relinquished Scene Command to Name Supervisor [REDACTED] Dept: RAIL Supervisor		Medical Attention Required/Requested:	All patrons were asked but all denied
Entry/Exit Log:	Officer [REDACTED]	CID Response:	none

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Attachment 1 – MTPD Hot Wash Page 1 of 4.

Date: 10/22/2021 Time: 14:11 hours.
Final Report –Evacuation for Life Safety Reasons.
E21513

Rev 1 Drafted By: SAFE 705 – 11/19/2021
Rev 1 Reviewed By: SAFE 71 – 12/20/2021
Rev 1 Approved By: SAFE 70 – 12/22/2021

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Metro Transit Police Department Hot Wash Summary

WMATA ON-SCENE PERSONNEL		
Name	Department/Office	Title/Role
	MTPD Watch Commander	Captain/On-Scene Commander
	MTPD POB D3	Lieutenant
	MTPD POB D1	Forward Liaison
	MTPD POB D1	Accountability Officer
	MTPD POB D1	Crowd Control
	MTPD POB D1	Crowd Control
	MTPD POB D1	Crowd Control
	RTRA	Rail Supervisor
	RTRA	Rail Supervisor
	BTRA	Bus Supervisor
	OEM/SAFE	SAFE representative/OSC Aid

EXTERNAL ON-SCENE PERSONNEL		
Name	Agency/Department	Title/Role
	DCFD	Battalion Chief/Battalion #6
	DCFD	Fire Chief
	DCFD	FD Lieutenant
	DCFD Engine #13	
	DCFD Engine #16	
	DCFD Engine #2	
	DCFD Engine #6	
	DCFD Engine #3/Truck #3	
	DCFD Truck #10	
	Rescue Squad #1	
	DCFD	Public Information Officer

Use separate sheet if additional space is required.

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MTPD-OSP-TMPL-009-00

Page 2 of 4

Effective: 12/30/20

Attachment 1 – MTPD Hot Wash Page 2 of 4.

Date: 10/22/2021 Time: 14:11 hours.
Final Report –Evacuation for Life Safety Reasons.
E21513

Rev 1 Drafted By: SAFE 705 – 11/19/2021
Rev 1 Reviewed By: SAFE 71 – 12/20/2021
Rev 1 Approved By: SAFE 70 – 12/22/2021

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Metro Transit Police Department Hot Wash Summary

REQUESTS	
*Radio Run Requested (Yes/No):	Yes
If "Yes," location where tape is stored:	Will be emailed to Capt [REDACTED] and OEM [REDACTED]
*Digital Video Evidence Unit (DVEU) Video Requested (Yes/No):	Yes
If "Yes," location where video is stored:	DVEU

OBSERVATIONS
1. 1419 hours - A call for service was dispatched for a disabled train (Train #302) at the Gallery Place metro station. Officer [REDACTED] arrived and confirmed the train was stranded and was able to be seen from the platform.
2. 1426 hours - Officer [REDACTED] assumed On-Scene- Command (OSC). He also advised approximately 10 patrons self-evacuated by climbing out of the operator ' s cab window.
3. 1434 hours - Sergeant [REDACTED] arrived and assumed OSC and assigned Officer [REDACTED] as the Forward Liaison and Officer [REDACTED] as the Accountability Officer. The patrons that self-evacuated made it to the platform on their own.
4. 1441 hours - Captain [REDACTED] assumed OSC. Officer Williams boarded the stranded train to inform the passengers and check for any possible injuries.
5. 1446 hours - WSAD's and personnel were in place to evacuate the remaining patrons from the train to the catwalk and onto the platform. There were no reported injuries.
6. 1457 hours - The passenger evacuation was complete. 109 passengers were evacuated.
7. 1509 hours - An inspection of the tunnel was conducted to ensure there were no stragglers on the roadway. The inspection was negative.
8. 1512 hours - All personnel were clear from the roadway
9. 1518 hours - DCFD turned the scene over to the On-Scene Commander-Captain [REDACTED]
10. 1520 hours - Track 1 was re-energized to begin single tracking and servicing the station.
11. 1536 hours - The scene was turned over to Rail Supervisor [REDACTED] and single tracking was still in effect at that time.

Use separate sheet if additional space is required.

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MTPD-OSP-TMPL-009-00

Page 3 of 4

Effective: 12/30/20

Attachment 1 – MTPD Hot Wash Page 3 of 4.

Date: 10/22/2021 Time: 14:11 hours.
Final Report –Evacuation for Life Safety Reasons.
E21513

Rev 1 Drafted By: SAFE 705 – 11/19/2021
Rev 1 Reviewed By: SAFE 71 – 12/20/2021
Rev 1 Approved By: SAFE 70 – 12/22/2021

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Metro Transit Police Department Hot Wash Summary

NOTES

Radio transmission was difficult to hear

No communication with MTPD regarding the establishment of bus bridge.

No communication was given to the OSC regarding the re-routing of buses which service 7th Street and H Street. Also, no Bus Supervisors responded to the scene to assist the patrons regarding bus service

Confusion regarding the Accountability Officer (Officer [REDACTED])

The teamwork and communication between DCFD and MTPD was smooth and provided for safe evacuation of the patrons from the train to the platform.

Use separate sheet if additional space is required.

On Scene Commander's Title, Printed Name, and Signature/Date

Captain [REDACTED] (On Scene Commander)

Watch Commander's Title, Printed Name and Signature/Date

Captain [REDACTED]

Patrol Operations Bureau Commander's, Printed Name and Signature/Date

Deputy Chief [REDACTED]

Office of Emergency Management Director's, Printed Name and Signature/Date

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MTPD-OSP-TMPL-009-00

Page 4 of 4

Effective: 12/30/20

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RTRA OPERATIONS PERSONNEL NOTICE

Friday, February 22, 2019

Rail Supervisors to Carry Hot Sticks and Gloves

As a reminder, all RSTO Rail Operations Supervisors are required to carry at all times while on duty, a hot stick (voltage tester) and a pair of Metro-issued electrical safety gloves (two-part, leather over insulated rubber gloves). This equipment shall be used whenever a Rail Supervisor is requested by ROCC to use a hot stick on the third rail. This decision comes as part of the elimination of the Station Emergency Cabinets and the contents from all Metrorail stations.

The station emergency cabinets were removed from stations due to the underutilization and unsustainability of the equipment stored inside the cabinets. Moving forward, Rail Operations Supervisors are required to carry their issued hot stick and gloves when on duty, and throughout their tour-of-duty.

If you are a Rail Operations Supervisor and do not currently have a hot stick and gloves, please immediately see your Division Management to acquire and/or replace these items.



I acknowledge the receipt of and understanding of this RTRA Operations Personnel Notice, ***“Rail Supervisors to Carry Hot Sticks and Gloves.”***

Print Name/Payroll#

Signature

Date Received

Supv. Print Name / Signature

Attachment 3 – RTRA Operations Personnel Notice Page 1 of 1.



Washington Metropolitan Area Transit Authority

CENV

Incident Report

**Train ID 302 Brake in Emergency and
Smoke reported in end of car 3283**

10-22-2021

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Attachment 1 – CENV Final Report page 1 of 13



Washington Area Metropolitan Transit Authority Incident Summary Report

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Attachment 1 – CENV Final Report page 2 of 13




LOCATION: Gallery Place

INCIDENT #: 8566800

DATE: 10/22/2021

TIME: 14:11 Hours

Investigation Team Members

 Vehicle Engineer
 Senior Vehicle Engineer
 Assistant Manager

Report Prepared By:





Report Approved By:



Digitally signed by

Date: 2022.01.20
13:30:14 -05'00'

 Deputy Chief Engineer - CENV

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Executive Summary

The OCC desk was notified on Friday October 22, at approximately 14:15hrs, that Train ID 302 CONSIST: L 3040/41 X 3091/90 X 3283/82 reported a B.I.E in approach to Gallery Place Station Track#2 and were unable to recharge the Brake Pipe. The road mechanic boarded the train and verified the exterior battery indicator light, white light, and bottom blue light on car 3283 were illuminated. Train ID 302 was unable to move and had to be recovered by a non-revenue train. There was a report of smoke in a rail car; however, the road mechanic was unable to confirm this during the inspection. The train was moved and arrived at Greenbelt (Track #5) at approximately 18:30. Hrs. The road mechanic reported smoke coming out from the rear, right side of car 3283 (near the ER box) but dissipated quickly upon walk around.

Note 1: White Light indicates Air Supply System Malfunction (e.g. Low air pressure at Main Reservoir).

Note 2: Blue Light indicates Brake System Malfunction (e.g. Stuck Brakes).

Investigation

CENV reviewed and analyzed VMS data downloaded from all cars in the consist. CENV also inspected the components involved in the incident on cars 3282/3283. During the investigation representatives from SAFE and WMSC were present and monitored the inspection process.

VMS Analysis

The following information was taken from VMS data analysis of cars 3040/3090/3282			
Event #	Date	Time	Description of the Event
1	10/22/21	14:09:52	Train ID 302 left the MT. Vernon Square (E01) -Truck #2 -Inbound -Lead car 3040 (TWC ID Code -144)
2	10/22/21	14:10:11	705 feet after the Station Platform (E01), with an operating speed of 35mph, the train began experiencing an erratic 37.5 voltage supply, while the 3 rd rail voltage remained stable at 750v.
3	10/22/21	14:10:28	Low Voltage Power readings were low (Car 3282 =21.68v and Car 3283=28.17V)
4	10/22/21	14:10:29	With the supply voltage in the A-CAR reading approximately 20V, the VMS system became inoperative and was not able to record other events (VMS system down). The Battery Circuit Breaker tripped (this event couldn't be recorded on the VMS of 3282). Road Mechanic reported that Battery CB red light indicator was found in the back of car 3283 during his inspection walk).

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5	10/22/21	14:10:29	VMS Data from Car 3090 (the VMS time is corrected with +10 seconds to synchronize with the time the events occurred in car 3283) shows Brake Pipe dumped and Emergency relays deenergized
6	10/22/21	14:10:38	Train come to full stop
7	10/22/21	14:10:47	First unsuccessful attempt to charge the cars' Battery Bus
8	10/22/21	14:11:03	Second unsuccessful attempt to charge the cars' Battery Bus
9	10/22/21	14:11:34	Third unsuccessful attempt to charge the cars' Battery Bus (car 3090 was coupled with car 3283). Short circuit in car 3283 affected the low voltage in car 3090 (no battery CB tripped in car 3091).
10	10/22/21	14:11:36	Low voltage indication in car 3090 started flickering (from 30.2 to 23.3v) and continued for approximately 32 seconds, until voltage returned to acceptable value. During this period the Battery Circuit Control in car 3091 didn't trip, because the voltage in that car remained above the tripping points (UVR trips 25.5V).
11	10/22/21	14:22:03	Train keyed down from lead car 3040
12	10/22/21	14:23:44	Train keyed up from car 3040. Stayed keyed up for 15sec, then keyed down
13	10/22/21	14:34:19	Train keyed up from car 3040. Seven unsuccessful attempts were made to charge the brake pipe (note: before the last attempt there was one quick key down/up event).
14	10/22/21	14:43:54	Train keyed down from car 3040
15	10/22/21	14:46:13	Train keyed up from car 3040
16	10/22/21	14:47:33	S1 rotary switch was moved to the uncouple position on car 3090, isolated (note: car 3090 was coupled to car 3283 during the incident)
17	10/22/21	14:57:12	Train keyed down from car 3040
18	10/22/21	15:55:53	Train keyed up from car 3040. 49 seconds later the Brake Pipe is charged
19	10/22/21	16:00:19	Brake Pipe was dumped and recharged after approximately 30 seconds
20	10/22/21	17:19:29	Train keyed down from car 3040
21	10/22/21	17:44:51	Train began moving (the direction of movement cannot determinate, some of the VMS signals were not available). Train moved about 71,826 feet, reaching maximum speed of 45 mph

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22	10/22/21	18:27:13	Train came to final stop
----	----------	----------	--------------------------

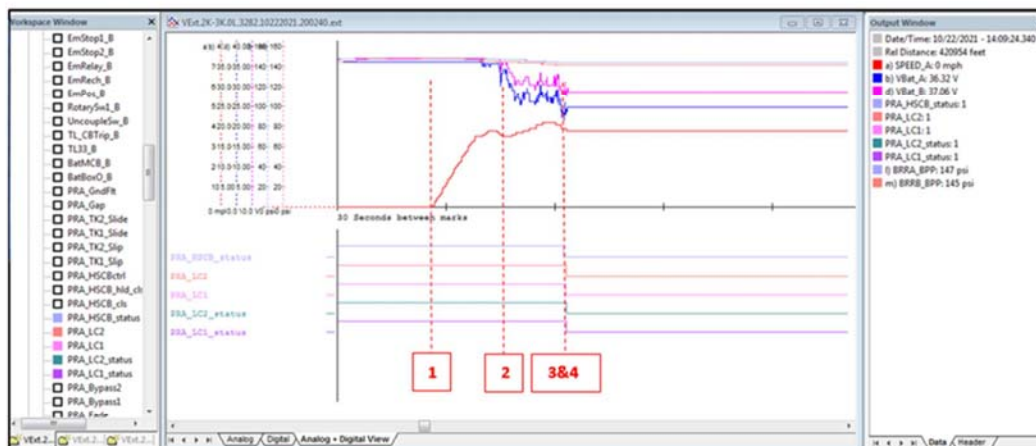


Figure 1. VMS Data Analysis Car 3282

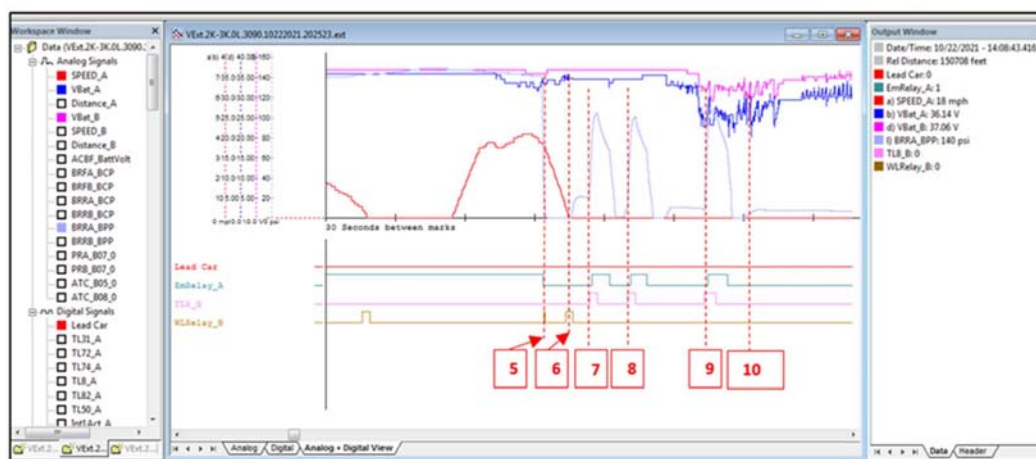


Figure 2. VMS Data Analysis Car 3090

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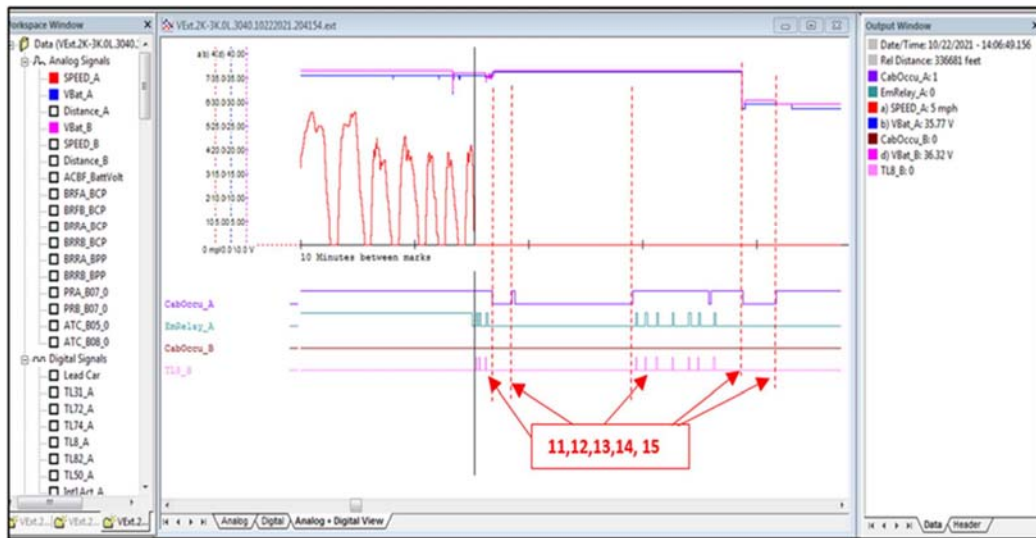


Figure 3. VMS Data Analysis Car 3040

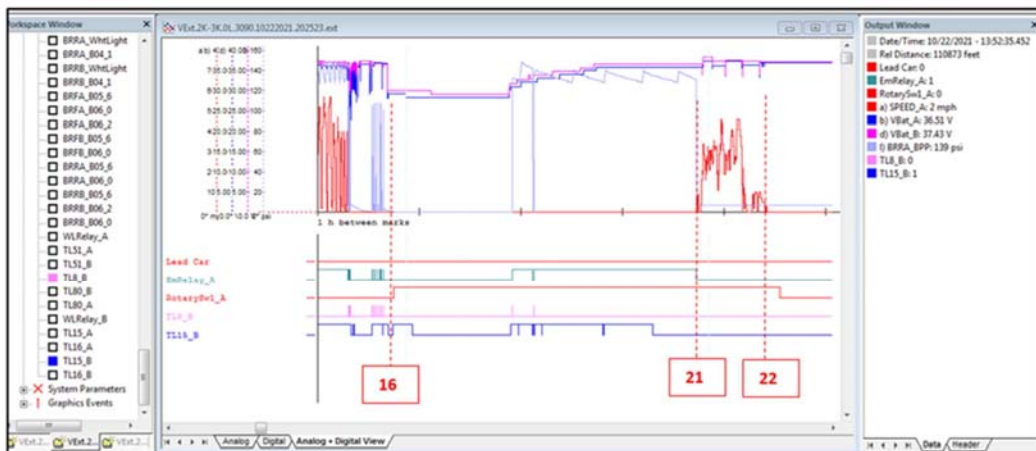


Figure 4. VMS Data Analysis Car 3090

Overhaul Shop Inspection and Testing

Car 3282

1. Inspected KA box, inter-car jumpers, cannon plugs and coupler pins. No discrepancies were found.
2. Inspected 37 VDC Battery System Bus in BD panel. No anomalies found.

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3. Inspected ER junction box, no wiring nor connector damage found. Found signs of flashing on the cover plate hardware of the external ER box connectors.

Car 3283

1. Inspected battery Charger CB and Aux Power CB, both were in the OFF position. No discrepancies found.
2. Inspected Battery Output CB, no discrepancies found. Note: The Battery CB and the CB light indication were placed in the OFF position prior to the inspection.
3. Inspected LVPS input/output cables, all were in good condition.
4. Inspected battery (SAFT 250), in good condition.
5. Inspected KA box, from the cannon plugs to coupler pins, no discrepancies found.
6. Inspected ER box, cannon plugs and inter-car jumpers (Refer to Figures 5, 6 and 7). The findings are identified below:
 - a. P7 connector burnt and partially melted, negative cable still connected.
 - b. The other 3 cables (2 positives and 1 negative) were broken due to overcurrent.
 - c. J7 socket burnt and partially melted with pins from P7 connector completely welded.
 - d. The cover plate of ER junction box connectors was found damaged and perforated.
 - e. P4-J4 (next to P7-J7) cannon plugs and conduit also damaged due to heat caused by overcurrent.

NOTE: The burnt connector J7-P7 of the inter-car jumper has 4 cables that connects the B car to the A car to provide battery positive voltage and negative return throughout the train.

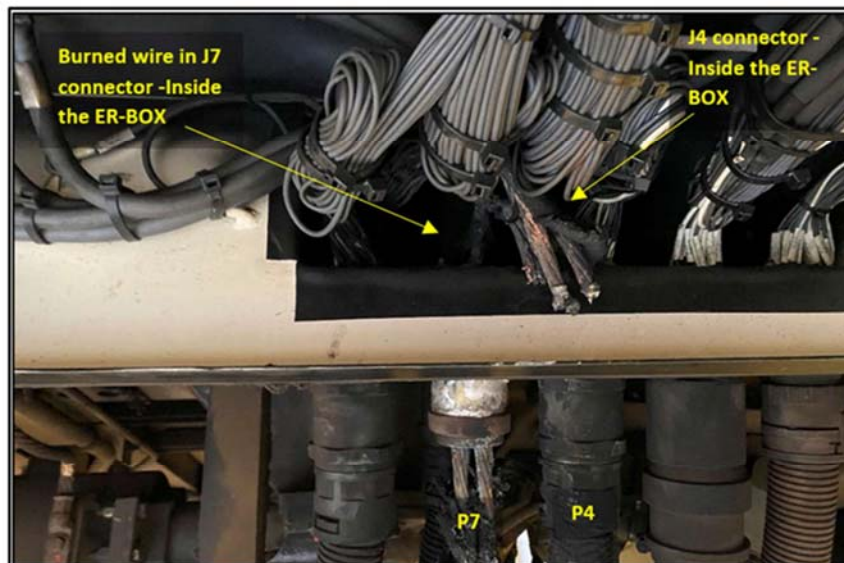


Figure 5. Damaged Connectors J7-P7 and J4-P4, Inside ER Box



Figure 6. Damaged Connectors J7-P7 and J4-P4, Front View



Figure 7. Burnt Connectors- View from behind

7. Inspected LVPS, KA and ER box inside wiring and terminals, Under Voltage Relay and Battery CB panel, no anomalies were found.

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Additional Findings (not related with the incident)

1. Car 3282 Traction Motors 1 and 2 ground cables were found loose from the lugs and Traction Motor 3 ground cable broken from the lug.
2. Car 3283 Traction Motor 2 ground cable broken from the lug
3. Water level low in Battery cells of car 3283

Additional Pertinent Information:

The wires ET003-5, ET003-6 (positive 37.5v) and ET007-10 (negative 37.5v) found burned and disconnected (detached) from the J7 connector pins. All these wires supply 37.5v from the battery/LVPS, located in CAR 3283, to CAR 3282 low voltage loads. Refer to Figure 8 below.

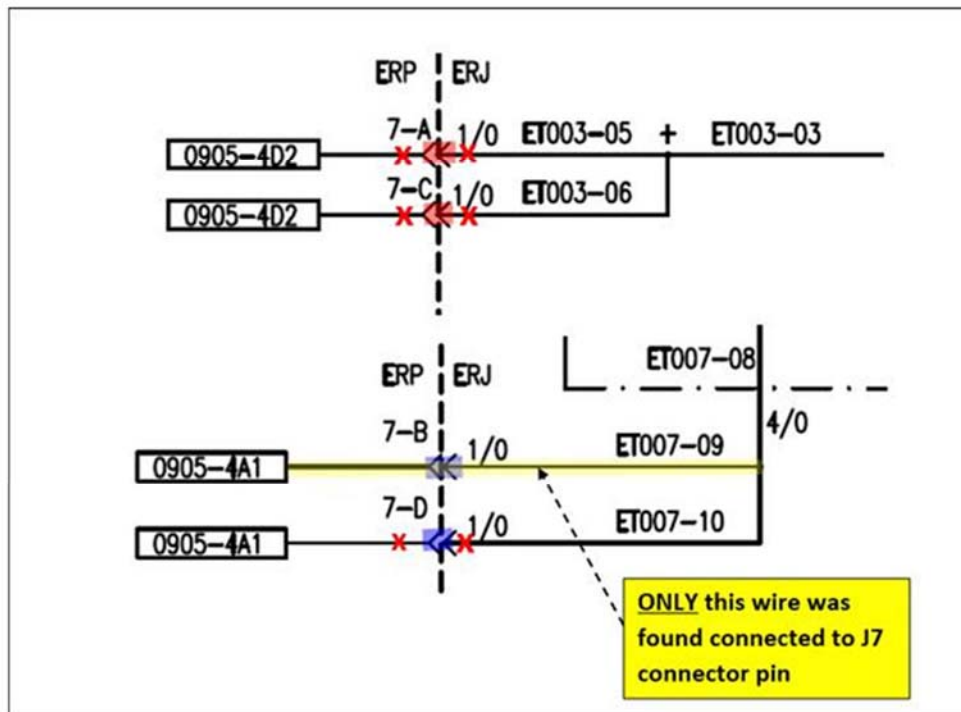


Figure 8. Drawing of burnt connector J7-P7

Actions Taken

1. Engineering isolated cables ET007 (negative) and ET003 (positive) in A and B cars from the loads.
2. Separated the burnt wires from each other and from car body.
3. Measured the cables isolation against car body and between each other. The resistance of the positive cables had a reading of infinity (OL) and the resistance of the negative

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- cable had a reading of 0.4 OHMS. **NOTE:** Some of the systems are connected directly to the car body ground. Both readings were acceptable.
4. Identified burnt connector J7-P7 of the inter-car jumper that connects the B car to the A car to provide battery positive voltage and negative return throughout the train.
 5. Engineering isolated all four burnt cables (removed from the terminal board in ER box BCAR) and measured resistance from ET007(-) and ET0003 (+) in A and B Cars to confirm isolation (no short circuit).
 6. With burnt wires isolated in B car, connected shop power only to B car for load testing:
 - a) Checked LVPS OK, holding the load.
 - b) Checked the car battery OK (charging OK).
 - c) Turned the head lights and the interior car lights ON -OK.
 - d) Turned the other systems, propulsion, Friction Brakes and HVAC ON, all running OK.
 - e) After this test, the shop power was removed from the B car.

Recommendations

1. Revise Periodic C type Inspection procedures to include inspection of the cables inside the ER Box as well as cable terminal lugs to carbody ground continuity checks.
2. Car 3283
 - Replace the J7 connector and cables to the terminal board
 - Replace the P7 inter-car jumper
 - Replace the J4 connector
 - Replace the P4 inter-car jumper
 - Replace the cover plate and mounting hardware for the ER junction box connectors and all Veam connectors found in the affected area
3. Car 3282
 - Replace the J7 connector and cables to the terminal board
 - Replace the P7 inter-car jumper
 - Replace the J4 connector
 - Replace the P4 inter-car jumper
 - Replace the cover plate and mounting hardware for the ER junction box connectors
4. Findings not related to the incident
 - a) Verify and replace the following broken/lose ground cables:
 - Car 3282 TM1
 - Car 3282 TM2
 - Car 3282 TM3 (TM3 has a ground cable must be re-crimped)
 - Car 3283 TM2
 - b) Refill the water level of battery cells to the maximum level

Conclusion

The train failure and the smoke reported with this incident was caused by the short circuiting of the battery power wires and the plastic conduit burning (within the ER box of car 3283) due to the heat associated with the short circuiting.

The short circuit was isolated to the J7-P7 connector/jumper that connects (transmit) battery power bus (positive and negative) from B car to A car; however, the actual root cause (i.e. source of the short circuit) was not identifiable due to the extent of the damage to all of wiring and connectors.

Based on the history of recent ER box failures, the circumstances surrounding this failure is considered an isolated incident

CENV will review, with CMNT, the PI procedures to require the addition of steps to inspect and verify the integrity of the wiring/circuitry involved in this unusual occurrence.

Factual Findings

- A. The burnt cable ET007-10 (one of the negative wires) was found to have black marks in the wire strands. These wire strands may have been partially melted prior to this incident. Refer to Figure 9 below.

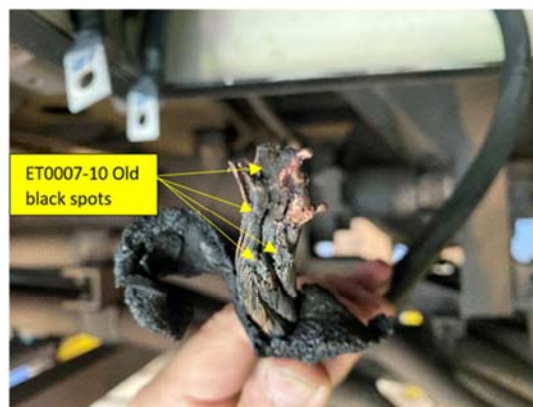


Figure 9. Damaged Wires ET007-10 Cable

- B. The J7-P7 connector shell has signs of extensive discoloration, in comparison to other connectors in ER box. Refer to Figure 10 below. The aspect of the burnt connector suggests the electrical integrity of the connector shell had been compromised.

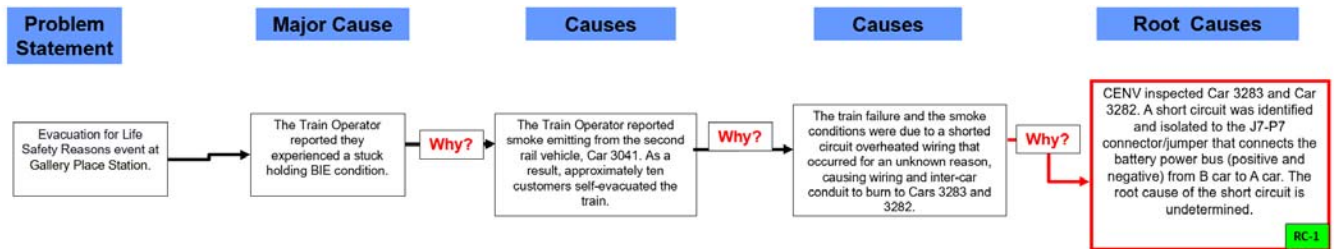


Figure 10. Rusted J7-P7 Connector

- C. The excessive heat from current imbalance, contributed to the deterioration of the J7-P7 connector, which is located outside the ER Box, underneath the car.
- D. This circuit is designed with two parallel 1/0-gauge copper cables (2 for negative and 2 for the positive) that must hold the full load at normal temperature. With the ET007-10 cable area being damaged, prior to the incident (Refer to Figure 9), this cable became the weak point of the circuit. Under the previously mentioned conditions, high temperatures are generated and transmitted thereby damaging the cable insulation within the connector.

NOTE: Wires where insulation is missing or exposed (positive and negative), when they touch one another or the positive of these wires comes in contact with the car body system, will cause a short circuit and/or overheating of the wires.

Appendix E – Root Cause Analysis



Root Cause Analysis

Attachment 1 Root Cause Analysis Page 1 of 1.

