

**WMSC Commissioner Brief: W-0150 – Collision, Evacuation – Blue/Orange/Silver Line – November 12, 2019**

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

**Safety event summary:**

A Blue Line train from Franconia-Springfield Station toward Largo Town Center Station struck a piece of metal on the roadway between Federal Triangle and Smithsonian stations at approximately 12:33 a.m. At the time of the collision, the train was moving approximately 27 mph. Power to the train decreased for approximately 19 seconds with erratic third rail voltage, then returned to normal. The train continued in service to Smithsonian Station.

Departing Smithsonian Station at 12:34 a.m. (note: times are approximate due to reliance on several different systems), the lead car of the train lost third rail power approximately 416 feet after departing Smithsonian Station when the train was moving 31 mph, disabling the HVAC system. Further investigation determined this location was likely the point where the car collector shoe fuses failed (collector shoes are the pieces of the car that contact the third rail to collect third-rail power).

The train continued in service, and an automatic power saving feature known as load shedding applied when part of the train lost third rail power approaching L'Enfant Plaza Station. This load shedding turned off all regular interior lights in at least the lead passenger cars when the train was moving 40 mph, 623 feet from the station. The Train Operator reported at 12:39 a.m., while the train was berthed at L'Enfant Plaza Station, that the interior lights had gone out, and at 12:42 a.m. that only emergency lighting was on. The Rail Operations Control Center (ROCC) Rail Controller asked the Train Operator whether the train could still close doors and release brakes (as required to move) and whether the HVAC system remained on. The Rail Controller stated that they could not copy the Train Operator's transmission in response, and that the Train Operator should contact the ROCC again from the Federal Center SW Station platform.

As the train entered Federal Center SW Station, the Train Operator heard a loud noise and saw electrical arcing and smoke coming from the train as the train pulled into the station. At that point, the Rail Controller instructed the Train Operator to turn off the HVAC system and to evacuate riders from the train. Riders were confirmed to all be off the train by 12:54 a.m.

The ROCC de-energized third rail power at 12:47 a.m., approximately 3 minutes after the train berthed at Federal Center SW Station. The ROCC activated station ventilation fans at 12:57 a.m.

Track inspections after the event identified broken wires and PVC pipes on the roadway, likely caused by the train striking and dragging the metal object. These pipes and wires were part of a train to wayside communications antenna.

After having Car Maintenance look for missing railcar panels and distributing an image of the metal object to other Metrorail departments, the investigation could not conclusively identify the source of the sheet metal on the roadway.

**Probable Cause:**

The probable cause of this event was debris on the roadway that Metrorail did not identify prior to a collision. Contributing to the potential consequences of this event was Metrorail's lack of procedures to specify when to remove



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railcars from service that have begun to activate emergency backup features such as load shedding or other emergency function activations.

**Corrective Actions:**

As the investigation could not identify the source of the metal on the roadway, no specific corrective actions could be effectively developed to address the source of the debris. Metrorail continues its regular track inspections.

**WMSC staff observations:**

Metrorail could consider adjusting procedures and training to specify acceptable or unacceptable operating conditions when a train has entered load shedding or other emergency support functions.

Metrorail tested radio communications at Federal Center SW rather than at L'Enfant Plaza, which was the only location where audio recordings suggested a potential deficiency. The WMSC is conducting a Communications Audit, which includes radio testing and troubleshooting processes.

**Staff recommendation:** Adopt final report.



Washington Metro Area Transit Authority  
Department of Safety and Environmental  
Management (SAFE)  
**FINAL REPORT OF INVESTIGATION A&I E21579**

<b>Date of Event:</b>	11/14/2021
<b>Type of Event:</b>	Evacuation for Life Safety Reasons
<b>Incident Time:</b>	00:43 hours.
<b>Location:</b>	Federal Center SW Station, Track 1.
<b>Time and How received by SAFE:</b>	00:44 hours. SAFE/IMO On-call Phone
<b>WMSC Notification Time:</b>	01:39 hours.
<b>Responding Safety Officers:</b>	WMATA SAFE: No WMSC: No Other: N/A
<b>Rail Vehicle:</b>	Train ID 405 [L3105-3104.3017-3016.3232-3233T]
<b>Injuries:</b>	No
<b>Damage:</b>	Rear collector shoes assembly and two blown collector shoe fuses on Car 3105.
<b>SMS I/A Incident Number:</b>	20211119#96919

**Federal Center SW Station  
Evacuation for Life Safety Reasons  
November 14, 2021**

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## **Abbreviations and Acronyms**

<b>AIMS</b>	Advanced Information Management System
<b>APS</b>	Auxiliary Power Supply
<b>ARS</b>	Audio Recording System
<b>CM</b>	Chain Marker
<b>COMR</b>	Office of Systems Maintenance, Office of Radio Communications
<b>CMNT</b>	Office of Car Maintenance
<b>CMOR IIT</b>	Office of Chief Mechanical Officer / Incident Investigation Team
<b>DCFEMS</b>	District of Columbia Fire and Emergency Medical Services Department
<b>ESR</b>	Event Scene Release
<b>FOD</b>	Foreign Object Damage
<b>IC</b>	Incident Commander
<b>IMO</b>	Incident Management Officer
<b>MSRPH</b>	Metrorail Safety Rules and Procedures Handbook
<b>MTPD</b>	Metro Transit Police Department
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>OSC</b>	On-Scene Commander
<b>OUC</b>	Office of Unified Communications
<b>PA</b>	Public Address
<b>ROCC</b>	Rail Operations Control Center
<b>RTC</b>	Rail Traffic Controller
<b>RTRA</b>	Office of Rail Transportation
<b>SAFE</b>	Department of Safety and Environmental Management
<b>SMS I/A</b>	Safety Measurement System Incidents/Accidents
<b>SOP</b>	Standard Operating Procedure
<b>TOC</b>	Transportation Operations Center
<b>TRST</b>	Office of Track and Structures
<b>WMATA</b>	Washington Metropolitan Area Transit Authority
<b>WMSC</b>	Washington Metrorail Safety Commission
<b>VMS</b>	Vehicle Monitoring System

## **Executive Summary**

On Sunday, November 14, 2021, at approximately 00:42 hours, the Train Operator operating Blue Line Train ID 405 [L3105-3104.3017-3016.3232-3233T] departed L'Enfant Plaza Station, Track 1, in the direction of Federal Center SW Station. Before departing L'Enfant Plaza Station, Track 1, the Train ID 405 Train Operator contacted the Rail Operation Control Center (ROCC) Radio Rail Traffic Controller (RTC) and reported that all the lights in the interior passenger cars were not working, and the consist emergency lights had activated. The Radio RTC instructed the Train Operator to continue to Federal Center SW Station. At approximately 00:43 hours, the Train ID 405 Train Operator contacted the Radio RTC and reported they heard a loud noise, saw an arc flash and smoke emitting from their consist before reaching the 8-car marker at Federal Center SW Station, Track 1. As a result, the Radio RTC instructed Train ID 405 Train Operator to turn off the environmental system in the consist. The Radio RTC then instructed Train ID 405 Train Operator to verify the consist was properly berthed on the platform and to key off the customers. The ROCC then initiated emergency notifications to the respective internal and external departments.

Based on the Advanced Information Management System (AIMS) playback, Train ID 405 berthed at Federal Center SW Station, Track 1, at approximately 00:44 hours. At approximately 00:47 hours, third rail power was de-energized at Federal Center SW Station, Track 1. At approximately 00:57 hours, the ROCC activated station ventilation fans in exhaust mode. At approximately 00:59, Train ID 405 was re-blocked to non-revenue Train ID 705. Audio Recording System (ARS) playback revealed at approximately 00:54 hours, the Train ID 405 Train Operator reported that the affected consist was offloaded. Personnel from the District of Columbia Fire and Emergency Medical Services Department (DCFEMS) arrived on scene at approximately 00:55 hours. At approximately 00:56 hours, the Radio RTC initiated Standard Operating Procedure (SOP) 1A, per the Metrorail Safety Rules and Procedures Handbook (MSRPH), and assigned Train ID 405 Train Operator as the On-Scene Commander (OSC). At approximately 00:59 hours, Office of Rail Transportation (RTRA) supervisors reported they were on scene and were appointed as the OSC by the Radio RTC. At approximately 01:07 hours, the RTRA Supervisor reported that Metro Transit Police Department (MTPD) was on scene and assumed OSC as Washington Metropolitan Area Transit Authority (WMATA) primary representative in the Unified Command. At approximately 01:17 hours, the RTRA Supervisor reported that the origin of smoke had dissipated. At approximately 01:30, the RTRA Supervisor reported that MTPD turned the scene back over to RTRA.

Based on the Office of Chief Mechanical Officer (CMOR) / Incident Investigation Team (IIT) post-incident analysis, the Vehicle Monitoring System (VMS) data revealed that at approximately 00:33 hours, the consist showed a battery voltage drop caused by erratic third rail voltage. CMOR IIT reported that this was assumed to be where the consist experienced Foreign Object Damage (FOD). The consist Auxiliary Power Supply (APS) showed that the third rail power was low, and battery voltage was approximately 30 VDC<sup>1</sup>. The consist was at traveling 27 mph. At 00:34 hours, Car 3105 APS showed that the HVAC system was low, caused by the loss of third rail power, approximately 416 feet after departing Smithsonian Station, Track 1. CMOR IIT reported that this

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<sup>1</sup> When the Low Voltage Power Supply is operating properly the battery voltage should be 37.5 volts.

was assumed to be where the vehicle shoe fuses failed due to the FOD. The consist speed was 31 MPH, and the battery voltage showed 34 VDC. At 00:34 hours, Car 3105 load shedding was initiated due to the loss of third rail voltage. Therefore, emergency lights turned on approximately 623 feet from L'Enfant Plaza Station, Track 1, with a train speed of 40 MPH. At 00:43 hours, the consist arrived at Federal Center SW Station. The consist battery voltage showed 30 VDC, and the consist was keyed down.

An Office of Car Maintenance (CMNT) Road Mechanic arrived at the incident site and inspected the consist under Foul Time (FT) protection. During the onsite inspection process, the CMNT Road Mechanic discovered a metal object pinned between the third rail and the right-side collector shoe assembly on Car 3105. Additionally, two collector shoe fuses failed on the rear truck on Car 3105. After the Road Mechanic safely removed the metal object pinned between the third rail and the right-side collector shoe and completed their assessment of the incident train. The Road Mechanic deemed the consist safe for transport. Based on ARS playback, the Radio RTC instructed non-revenue Train ID 705 Train Operator to continue down the line to New Carrollton Yard for post-incident inspection. At New Carrollton Yard, CMNT replaced the collector shoes and fuses and adjusted the collector shoe assembly to specification. See Appendix B.

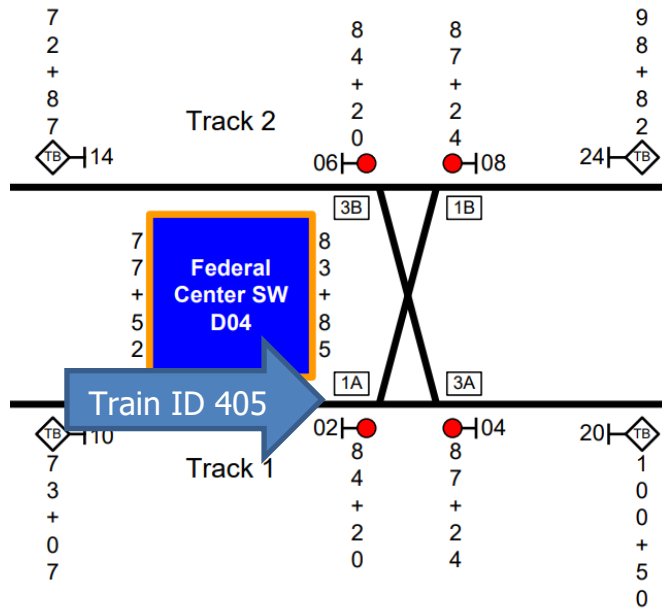
The Department of Safety and Environmental Management's (SAFE) Incident Management Official (IMO) authorized an Event Scene Release (ESR) at 01:37 hours. Based on ARS playback, at approximately 02:23 hours, the Office of Track and Structures (TRST) Personnel conducted a visual track inspection and walked from Federal Center SW Station to Smithsonian Station, Track 1. TRST Personnel reported no damage to any track components and deemed the area safe for rail vehicle movement. After reviewing the ARS, there appeared to be communication deficiencies over the radio. There were no injuries reported as a result of this incident.

The probable cause of the Evacuation for Life Safety Reasons event on Train ID 405 at Federal Center SW Station was that the consist encountered a foreign object of undetermined origin that resulted in an arc flash and smoke emitting from Car 3105. The investigation did not identify significant deficiencies with communication or adherence to established response procedures under the direction of responding emergency responders.

### **Incident Site**

Federal Center SW Station, Track 1.

## 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:

- 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:
  - Metrorail Safety Rules and Procedures Handbook (MSRPH)
  - National Oceanic and Atmospheric Administration (NOAA)
  - Rail Operations Control Center (ROCC) Procedures Manual
  - Office of Systems Maintenance Communication Section (COMM)
  - Office of Car Maintenance (CMNT)
  - Office of Chief Mechanical Officer (CMOR) / Incident Investigation Team (IIT)
- 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 Sunday, November 14, 2021, at approximately 00:43 hours, the Train Operator operating Blue Line Train ID 405 [L3105-3104.3017-3016.3232-3233T] contacted the Radio RTC and reported they heard an unidentified loud noise and saw an arc flash and smoke emitting from their consist before reaching the 8-car marker at Federal Center SW Station, Track 1. As a result, the Radio RTC instructed Train ID 405 Train Operator to turn off the environmental system in the consist. The Radio RTC then instructed Train ID 405 Train Operator to verify the consist was properly berthed on the platform and key off the customers. The ROCC then initiated emergency notifications to the respective internal and external departments. There were no injuries reported as a result of this incident.

At approximately 00:33 hours, Train ID 405 departed McPherson Sq., track 1 and experienced a battery voltage drop caused by erratic third rail voltage. The consist APS showed that the third rail power was low and the consist was at traveling 27 mph. At approximately 00:34 hours, Train ID 405 arrived at Metro Center Station the APS showed that the HVAC system was low, caused by the loss of third rail power on the lead car 3105, the train speed was 31 mph. At approximately 00:38 hours, Train ID 405 departed Smithsonian Station and according to the CMOR IIT report it is at this approximate time that the shoe fuses failed. At approximately 00:38 hours, Train ID 405 arrived at L'Enfant Plaza Station.

## **Chronological Event Timeline**

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

<b>Time</b>	<b>Description</b>
00:39:54 hours	<u>Train ID 405 Train Operator:</u> Contacted Radio RTC and reported they are at L'Enfant Plaza Station, Track 1, and the lights went out on their consist. <u>Radio RTC:</u> Responded, "what's your lead car?" <u>Train ID 405 Train Operator:</u> Responded, "Lead Car 3105." [Ops 2]
00:42:11 hours	<u>Train ID 405 Train Operator:</u> Contacted Radio RTC and reported their consist emergency lighting had activated. <u>Radio RTC:</u> Acknowledged and asked, "can you get all doors closed and brakes off?" And "Train ID 405 Train Operator, is your consist environmental system on?" <u>Radio RTC:</u> Contacted Train ID 405 Train Operator and stated "I couldn't copy your transmission. Let the ROCC know when you get to Federal Center SW Station." [Ops 2]
00:43:24 hours	<u>Train ID 405 Train Operator:</u> Contacted Radio RTC and reported something was wrong with their consist. The Train Operator reported hearing a loud noise, seeing smoke and arcing coming from their consist at Federal Center SW Station. The Train Operator also noted they are not properly berthed at the platform. <u>Radio RTC:</u> Acknowledged and stated, "you have a permissive block to berth and offload your consist properly." The Radio RTC then instructed the Train ID 405 Train Operator to stop their Train. <u>Train ID 405 Train Operator:</u> Responded, "my consist is stopped." [Ops 2]

Time	Description
00:45:12 hours	<p><u>Radio RTC</u>: Contacted Train ID 405 Train Operator and instructed them to “turn off the consist environmental system, make announcements to your customers, key down and key off customers off the lead car.”</p> <p><u>Train ID 405 Train Operator</u>: Acknowledged and stated, “the consist environmental system is turned off.”</p> <p><u>Radio RTC</u>: Acknowledged. [Ops 2]</p>
00:46:10 hours	<p><u>ROCC Assistant Superintendent</u>: Contacted the Office of Unified Communications (OUC).</p> <p><u>OUC Emergency Dispatcher</u>: Answered and stated, “what’s the address of the emergency?”</p> <p><u>ROCC Assistant Superintendent</u>: Responded “401 Third Street SW, which is Federal Center SW Station.”</p> <p><u>OUC Emergency Dispatcher</u>: Responded “how can I help you?”</p> <p><u>ROCC Assistant Superintendent</u>: Responded “a Train Operator reported smoke in Federal Center SW Station within platform limits.”</p> <p><u>OUC Emergency Dispatcher</u>: Responded “are there any flames, and are customers still on the Train?”</p> <p><u>ROCC Assistant Superintendent</u>: Responded “no flames, only smoke, and the Train Operator was in the process of offloading the Train.”</p> <p><u>OUC Emergency Dispatcher</u>: Responded “are there any reported injuries?”</p> <p><u>ROCC Assistant Superintendent</u>: Responded “no injuries have been reported.” [Phone]</p>
00:49:00 hours	<p><u>Train ID 405 Train Operator</u>: Contacted Radio RTC and performed a radio check.</p> <p><u>Radio RTC</u>: Responded “loud and clear and asked how many cars you have on the platform?”</p> <p><u>Train ID 405 Train Operator</u>: Responded that the Federal Center SW Station Manager was on scene and said all cars are within platform limits.</p> <p><u>Radio RTC</u>: Responded “please walk through the entire consist and verify all cars are on the platform.”</p> <p><u>Train ID 405 Train Operator</u>: Acknowledged. [Ops 2]</p>
00:53:23 hours	<p><u>Train ID 405 Train Operator</u>: Contacted Radio RTC and reported they are the last car, and all cars are within platform limits. The Train ID 405 Train Operator stated that they are currently keying off the last customer as well. [Ops 2]</p>
00:54:54 hours	<p><u>Radio RTC</u>: Contacted Train ID 405 Train Operator and asked to “verify your consist has been offloaded, and you are clear of customers.”</p> <p><u>Train ID 405 Train Operator</u>: Responded and confirmed the consist was clear of customers.</p> <p><u>Radio RTC</u>: Responded “is there still smoke conditions in the station?”</p> <p><u>Train ID 405 Train Operator</u>: Responded, light smoke conditions in the station and reported the fire department is on scene. [Ops 2]</p>
00:56:51 hours	<p><u>Radio RTC</u>: Contacted Train ID 405 Train Operator and stated you are appointed as the OSC.</p> <p><u>Train ID 405 Train Operator</u>: Acknowledged. [Ops 2]</p>

Time	Description
00:59:29 hours	<u>RTRA Supervisor:</u> Contacted ROCC Radio RTC and reported they are on scene. <u>Radio RTC:</u> Acknowledged and stated "RTRA Supervisor, you are now appointed as the OSC." [Ops 2]
01:07:48 hours	<u>RTRA Supervisor:</u> Contacted ROCC Radio RTC and reported MTPD is on scene. [Ops 2]
01:17:38 hours	<u>RTRA Supervisor:</u> Contacted ROCC Radio RTC and reported that all smoke had dissipated in the station. <u>Radio RTC:</u> Acknowledged. [Ops 2]
01:30:03 hours	<u>RTRA Supervisor:</u> Contacted ROCC Radio RTC and reported that MTPD had turned the scene back over to RTRA and handbrakes are applied to the incident train on Cars 3105, 3104, 3017, 3016, 3232 and 3233. <u>Radio RTC:</u> Acknowledged. [Ops 2]
01:33:32 hours	<u>Radio RTC:</u> Contacted TRST Personnel and instructed them to perform a walking inspection from Federal Center SW Station to L'Enfant Plaza Station, Track 1. <u>TRST Personnel:</u> Acknowledged. [Ops 2]
01:50:04 hours.	<u>RTRA Supervisor:</u> Contacted ROCC Radio RTC and reported that they performed a good ground walk around and no defects were identified. [Ops 2]
01:51:13 hours	<u>Radio RTC:</u> Contacted TRST Personnel and stated "D02-02 signal is red, blue block, prohibited exits has been established for your protection. You do have FT to enter the roadway, hot stick, confirm the third rail is de-energized, and provide the ROCC with a CM." <u>TRST Personnel:</u> Acknowledged. [Ops 2]
01:52:10 hours	<u>TRST Personnel:</u> Contacted Radio RTC and stated third rail power was de-energized at CM D1-77+00 and "I request permission to continue our walk to L'Enfant Plaza Station, Track 1." <u>Radio RTC:</u> Acknowledged. [Ops 2]
01:56:15 hours	<u>TRST Personnel:</u> Contacted Radio RTC and reported they identified a broken wire on the roadway at CM D1-69+00 <u>Radio RTC:</u> Acknowledged, [Ops 2]
01:59:58 hours	<u>TRST Personnel:</u> Contacted Radio RTC and reported personnel and equipment had cleared the roadway and are safely on L'Enfant Plaza Station platform and will be relinquishing their FT protection. <u>Radio RTC:</u> Acknowledged, [Ops 2]
02:05:49 hours	<u>Radio RTC:</u> Contacted TRST Personnel and reported that "Rail 1 would like you to continue your walk from L'Enfant Plaza Station to Smithsonian Station, Track 1." <u>TRST Personnel:</u> Acknowledged and stated they are in place to continue their walk. <u>Radio RTC:</u> Responded" you have permission to continue your walk from L'Enfant Plaza Station to Smithsonian Station, Track 1 report anything unusual and let the ROCC know when you are safely on the platform at Smithsonian Station." <u>TRST Personnel:</u> Acknowledged. [Ops 2]

Time	Description
02:12:07 hours	<u>TRST Personnel:</u> Contacted Radio RTC and reported that broken PVC pipes plus wires were on the roadway at CM D1-54+00 and CM D1-51-00. <u>Radio RTC:</u> Acknowledged, [Ops 2]
02:23:58 hours	<u>TRST Personnel:</u> Contacted Radio RTC and reported personnel and equipment had cleared the roadway and are safely on Smithsonian Station platform and will be relinquishing their FT protection. TRST personnel said there were no other findings to report, and all track components are suitable and deemed the area safe from Federal Center SW Station to Smithsonian Station, Track 1. <u>Radio RTC:</u> Acknowledged, [Ops 2]
02:30:35 hours	<u>Radio RTC:</u> Contacted CMNT Road Mechanic and requested that they to conduct a ground walk around and an internal inspection of the disabled Train. <u>CMNT Road Mechanic:</u> Acknowledged. [Ops 2]
02:37:52 hours	<u>CMNT Road Mechanic:</u> Contacted Radio RTC and requested FT protection to enter the roadway plus one to inspect the disabled Train at Federal Center Station SW, Track 1. <u>Radio RTC:</u> Acknowledged and stated "D02-02 signal is red, blue block, prohibited exits has been established for your protection. You do have FT protection to enter the roadway to perform a ground walkaround of the incident train." <u>CMNT Road Mechanic:</u> Acknowledged. [Ops 2]
02:49:17 hours	<u>CMNT Road Mechanic:</u> Contacted Radio RTC and reported a metal object pinned between the third rail and the right-side collector shoe on Car 3105. Additionally, both collector shoe fuses were blown on the rear truck on Car 3105. Pictures have been taken, and they are about to remove the metal object. <u>Radio RTC:</u> Acknowledged. [Ops 2]
02:51:41 hours	<u>CMNT Road Mechanic:</u> Contacted Radio RTC and reported that the metal object had been safely removed. <u>Radio RTC:</u> Acknowledged. [Ops 2]
02:56:19 hours	<u>CMNT Road Mechanic:</u> Contacted Radio RTC and reported that after completing the inspection of the incident train, they deemed the consist safe for transport. <u>Radio RTC:</u> Acknowledged. [Ops 2]
02:58:56 hours	<u>CMNT Road Mechanic:</u> Contacted Radio RTC and reported "all personnel and equipment are clear of the roadway at Federal Center SW Station, Track 1, and you can restore third rail power at your discretion; tracks are revenue ready." <u>Radio RTC:</u> Acknowledged and asked if it was safe to move the incident train and are all components secure. <u>CMNT Road Mechanic:</u> Responded, it is safe to transport. [Ops 2]
03:00:04 hours	<u>Radio RTC:</u> Alerted all Ops 2 Train Operators and personnel and reported that third rail power is about to be restored at Track 1 between Smithsonian Station and Federal Center SW Station. [Ops 2]
03:13:48 hours	<u>CMNT Road Mechanic:</u> Contacted Radio RTC and reported that all handbrakes had been released. <u>Radio RTC:</u> Acknowledged. [Ops 2]

Time	Description
03:19:09 hours	<u>CMNT Road Mechanic:</u> Contacted Radio RTC and reported they would be onboard the incident train to support the operator to New Carrollton Yard. <u>Radio RTC:</u> Acknowledged. [Ops 2]
03:33:10 hours	<u>Radio RTC:</u> Contacted RTRA Supervisor and instructed them to perform a rolling brake test to ensure that the consist was rolling freely. <u>RTRA Supervisor:</u> Responded that they completed their rolling brake test and confirmed they are rolling freely. <u>Radio RTC:</u> Acknowledged and stated, "you have an absolute block to Potomac Avenue Station, Track 1 with speeds not exceeding 10 MPH, verifying lunars and correct rail alignment along the way." <u>RTRA Supervisor:</u> Acknowledged. [Ops 2]

**\*\*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 thus do not represent the actual view available to the ROCC controller.

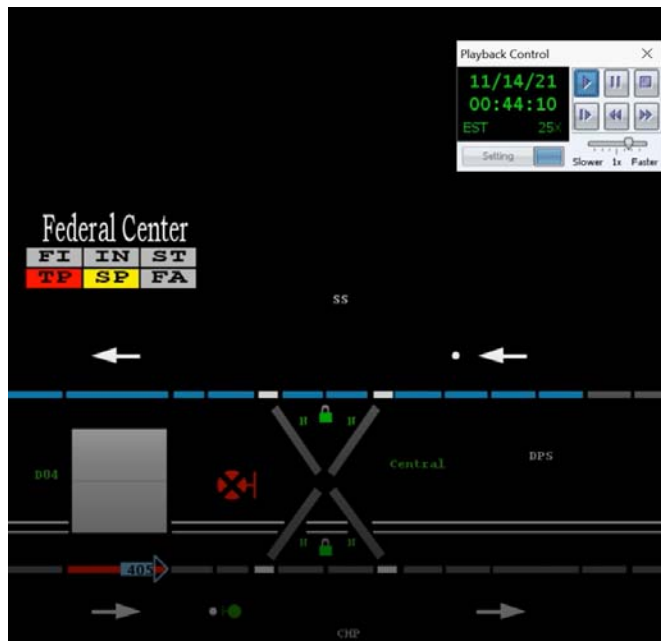


Diagram 1 - Based on the AIMS playback, Train ID 405 berthed at Federal Center SW Station, Track 1, at 00:44:10 hours.

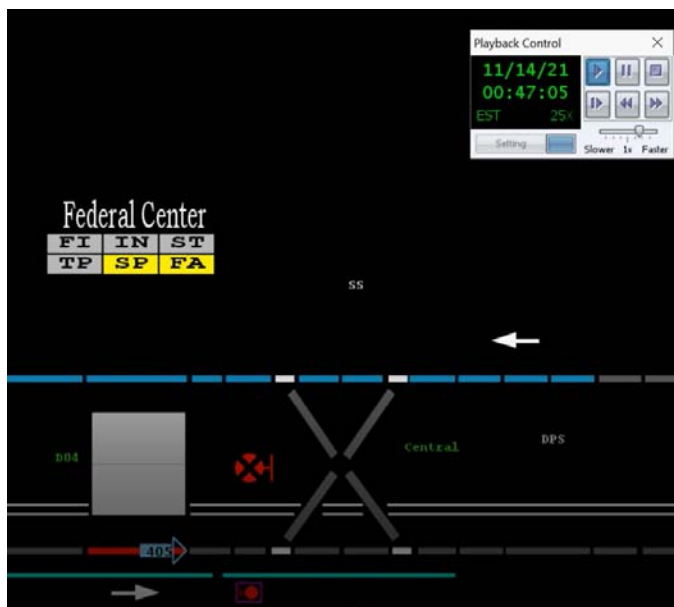


Diagram 2 - Based on the AIMS playback, Federal Center SW Station, Track 1, third rail power was de-energized at 00:47:05 hours.

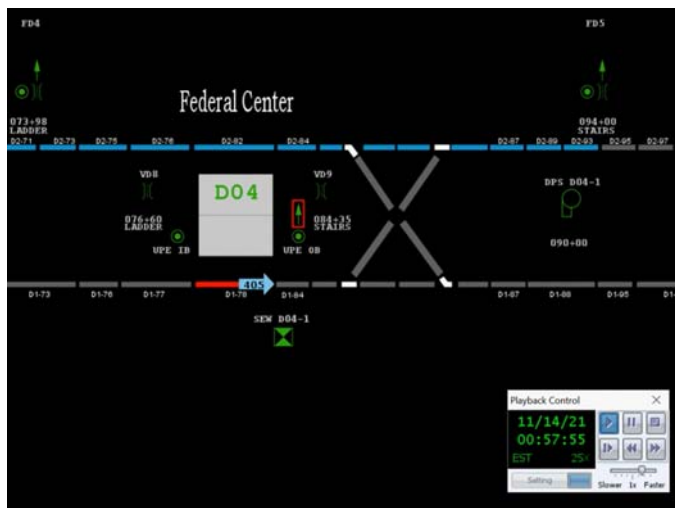


Diagram 3 - Based on the AIMS playback, the ROCC activated Federal Center SW Station fans in exhaust mode at 00:57:55 hours.



Diagram 4 - Based on the AIMS playback, Train ID 405 was re-blocked to non-revenue Train ID 705 00:59:35 hours.



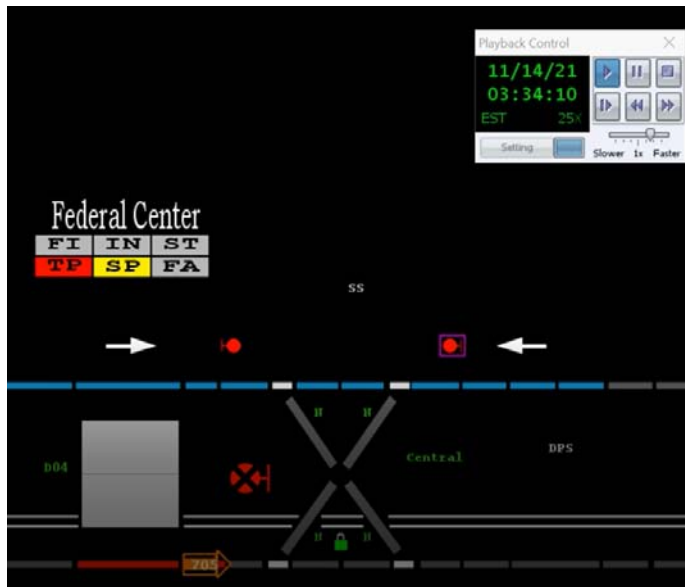


Diagram 5 – Based on the AIMS playback, non-revenue Train ID 705 continued down the line to New Carrollton Yard at 03:34:10 hours.

## Photographic Evidence



Figure 1 – The metal object that was pinned between the third rail and the right-side collector shoe on Car 3105.





Figure 2 – Broken Polyvinyl Chloride pipes plus wires found on the roadway at CMs D1-54+00 and D1-51-00.



Figure 3 - Damaged rear collector assembly on Car 3105 due to the heat from the arc flash.

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

**Event Recorder (ER) Data Graph/Sequence of Events**

Based on CMOR IIT analysis of the downloaded VMDS and ER, details from the data analysis are as follows:

Time	Description
00:31:38 hours	Train ID 405, Lead car 3105, departed Farragut West Station, Track 1, while the consist battery voltage and third rail voltage showed normal at this time.

Time	Description
00:33:00 hours	The consist showed voltage drop caused by a third rail voltage erratic after the train departed McPherson Sq. Station heading towards Metro Center Station, Track 1. CMOR IIT reported that this was assumed to be where the consist encountered the Foreign Object Damage (FOD). The consist Auxiliary Power Supply (APS) showed that the third rail power was low and battery voltage was approximately 30 VDC. The consist was traveling 27 mph.
00:33:19 hours	The consist battery voltage showed a normal 35 VDC. Both The consist ASP showed normal operation at this time.
00:34:02 hours	The consist arrived at Smithsonian Station, Track 1. The consist serviced the station and continued to the next station.
00:34:23 hours	Car 3105 APS showed that the HVAC system was low caused by the loss of the third rail approximately 416 feet after departing Smithsonian Station, Track 1. (CMOR IIT reported that this was assumed to be the location where the vehicle shoe fuses opened due to the FOD). The consist speed was 31 MPH, and the battery voltage showed 34 VDC.
00:34:41 hours	Car 3105 load shedding was initiated due to the loss of third rail voltage at this time. Therefore, emergency lights turned on approximately 623 feet from L'Enfant Plaza Station, Track 1, with a train speed of 40 MPH.
00:35:23 hours	The consist arrived at L'Enfant Plaza Station and serviced the station.
00:38:05 hours	The consist was keyed down at L'Enfant Plaza Station. The consist APS B car still showed a low HVAC system with load shedding and emergency lights activated.
00:38:12 hours	The consist was keyed up on Car 3105, and doors were closed and locked. The consist continued to Federal Center SW Station, Track 1.
00:43:31 hours	The consist arrived at Federal Center SW Station. The consist battery voltage showed 30 VDC, and the consist was keyed down.

**Note:** CMOR IIT reported based on the VMS Fault logs and ER data; there were no train functionality anomalies that contributed to the cause of this incident.

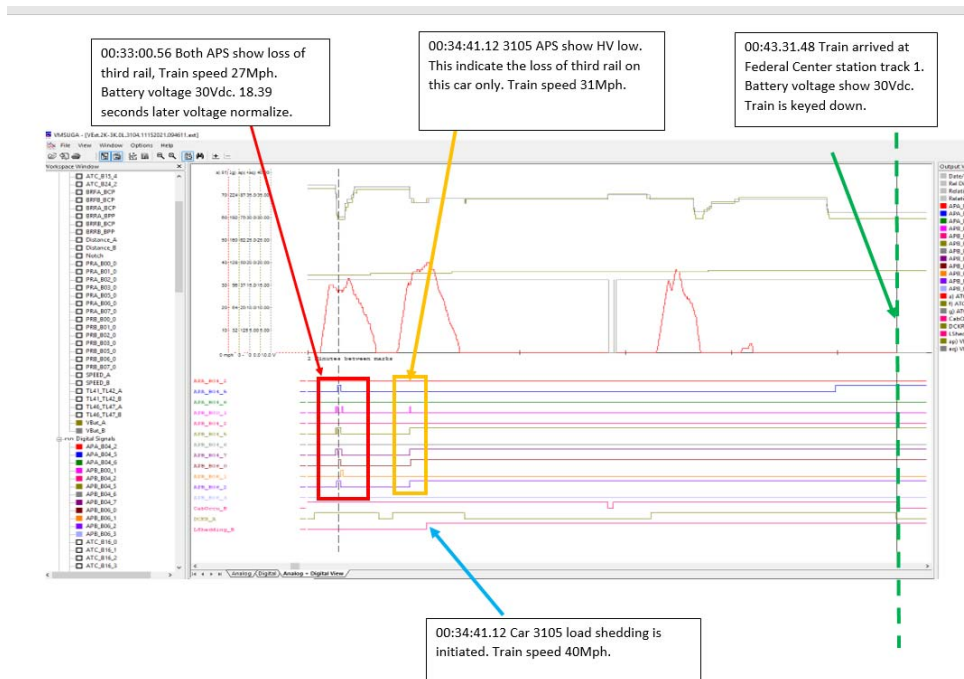


Diagram – ER Graphical Analysis.

### **Office of Car Maintenance (CMNT)**

A CMNT Road Mechanic arrived at the incident site and inspected the consist under Foul Time (FT) protection. During the onsite inspection process, the Road Mechanic discovered a metal object pinned between the third rail and the right-side collector shoe on Car 3105. Additionally, two collector shoe fuses had blown on the rear truck on Car 3105. After the Road Mechanic safely removed the metal object pinned between the third rail and the right-side collector shoe and completed their assessment of the incident train, the Road Mechanic deemed the consist safe for transport. Based on ARS playback, the Radio RTC instructed non-revenue Train ID 705 Train Operator to continue down the line to New Carrollton Yard for post-incident inspection. At New Carrollton Yard, CMNT replaced the collector shoes and fuses and adjusted the collector shoe assembly to specification. See Appendix B.

### **Office of System Maintenance Office of Radio Communication (COMR)**

COMR personnel performed a comprehensive radio operational test at 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 on Sunday, November 14, 2021, at approximately 00:45 hours, Train ID 405 Train Operator reported smoke and arcing from the train's undercarriage. SAFE IMO reported DCFEMS was notified and responded to the scene. Customers were safely evacuated from the incident train to the outside of the station. Reportedly, the ROCC activated all ventilation systems.

## **Written Statement Findings**

SAFE received one written statement. The written statement identified the following key findings associated with this event:

In a written statement, the Train Operator stated that on November 14, 2021, between 00:30 hours and 00:40 hours, they noticed that the environmental system had shut off, and the train was dark. The Train Operator notified the ROCC, and the ROCC asked the Train Operator to see if any circuit breakers had tripped. After checking, the Train Operator informed the ROCC that their consist still had no lights, but the emergency lighting had activated. The ROCC then asked if they could get the brakes off and all doors closed to continue. The Train Operator indicated that as they were entering Federal Center SW Station, they heard a loud explosive sound coming from the train and saw smoke. The Train Operator stated they stopped the train and contacted the ROCC. The ROCC then asked if they were properly berthed on the platform. The employee told the ROCC they were not at the 8-car marker. The ROCC instructed them to properly berth and granted Train ID 405 Train Operator a permissive block. The Train Operator repeated back instructions and informed the ROCC again of the loud explosive noise they heard and the smoke they saw. The ROCC then instructed the Train Operator to key down and walk through the consist to make sure all six cars were on the platform. The Federal Center SW Station Manager then contacted the ROCC and reported that all six cars were on the platform. The Train Operator stated they then asked if they could key off customers as they walk through the consist because they wanted to exit the consist. The ROCC granted the Train Operator permission to key off the customers. After the train was confirmed clear of customers, the Train Operator indicated that they contacted the ROCC to let them know that the train had been offloaded.

## **Weather**

At the time of the incident, NOAA recorded the temperature at 34° F, clear and 72% humidity. Federal Center SW station is within a tunnel section of the rail system. Weather was not a contributing factor to the incident. (Weather source: National Oceanic Atmospheric Administration – Location: Washington, DC.)

## **Findings**

- Incident consist encountered foreign object at approximately 00:33 hours, outside of Smithsonian Station on track 1.
- Incident consist experienced disabling damage on approach to Federal Center SW when the foreign object became lodged between a collector shoe assembly and the third rail.
- At approximately 00:57 hours, the ROCC activated the station fan in exhaust mode.
- Cars 3105 and 3104 received their last 90-day Preventive Maintenance Inspection on October 31, 2021. There were no discrepancies noted in the CMNT report provided.
- ROCC, MTPD and RTRA complied with SOP #1A and SOP #7 procedures when responding to this event.
- At New Carrollton Yard, CMNT replaced the collector shoes and fuses and adjusted the collector shoe assembly to specification. See Appendix B.

### **Immediate Mitigation to Prevent Recurrence**

- The ROCC Radio RTC instructed Train ID 405 Train Operator to offload their consist.
- The ROCC removed Train ID 405 from service for post-incident investigative processes.

### **Probable Cause Statement**

The probable cause of the Evacuation for Life Safety Reasons event on Train ID 405 at Federal Center SW Station was that the consist encountered a thin piece of sheet metal, conduit and mating wires that resulted in an arc flash and smoke emitting from Car 3105.

### **SAFE Recommendations/Corrective Actions**

SAFE has no recommendations or corrective actions related to this incident.

## **Appendices**

### **Appendix A – Written Statement**

*The below narrative is a summary of the written statement made by the involved individual. 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 approximately seven (7) years and five (5) months of service.

In a written statement, the Train Operator stated that on November 14, 2021, between 00:30 hours and 00:40 hours, they were operating Train ID 405 on Track 1 and properly berthed at L'Enfant Plaza Station, servicing the station. The Train Operator noticed that the EV system had shut down, and the train was dark. The Train Operator notified the ROCC, and the ROCC asked the Train Operator to see if any circuit breakers had tripped. After checking, the Train Operator informed the ROCC that their consist still had no lights, but the emergency lighting had activated. The ROCC then asked if they could get the brakes off and all doors closed to continue. The Train Operator indicated that as they were entering Federal Center SW Station, they heard a loud explosive sound coming from the train and saw smoke. The Train Operator stated they stopped the train and contacted the ROCC. The ROCC then asked if they were properly berthed on the platform. The employee told the ROCC they were not at the 8-car marker. The ROCC instructed them to properly berth and granted Train ID 405 Train Operator a permissive block. The Train Operator repeated back instructions and informed the ROCC again of the loud explosive noise they heard and the smoke they saw. The ROCC then instructed the Train Operator to key down and walk through the consist to make sure all six cars were on the platform. The Federal Center SW Station Manager then contacted the ROCC and reported that all six cars were on the platform. The Train Operator stated they then asked if they could key off customers as they walk through the consist because they wanted to exit the consist. The ROCC granted the Train Operator permission to key off the customers. After the train was confirmed clear of customers, the Train Operator indicated that they contacted the ROCC to let them know that the train had been offloaded.



## Appendix B – CMNT Work Order Details



### Washington Metropolitan Area Transit Authority Maintenance and Material Management System Work Order Details

Page 1 of 2  
MX76PROD

Work Order #: 16701124  
Type: CM



Status: CLOSE  
11/17/2021 23:28

Work Description: SMOKE ON TRAIN COLLECT SHOE ASSEMBLY FLASHED AND FUSE BLOWN  
Job Plan Description:

D04-D1 SMOKE ON TRAIN #405. TRACK UNIT #665, ATC, AND TRPM NOTIFIED EN ROUTE.

Work Information			
Asset: R3105	3105, RAIL CAR, BREDA, 3000 AC, B CAR	Owning Office: CMNT-CMNT-CMNT	Parent:
Asset Tag: R3105		Maintenance Office: CMNT-NEWC-INSP	Create Date: 11/14/2021 04:51
Asset S/N: 3105		Labor Group:	Actual Start: 11/14/2021 04:52
Location: 1230	D99, NEW CARROLLTON YARD	Crew:	Actual Comp: 11/16/2021 12:55
Work Location: 1230	D99, NEW CARROLLTON YARD	Lead:	Item: L18060002
Failure Class: CMNT001	RAIL CAR	GL Account: WMATA-02-33393-50499160-041-*****-OPR**	
Problem Code: 3054	SPARKS OBSERVED	Supervisor:	Target Start:
Requested By:		Requestor Phone:	Target Comp:
Chain Mark Start:		Chain Mark End:	Scheduled Start:
Create-Mileage: 2591429.0		Complete-Mileage: 2591589.0	

Task IDs	
Task ID	
10	REMOVE REPLACED NUMBER 1 COLLECTOR SHOE FUSE. NEEDS R/H COLLECTOR SHOE FUSE ASSEMBLY DUE TO FLASHING NPIS.

000-300-K08-005 FUSE: COLLECTOR ASSY:						
Component: TRUCK: 2K/3K/6K/7K	Work Accom: REPLACED NEW	Reason: INOPERATIVE	Status: CLOSE	Position: 246	Warranty?: N	
20	replace #3 COLLECTOR ASSEMBLY DUE TO FLASHING / REPLACE BLOWN FUSE					

REPLACED COLLECTOR ASSEMBLY AND FUSE WITH NEW, ADJUSTED COLLECTOR TO SPEC.						
000-300-K08 TRUCK&SUSPENSION: CURRENT						
Component: COLLECTOR ASSY: TRUCK: 2K/3K/6K/7K	Work Accom: REPLACED NEW	Reason: FLASHED	Status: CLOSE	Position: 3	Warranty?: N	

Planned Materials						
Task ID	Item	Description	Storeroom	Issue Unit	Quantity	Unit Cost
	M18355001	COLLECTOR:RIGHT HAND CURRENT	561	EA	1	\$0.01
	R18350018	FUSE:COLLECTOR SHOE	259	EA	1	\$621.41
						Total Planned Materials: \$621.42

Actual Labor									
Task ID	Labor	Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
10		11/14/2021	11/14/2021	10:00	12:00	Y	02:00	00:00	\$75.09
10		11/14/2021	11/14/2021	10:00	14:00	Y	04:00	00:00	\$150.93
20		11/16/2021	11/16/2021	09:30	13:00	Y	03:30	00:00	\$150.51

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11/23/2021 13:13

Attachment 1 – Page 1 of 2.



Washington Metropolitan Area Transit Authority  
Maintenance and Material Management System  
**Work Order Details**

Page 2 of 2  
MX76PROD

Work Order #: 16701124  
Type: CM



Status: CLOSE  
11/17/2021 23:28

Work Description: SMOKE ON TRAIN COLLECT SHOE ASSEMBLY FLASHED AND FUSE BLOWN  
Job Plan Description:

Actual Labor									
Task ID	Labor	Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
Total Actual Hour/Labor:							09:30	00:00	\$376.53
Actual Materials									
Task ID	Item	Assetnum	Description	Storeroom	Trans Date	Issue Unit	Quantity	Unit Cost	Line Cost
	R18350018		FUSE:COLLECTOR SHOE	259	11/14/2021	EA	1	\$621.41	\$621.41
Total Actual Materials:									\$621.41
Related Incidents									
Ticket	Description			Class	Status		Relationship		
8570590	D04-D1 SMOKE ON TRAIN #405			SR	CLOSED		ORIGINATOR		
Failure Reporting									
Cause		Remedy			Supervisor			Remark Date	
2349	MATERIAL FAILURE		0004	REPLACED				11/16/2021	
Remarks: REPLACED #3 COLLECTOR SHOE ASSEMBLY (PART FROM MRO STOCK), GOOD OPS CHECK.									

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11/23/2021 13:13

Attachment 1 – Page 2 of 2.

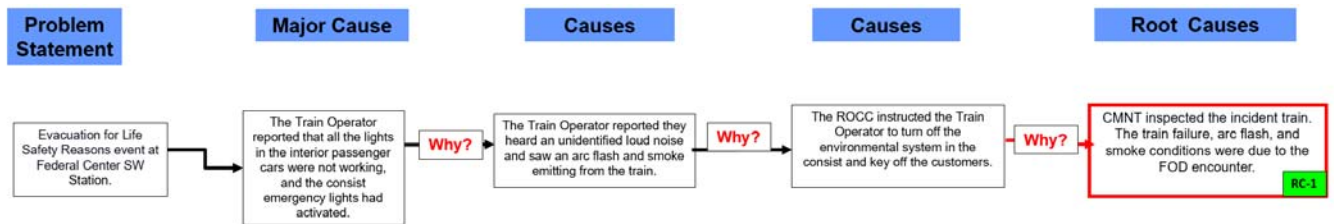
Date: 11/14/2021 Time: 00:43 hours.  
Final Report – Evacuation for Life Safety Reasons  
Reasons. E21579

Drafted By: SAFE 705 – 11/23/2021  
Reviewed By: SAFE 71 – 11/29/2021  
Approved By: SAFE 71 – 11/29/2021

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## Appendix C – Root Cause Analysis



## Root Cause Analysis



Attachment 2 – Page 1 of 1.