

**WMSC Commissioner Brief: W-0109 – Derailment – near Farragut West Station – April 29, 2021**

Prepared for Washington Metrorail Safety Commission meeting on September 21, 2021

Safety event summary:

A Roadway Maintenance Machine (RMM) derailed in the tunnel between Foggy Bottom and Farragut West stations after an Equipment Operator who was not trained on that RMM, Tie Remover/Inserter unit TR06, operated that vehicle in work mode rather than travel mode. The Equipment Operator did not immediately report the derailment to the Rail Operations Control Center (ROCC), and instead notified a supervisor before contacting the ROCC.

TR06 was the first of two vehicles moving from West Falls Church Yard to Alexandria Yard in a "convoy block," which means the two vehicles were granted permission to travel together through a specific section of track with appropriate spacing between them. The operator of the trailing vehicle stopped that unit without issue after TR06 derailed.

Neither equipment operator in the convoy block had a hot stick, which is required to verify that third rail power is de-energized to ensure that it is safe to conduct a ground walk-around needed to determine the extent of any damage and to confirm the derailment. The Equipment Operator was granted Foul Time protection to leave the vehicle to identify and communicate the extent of any damage. The operator of the other vehicle walked up to the derailment location to check on the Equipment Operator without explicitly receiving Foul Time from the ROCC.

Track-related infrastructure damage included third rail insulators, brackets and cover boards as well as studs on the running rails. Neither equipment operator was injured. Damage to the vehicle included bearings that shifted and a cracked and bent bracket for the rail fork. The post-derailment inspections also identified that the left rear suspension axle pivot arm was worn approximately 0.25 inches, and that there was a cracked left rear brake shoe, an inoperative camera system monitor (used to assist with movement and work), a missing lock pin on the left tie gripper, and a broken lock pin on the right main work arm. The suspension alarm and work over speed alarm (that sounds if the vehicle is operated at travel speed in work mode) were working during the post-derailment inspections.

Vehicle data is not available from TR06, however an analysis of Advanced Information Management (AIM) system data found that TR06 was moving an average of approximately 18.4 mph in the 109 seconds before it stopped. The maximum allowable speed for the movement this operator was making is 15 mph, even if the vehicle had been properly set in travel mode.

The Equipment Operator said in an interview that the unit was not properly secured at the time they conducted their pre-trip inspection and that they inserted a screw spike to replace a missing gripper claw pin prior to moving the vehicle from West Falls Church Yard in an effort to complete their assigned task to move the vehicle. The operator stated that they documented suspension issues on a pre-trip inspection form, but did not immediately report the problem with the suspension part to a supervisor, interlocking operator or mechanic. The Equipment Operator also did not report problems with the vehicle identified once on the mainline. It was when they identified the issue shortly after entering the mainline tracks that they stopped near East Falls Church Station and switched from travel mode to work mode in an effort to tighten the suspension. This is not proper procedure, and the vehicle sounded an alarm.

In work mode, air was released from the suspension system, reducing flexibility in the front end. The unit derailed as it exited a curve.



When the unit is in work mode, it is lower to the rails in order to pull out or insert a track tie. In travel mode, many aspects of the vehicle are locked out and hydraulic and braking systems are in a mode designed for movement.

This Equipment Operator does not frequently operate TR06, and has only operated it to transport it from one location to another. The Equipment Operator stated it is a known problem that the air spring suspension system is not functioning as designed because they reported these issues to the mechanics in the past. The operator had not used the vehicle in work mode, and had never received any specific training or familiarization with the unit's work mode or purpose.

The Equipment Operator stated that they had not been trained for emergency events, and did not know that the derailment was required to be reported to the ROCC prior to calling their Assistant Superintendent.

Probable Cause:

The probable cause of this event was Metrorail's insufficient maintenance practices to ensure that vehicles remain in a state of good repair, insufficient training of equipment operators on each type of vehicle they may operate, and a lack of supervisory oversight to ensure equipment operators only operate vehicles that they are trained to operate and operate those vehicles properly.

Corrective Actions:

Metrorail conducted a stand down training for Track and Structures maintenance managers, which included a review of this derailment.

Metrorail is procuring parts to repair, repairing then performing an operational check of TR06.

The Equipment Operator received training on the operations of a tie remover and on reporting defects.

SAFE plans to issue a Safety Bulletin emphasizing proper operation and movement of vehicles in a convoy block.

WMSC staff observations:

In the RMM Audit issued on March 9, 2021, the WMSC identified and required Metrorail to develop corrective action plans to address several issues that manifested themselves in this event on April 29, 2021. These include findings that Metrorail equipment operators are not fully trained on each type of vehicle they may be directed to operate, some training has not included sufficient hands-on experience, and equipment operator certifications for specific vehicles do not expire or require recertification. Metrorail's CAP proposals to address these findings have been approved, and Metrorail is now responsible for implementing and then maintaining these safety improvements.

The RMM Audit also identified that equipment operator pre-trip inspection information was not available to the mechanics who work on the vehicles, which may have contributed in this event to the operator's sense that problems had been previously reported that were not addressed. It is important that Metrorail ensure safety concerns are reported and addressed in a timely fashion, and that maintenance and inspections are properly and fully carried out on a regular basis.

Metrorail may also consider reiterating accident reporting requirements and ensuring that all personnel have appropriate training for emergencies.

Staff recommendation: Adopt final report.



Washington Metro Area Transit Authority
Department of Safety and Environmental
Management (SAFE)

FINAL REPORT OF INVESTIGATION A&I E21168

Date of Event:	4/29/2021
Type of Event:	Derailment
Incident Time:	00:04 hours.
Location:	In Tunnel Area Between CM C1-052+00 to CM C1-053+00.
Time and How received by SAFE:	00:05 hours. SAFE/IMO In-Person Notification
WMSC Notification Time:	01:26 hours.
Responding Safety Officers:	WMATA SAFE: Yes WMSC: No Other: No
Rail Vehicle:	Nordco Tie Remover and Inserter (TR) 06
Injuries:	No
Damage:	Damaged brakes on TR06, damage to studs on the running rails, third rail cover boards, insulators, and brackets.
Emergency Responders:	MTPD, SAFE, TRST, ATCM, POWR, CTEM
SMS I/A Incident Number:	20210429#93036MX

In Tunnel Area Between CM C1-052+00 to CM C1-053+00.
Derailment
April 29, 2021

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Abbreviations and Acronyms

AIMS	Advanced Information Management System
ARS	Audio Recording System
ATCE	Automatic Train Control Engineering
ATCM	Automatic Train Control Maintenance
CBT	Computer Based Training
CCTV	Closed-Circuit Television
CM	Chain Marker
CMC	Crisis Management Center
CTEM	Car and Track Equipment Maintenance
COMM	Office of Systems Maintenance Communication Section
EDT	Eastern Daylight Time
ELM	Enterprise Learning Management
ERT	Emergency Response Team
FT	Foul Time
GOTRS	General Orders and Track Rights System
IC	Incident Commander
ITSS	Office of IT Systems & Software
IMO	Incident Management Official
MOC	Maintenance Operations Center
MSRPH	Metrorail Safety Rules and Procedures Handbook
MTPD	Metro Transit Police Department
NOAA	National Oceanic and Atmospheric Administration
OEM	Original Equipment Manufacturer
OPMS	Operations Management Services
PA	Public Address
RMM	Roadway Maintenance Machine
RWP	Roadway Worker Protection
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
TBD	To Be Determined
TRST	Office of Track and Structures
TR	Tie Remover
WMATA	Washington Metropolitan Area Transit Authority
WMSC	Washington Metrorail Safety Commission

Executive Summary

On Thursday, April 29, 2021, at 00:05 hours Eastern Daylight Time (EDT), the Rail Operations Control Center (ROCC) received a report that a Rail Maintenance Machine (RMM), Nordco Tie Remover/Insertor (TR) 06, derailed between Chain Markers (CM) C1-052+00 to C1-053+00 [see Figure 4]. The Office of Track and Structures (TRST) Equipment Operator AA of TR06 notified the ROCC Radio Rail Traffic Controller (RTC) of the derailment event. The ROCC initiated emergency notifications to the respective internal departments for support during recovery efforts until all operations were returned to normal. Based on the Advanced Information Management System (AIMS) playback and General Orders and Track Rights System (GOTRS) data review, third rail power was already de-energized in the derailment area prior to the incident due to the ROCC conducting preparation work for a weekend shutdown. [See Diagram 1 and Appendix A.]

Based on ARS playback, at 00:08 hours, the Radio RTC initiated Standard Operating Procedure (SOP) 1A per the Metrorail Safety Rules and Procedures Handbook (MSRPH) when they appointed the Equipment Operator AA as the On-Scene Commander (OSC). At 00:11 hours, the Equipment Operator AA notified the Radio RTC and reported that during their visual inspection, they identified damage to studs on the running rails, third rail cover boards, insulators, and brackets. Additionally, TR06 had contacted the third rail. Based on ARS playback and review of the ROCC's incident report, SAFE cannot determine if the ROCC alerted the Fire Department Communications Center of the derailment.

Based on AIMS playback, TR06 came to a stop, occupying track circuits C1-52 and C1-49 at 00:04:27 hours. The review of the occupancy chart showed TR06 moving 2955 feet in the 109 seconds before it stopped. This speed translates to 27 feet per second (ft/s) or an average of 18.4 mph. Additionally, the occupancy chart showed TR06 was trailed by a different, mostly shunting track unit labeled ST03. First, ST03 traveled at an average speed of 7 mph, from approximately 00:01:57 hours to approximately 00:04:23 hours. Then, from approximately 00:04:23 hours to 00:04:54 hours, ST03 accelerated (increased its speed) and traveled at an average speed of 18.2 mph, from approximately 00:04:54 hours to approximately 00:05:32 hours. (See Diagrams 5 through 7). Per convoy block procedures defined by the Metrorail Safety Rules and Procedures Handbook (MSRPH) in SOP 15.5.9., "Operators shall travel at restricted speed i.e. speed not to exceed 15 mph and be prepared to stop within half the distance of vision."

Automatic Train Control Maintenance (ATCM) conducted a visual inspection of the incident area and determined no damage to any ATCM equipment. Automatic Train Control Engineering (ATCE) engineers indicated that the ATC system could not determine where the derailment took place. TR06 traveled through the Foggy Bottom Station Interlocking with a clear signal and both switches in normal correspondence. The rail vehicle then continued traveling inbound until it stopped roughly 1200 feet from the Foggy Bottom Station Interlocking.

During the virtual interviews, the Equipment Operator AA stated they performed a pre-trip inspection before moving TR06. See Appendix E. The Equipment Operator AA indicated that once they got on the mainline, the air spring suspension system was not working correctly and was bouncing while traveling. The Equipment Operator AA stated that they identified the defect of TR06's suspension system not operating as designed during their pre-trip inspection in West Falls Church Yard and documented it but never informed their supervisor, Interlocking Operator,

or a Car and Track Equipment Maintenance (CTEM) mechanic. The Equipment Operator AA reported that since TR06's suspension system was malfunctioning in travel mode, they stopped TR06 on the mainline and switched TR06 from travel mode to work mode. The Equipment Operator AA believed that placing TR06 in work mode would tighten up the air spring suspension system and drop TR06 lower to the ground, which they thought would help prevent the rough travel. The Equipment Operator AA never reported concern of the condition of the air spring suspension system and continued operating. The Equipment Operator AA said that after passing the Foggy Bottom Station Interlocking, they operated approximately 15 feet out of a restricted view curve, and TR06's front left truck derailed and made contact with the de-energized third rail.

The ROCC removed the Equipment Operator AA from service for post-incident toxicology testing.

Based on ARS playback, at 04:19 hours, TR06 was re-railed without further incident, and TR06 was chocked and secured in the C&A Connector. At 06:55 hours, TRST personnel reported a good track inspection and verified it was safe for train movement. At 06:56 hours, regular rail service resumed from Foggy Bottom Station to McPherson Square Station on Track 1 with a restricted speed at 35 mph directed by the ROCC. There were no injuries reported as a result of this incident.

After reviewing the ARS, there did not appear to be any communication deficiencies over the radio. The Crisis Management Center (CMC) was notified by SAFE on April 29, 2021, at 01:26 hours, via email.

The probable cause of the derailment event on April 29, 2021, was the Equipment Operator failing to respond to an active warning device (alarm) while traveling in Work Mode while operating TR06. Contributing to the derailment was improper decision-making by the Equipment Operator during the pre-trip inspection. After discovering discrepancies with the work equipment, the Operator failed to notify a supervisor or mechanic to assess the vehicle's readiness for travel. For example, the Equipment Operator found one of the four gripper claw pins was missing. Rather than properly report the missing part and document the issue, the Operator used a screw spike to replace the missing pin as a temporary fix. While on the mainline, the Operator again failed to report mechanical concerns with the equipment when they observed that the stabilization system was not working correctly, causing the front end of TR06 to bounce on the tracks. Instead of properly reporting the concern, they stopped TR06, switched from travel mode to work mode, and continued. To prevent and warn operators against traveling in work mode, the equipment has an alarm system installed. The alarm operated as designed, however, and the operator continued to travel while in work mode.

Due to traveling in work mode, the air was released from the suspension system, which caused TR06's front end to lose flexibility. This rigidity was a likely contributing factor of the resulting derailment.

Incident Site

The incident area was located in the tunnel between Foggy Bottom Station and Farragut West Station, Track 1 between CM C1-052+00 to CM C1-053+00.

Field Sketch/Schematics

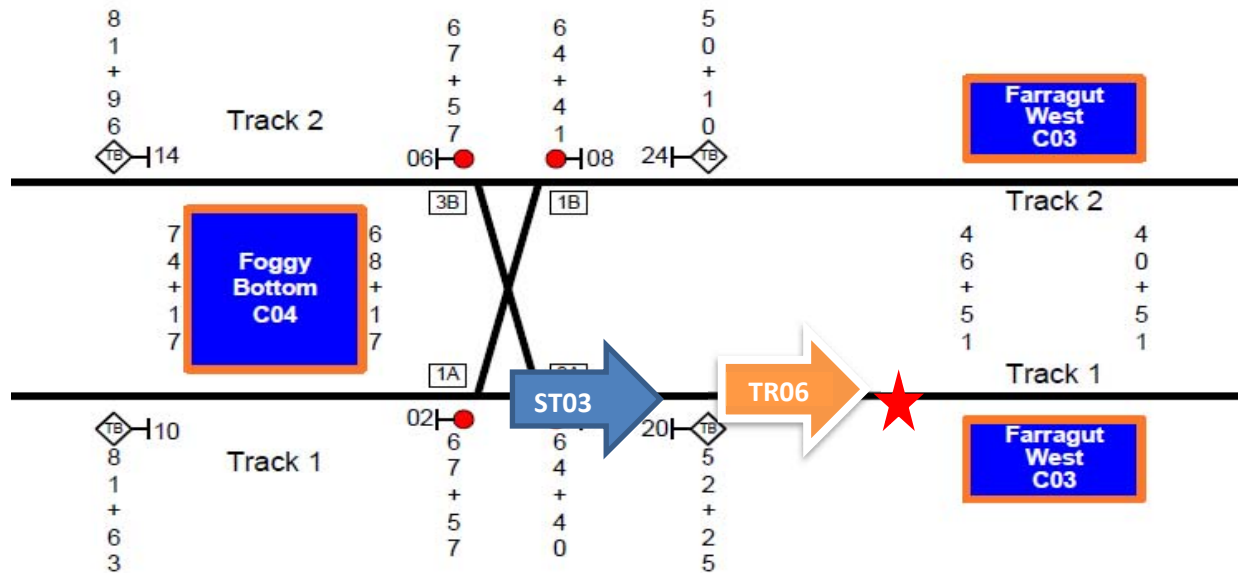
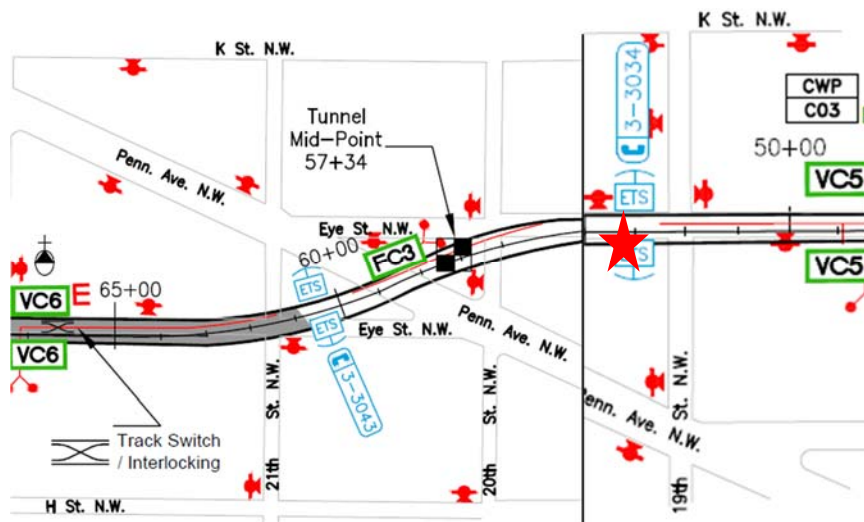


Diagram 1 - TR06 was the lead unit in a convoy block with ST03.



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.

Investigation Methods

The investigative methodologies included the following:

- Formal Interview – SAFE performed one interview as part of this investigation. SAFE interviewed:
 - TRST-Equipment Operator AA

- 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
 - Certification
 - The 30-Day work history review
 - Metrorail Safety Rules and Procedures Handbook (MSRPH)
 - Washington Metropolitan Area Transit Authority (WMATA), Section 5 – Roadway Worker Protection (RWP) Manual Review
 - National Oceanic and Atmospheric Administration (NOAA)
 - Rail Operations Control Center (ROCC) Procedures Manual Review
 - Preventive Maintenance Manual Nordco Tie Remover/Insert Machine Review
 - Office of Systems Maintenance Communication Section (COMM)
 - Automatic Train Control Maintenance (ATCM) Data Review
 - Automatic Train Control Engineering (ATCE) Data Review
 - Office of IT Systems & Software (ITSS) Data Review
 - Car Track Equipment Maintenance (CTEM) Inspection Data Review
 - Office of Track and Structures (TRST) Inspection Data Review
 - Maximo
- 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)
 - General Orders and Track Rights System (GOTRS)

Investigation

On Thursday, April 29, 2021, at 00:05 hours EDT, the ROCC received a report that TR06 derailed between CM C1-052+00 to CM C1-053+00. [See Figure 4.] TRST Equipment Operator AA of TR06 notified the Radio RTC of a derailment event. The ROCC initiated emergency notifications to the respective internal departments for support during recovery efforts until all operations were returned to normal. Based on the AIMS playback and GOTRS data review, third rail power was already de-energized in the derailment area prior to the incident due to the ROCC conducting preparation work for a weekend shutdown. [See Diagram 1 and Appendix A.]

The ROCC removed the Equipment Operator AA from service for post-incident toxicology testing. Based on ARS playback, at 00:22 hours, the Radio RTC confirmed that Equipment Operator Two operating ST03 exited their unit and walked up to TR06 to check on Equipment Operator AA without being granted permission by the ROCC. Therefore, Equipment Operator Two was not in compliance with MSRPH SOP 4.168, which states, "Employees shall not enter upon the roadway or cross the tracks except when absolutely necessary in the performance of their duties and permission has been granted by ROCC. The ROCC Radio RTC instructed ST03 Equipment Operator to return to their unit and stay where they are. ARS playback revealed that Radio RTC indicated ST03 Equipment Operator could not move until they speak with SAFE. At 03:00 hours, the Radio RTC notified TRST Supervisor and stated ST03 could be released. Based on ARS playback, at 04:19 hours, TR06 was re-railed without further incident, and TR06 was

chocked and secured in the C&A Connector. At 06:55 hours, TRST personnel reported a good track inspection and verified it was safe for train movement. At 06:56 hours, regular rail service resumed from Foggy Bottom Station to McPherson Square Station on Track 1 with a restricted speed at 35 mph directed by the ROCC. There were no injuries reported as a result of this incident.

Chronological Event Timeline

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

Time	Description
23:19:08 hours	<u>West Falls Church Interlocking Operator:</u> Notified TR06 Equipment Operator AA and stated you have a lunar at K99-130 signal with an absolute block to K06-18 signal. <u>Equipment Operator AA:</u> Acknowledged. [Yard Ops]
23:20:22 hours	<u>West Falls Church Interlocking Operator:</u> Notified ST03 Equipment Operator AA and stated you have a lunar at K99-130 signal with an absolute block to K06-18 signal, and TR06 is in front of you. <u>Equipment Operator Two:</u> Acknowledged. [Yard Ops]
23:22:40 hours	<u>West Falls Church Interlocking Operator:</u> Notified the ROCC RTC and reported you have TR06 and ST03 approaching the K06-18 signal. They are both going to Alexandria Yard with TR06 leading the convoy. <u>ROCC RTC:</u> Acknowledged. [Phone]
23:23:51 hours	<u>Equipment Operator Two:</u> Notified West Falls Church Interlocking Operator and reported being clear of 54 signal. <u>West Falls Church Interlocking Operator:</u> Acknowledged. [Yard Ops]
23:26:58 hours	<u>Equipment Operator AA:</u> Notified Radio RTC and reported they are at K06-18 signal doing a Transport to Alexandria Yard. <u>Radio RTC:</u> Responded, are you comfortable being a lead unit in a convoy block following convoy procedures. <u>Equipment Operator AA:</u> Responded, yes. <u>Radio RTC:</u> Responded, ST03 Equipment Operator and asked are you comfortable being a trailing unit in a convoy block following convoy procedures. <u>Equipment Operator Two:</u> Responded, that affirmative. [Ops 2]
23:31:06 hours	<u>Radio RTC:</u> Notified TR06 plus one and instructed them to verify the lunar at K06-18 signal entering mainline Track 1. You have a convoy block to Virginia Square Station, Track 1. <u>Equipment Operator AA:</u> Acknowledged. [Ops 2]
23:34:39 hours	<u>Equipment Operator AA Two:</u> Notified Radio RTC and reported TR06 plus one cleared K06-36 signal. <u>ROCC RTC:</u> Acknowledged. [Ops 2]
23:40:51 hours	<u>Equipment Operator AA Two:</u> Notified Radio RTC and reported TR06 plus one cleared East Falls Church Station. <u>ROCC RTC:</u> Acknowledged. [Ops 2]
23:48:30 hours	<u>Equipment Operator AA:</u> Notified Radio RTC and reported TR06 plus one are holding at Ballston Station, Track 1. <u>ROCC RTC:</u> Responded, you have a convoy block to Rosslyn Station, Track 1.

Time	Description
	<u>Equipment Operator AA</u> : Acknowledged. [Ops 2]
23:52:51 hours	<u>Equipment Operator AA Two</u> : Notified Radio RTC and reported TR06 plus one cleared Clarendon Station, Track 1. <u>ROCC RTC</u> : Acknowledged. [Ops 2]
23:57:44 hours	<u>Equipment Operator AA</u> : Notified Radio RTC and reported TR06 plus one are holding at Rosslyn Station, Track 1. <u>ROCC RTC</u> : Responded, you have a convoy block to McPherson Square Station, Track 1. <u>Equipment Operator AA</u> : Acknowledged. [Ops 2]
00:05:22 hours	<u>Equipment Operator AA</u> : Notified Radio RTC and repeated three times (Emergency, Emergency, Emergency) and reported TR06 had detailed at CM C1-052+00. <u>Radio RTC</u> : Instructed ST03 to stop their unit and asked TR06 to repeat the CM of the derailment. <u>Equipment Operator AA</u> : Responded between CM C1-052+00 to CM C1-053+00. <u>Radio RTC</u> : Responded, do we have any injuries, and do we need any medical assistance. <u>Equipment Operator AA</u> : Responded; there are no physical injuries to report. <u>Radio RTC</u> : Responded, key the unit down and perform a ground walk around and let the ROCC know if there are any damages to report. [Ops 2]
00:05:48 hours	<u>ROCC RTC</u> : Notified the ROCC Assistant Superintendent and reported the derailment event. [Phone]
00:06:26 hours	<u>Radio RTC</u> : Notified the Equipment Operator AA and asked, do you have a good working hot stick. <u>Equipment Operator AA</u> : Responded, that's a negative. <u>Radio RTC</u> : Acknowledged and asked ST03 Equipment Operator Two, do you have a good working hot stick. <u>Equipment Operator Two</u> : Responded, unit ST03 does not have a hot stick. [Ops 2] NOTE: There was no procedures identified requiring RMMs or equipment operators to carry a hot stick.
00:07:46 hours	<u>MOC Assistant Superintendent</u> : Notified MOC Power Desk and requested an emergency red tag from CM C1-060+00 to CM C1-040+00.
00:07:49 hours	<u>Radio RTC</u> : Notified the Equipment Operator AA on TR06 and indicated you would be granted FT protection on Track 1, and stated Signal C04-02 is red, all prohibit exits blue block human form is in place at this time you have permission under FT protection to enter the roadway and perform a ground walk around the unit and notify the ROCC of any damage. <u>Equipment Operator AA</u> : Acknowledged. [Ops 2]
00:07:57 hours	<u>ROCC Assistant Superintendent</u> : Notified MTPD and reported TR06 derailed between CM C1-052+00 to CM C1-053+00. [Phone]
00:08:31 hours	<u>Radio RTC</u> : Notified the Equipment Operator AA and indicated you are appointed as the OSC, SOP 1A is in effect. <u>Equipment Operator</u> : Acknowledged. [Ops 2]

Time	Description
00:11:08 hours	<u>Equipment Operator AA:</u> Notified the Radio RTC and reported damage to studs on the running rails, third rail cover boards, insulators, and brackets. Additionally, TR06 had derailed on the same side as the third rail. <u>Radio RTC:</u> Acknowledged. [Ops 2]
00:16:00 hours	<u>Radio RTC:</u> Notified the Equipment Operator AA and ST03 Operator and asked them to confirm to the ROCC that we don't need any medical support and no injuries to report. <u>Equipment Operator AA:</u> Responded; no injuries to report or required medical support. [Ops 2]
00:20:28 hours	<u>Radio RTC:</u> Notified the Equipment Operator – OSC and asked them to take pictures and notify the ROCC via a landline. [Ops 2]
00:22:16 hours	<u>ROCC Assistant Superintendent:</u> Notified Office of Emergency Management (OEM) and reported TR06 derailed between CM C1-052+00 to CM C1-053+00. [Phone]
00:22:41 hours	<u>Radio RTC:</u> Notified Equipment Operator Two operating ST03 and asked; have you made contact with TR06? <u>Equipment Operator Two:</u> Responded; I walked up to TR06 to see how Equipment Operator AA was doing. <u>Radio RTC:</u> Acknowledged and indicated we will move you back to Foggy Bottom Station and try to get you back to Alexandria rail yard. Let the ROCC know when you are back on the ST03 and ready to move. <u>Equipment Operator Two:</u> Acknowledged. [Ops 2]
00:25:15 hours	<u>Radio RTC:</u> Notified the Equipment Operator Two on ST03 and indicated a change of plans you will have to stay where you are. <u>Equipment Operator Two:</u> Acknowledged. [Ops 2]
00:52:09 hours	<u>TRST Supervisor:</u> Notified the Radio RTC and reported they were on the scene with SAFE and were waiting on their Assistant Superintendent to walk to the incident scene. <u>Radio RTC:</u> Acknowledged. [Ops 2]
00:59:22 hours	<u>SAFE:</u> Notified the Radio RTC and reported being on the platform at Farragut West Station, Track 1. [Ops 2]
01:02:52 hours	<u>TRST Supervisor:</u> Notified the Radio RTC and reported being on the platform at Farragut West Station, Track 1. <u>Radio RTC:</u> Acknowledged and stated at this time you are now the OSC SOP 1A is in effect, and I need to know everyone that's entering the roadway with you. [Ops 2]
01:07:51 hours	<u>TRST Supervisor:</u> Notified the Radio RTC and reported TRST personnel, Power personnel, SAFE, MTPD, and COMM would be entering the roadway with them to perform their assessment. <u>Radio RTC:</u> Acknowledged and stated, before you take anyone to the roadway, I need you to hot stick and confirm third rail power is de-energized. The Radio RTC asked, do you have the proper PPE and good working hot stick. <u>TRST Supervisor:</u> Responded, I have a good working hot stick and proper PPE. [Ops 2]
01:14:31 hours	<u>Radio RTC:</u> Notified the TRST Supervisor and stated Signal C04-02 is red, all prohibit exits blue block human form are in place at this time you have permission under FT protection to enter the roadway to hot stick and confirm third rail power is de-energized and provide the ROCC with a CM. [Ops 2]

Time	Description
	<u>TRST Supervisor:</u> Acknowledged. [Ops 2]
01:19:45 hours	<u>TRST Supervisor:</u> Notified the Radio RTC and confirmed third rail power is de-energized at CM C1-047+00. <u>Radio RTC:</u> Acknowledged and stated you are granted FT protection to investigate the derailment, accompanied by SAFE personnel, TRST personnel, and Power personnel, and the red tag is in effect. [Ops 2]
01:28:11 hours	<u>TRST Supervisor:</u> Notified the Radio RTC and reported damage to five cover boards and two insulators. [Ops 2]
01:47:03 hours	<u>TRST Supervisor:</u> Notified the Radio RTC and reported PM35 would be utilized to re-rail TR06. [Ops 2]
01:57:35 hours	<u>Power Personnel:</u> Asked Radio RTC to enter the roadway to hot stick for the purpose of the emergency red tag. <u>Radio RTC:</u> Responded, Signal C04-02 is red, all prohibit exits blue block human form are in place at this time you have permission under FT protection for you and your partner to enter the roadway to hot stick and confirm third rail power is de-energized and provide the ROCC with a CM. [Ops 2]
01:59:04 hours	<u>Radio RTC:</u> Notified the TRST Supervisor and reported that Power personnel had entered the roadway to hot stick to confirm the emergency red tag. <u>TRST Supervisor:</u> Acknowledged. [Ops 2]
02:03:14 hours	<u>Power Personnel:</u> Notified Radio RTC and reported that personnel and equipment are clear of the roadway and relinquishing their FT. NOTE: Based on ARS playback, it could not be confirmed whether involved personnel complied with all aspects of SOP 1A, Command, Control, and Coordination of Emergencies on the Rail System while under ICS.
02:22:08 hours	<u>Power Personnel:</u> Notified Radio RTC and requested to enter the roadway at CM C1-047+00 and walk to C1-050+00 under FT to hot stick and confirm third rail power de-energized at chain marker C1 050+00. <u>Radio RTC:</u> Responded, Signal C04-02 is red, all prohibit exits blue block human form are in place at this time you have permission under FT protection to enter the roadway. Let the ROCC know when personnel and equipment are clear of the roadway. [Ops 2]
02:23:23 hours	<u>Radio RTC:</u> Notified the TRST Supervisor and instructed them to landline MOC for their emergency red tag. [Ops 2]
02:25:48 hours	<u>Power Personnel:</u> Notified Radio RTC and reported that personnel and equipment are clear of the roadway and ready to relinquish their FT. [Ops 2]
02:44:12 hours	<u>TRST Supervisor:</u> Notified Radio RTC and reported they have an emergency red tag. <u>Radio RTC:</u> Acknowledged and stated Signal C04-02 is red; all prohibit exits blue block human form are in place when you have permission under FT protection to hot stick to confirm third rail power is de-energized and provide the ROCC with a CM. [Ops 2]

Time	Description
02:45:23 hours	<p><u>TRST Supervisor:</u> Notified Radio RTC and confirmed power is de-energized at CM C1-040+00.</p> <p><u>Radio RTC:</u> Acknowledged and indicated, I need to get PM35 in the work location before I allow you to set up your work location.</p> <p><u>TRST Supervisor:</u> Responded FT is relinquished, personnel and equipment are clear of the roadway, and you can bring PM35 to my work location.</p> <p><u>Radio RTC:</u> Acknowledged. [Ops 2]</p>
02:46:18 hours	<p><u>Radio RTC:</u> Notified TRST Equipment Operator on PM35 and granted them FT to clamp C02 switches 1A and 3A in the normal position. The Radio RTC stated Signal C02-02 is red; all prohibit exits blue block human form are in place at this time you have permission under FT protection to clamp C02 switches 1A and 3A in the normal and notify the ROCC.</p> <p><u>Equipment Operator Three:</u> Acknowledged. [Ops 2]</p>
02:58:35 hours	<p><u>TRST Supervisor:</u> Notified Radio RTC and asked did we get ST03 to move back to Foggy Bottom Station and try to get you back to a transport location?</p> <p><u>Radio RTC:</u> Responded, has ST03 talked to SAFE?</p> <p><u>TRST Supervisor:</u> Responded I am not sure if ST03 was in the area of the derailment.</p> <p><u>Radio RTC:</u> Responded, ST03 was in the area moving in a convoy block. Radio RTC indicated ST03 could not move until they speak with SAFE. [Ops 2]</p>
02:59:39 hours	<p><u>Equipment Operator Three:</u> Notified Radio RTC and reported C02 switches 1A and 3A are clamped in the normal position, and they are safe aboard PM35.</p> <p><u>Radio RTC:</u> Acknowledged and indicated Signal C02-04 is red, verifying 1A and 3A in the normal position for a straight move. Speed shall not exceed 5 mph over switches and your absolute block down to CM C1-040+00 and go direct with TRST personnel when you get to that CM.</p> <p><u>Equipment Operator Three:</u> Acknowledged. [Ops 2]</p>
03:00:02 hours	<p><u>Radio RTC:</u> Notified ROCC Assistant Superintendent and reported SAFE concluded their initial investigation. [Phone] Note: SAFE personnel remained on the scene.</p>
03:00:57 hours	<p><u>Radio RTC:</u> Notified TRST Supervisor and stated ST03 could be released and have them make contact with the ROCC. [Ops 2]</p>
03:03:39 hours	<p><u>Equipment Operator Two:</u> Notified the Radio RTC.</p> <p><u>Radio RTC:</u> Responded, ST03 verify all personnel and equipment are clear, and it is safe for you to move, and your absolute block is down to Foggy Bottom Station, Track 1.</p> <p><u>Equipment Operator Two:</u> Acknowledged. [Ops 2]</p>
03:12:28 hours	<p><u>TRST-Supervisor:</u> Notified Radio RTC and reported PM35 is holding secure in their work location, and they are standing by for FT to install shunts and be verified by ROCC.</p> <p><u>Radio RTC:</u> Notified TRST and stated Signal C04-02 is red, all prohibit exits blue block human form are in place at this time you have permission under FT protection to install shunts and verify with the ROCC. [Ops 2]</p>

Time	Description
03:16:08 hours	<u>Radio RTC</u> : Notified TRST personnel and indicated Signal C04-02 is red, all prohibit exits blue block human form are in place at this time, you have permission under FT protection to enter the roadway from CM C1-040+00 to walk down to McPherson Square Station Interlocking to unclamp switches on Track 1 only and notify the ROCC when you are safely back on the platform at Farragut West Station. [Ops 2]
03:21:02 hours	<u>SAFE</u> : Notified Radio RTC and reported SAFE has completed their investigation and had cleared the roadway. [Ops 2]
03:21:35 hours	<u>TRST Supervisor</u> : Notified Radio RTC and reported they had placed their shunts on C03, Track 1. <u>Radio RTC</u> : Responded, I copy two good shunts; you have permission to install your remaining safety equipment and go to work. <u>TRST Supervisor</u> : Acknowledged. [Ops 2].
03:28:30 hours	<u>TRST Personnel</u> : Notified Radio RTC and reported personnel and equipment were clear of the roadway, and they were safely on the Farragut West Station platform. C02 Interlocking switches 1A and 3A were unclamped in the normal position, and they were relinquishing their FT. [Ops 2]
03:30:42 hours	<u>Radio RTC</u> : Notified TRST Supervisor and stated at this time you are the Roadway Worker In Charge (RWIC) of the work location and was no longer under Incident Command System (ICS). The Radio RTC indicated you transitioned into a fixed work location under Exclusive Track Occupancy (ETO) protection when you received your red tag at 02:48 hours. <u>TRST Supervisor</u> : Acknowledged. [Ops 2]
04:19:44 hours	<u>TRST Supervisor</u> : Notified Radio RTC and reported that TR06 confirmed being re-railed and requesting a test train. [Ops 2]
04:39:48 hours	<u>MTPD</u> : Contacted ROCC Assistant Superintendent, are you guys going to be single tracking <u>ROCC Assistant Superintendent</u> : Responded, we are currently single-tracking between Foggy Bottom Station to McPherson Square Station, Track 2. [Phone]
04:58:47 hours	<u>Radio RTC</u> : Alerted all Silver and Orange Train Operators that we are currently single-tracking between Foggy Bottom Station to McPherson Square Station, Track 2 due to a track issue at Farragut West Station, Track 1. [Ops 2]
05:06:49 hours	<u>TRST Mechanic</u> : Notified Radio RTC and reported that TR06 brakes were repaired. [Ops 2]
05:07:01 hours	<u>Equipment Operator Four</u> : Notified Radio RTC and reported that they would be operating TR06 and holding at CM C1-053+00 and transporting TR06 to New Carrollton Yard. [Ops 2] <u>TRST Supervisor</u> : Responded, TR06 standby until PM35 is ready to go. We would be in a convoy block to New Carrollton Yard.
05:13:47 hours	<u>SAFE</u> : Notified Radio RTC and reported being clear of the roadway at Farragut West Station. [Ops 2]
05:33:51 hours	<u>TRST Supervisor</u> : Notified Radio RTC and reported that the TRST Mechanics implemented a 5 mph speed restriction for TR06 to move.
05:47:31 hours	<u>TRST Supervisor</u> : Notified Radio RTC and reported all personnel and equipment clear of the roadway, and you may restore third rail power at your discretion, and the red tag was turned in to MOC. Tracks are revenue-ready, and we will be sending through a test train. Machine TR06 would

Time	Description
	be going into the C&A Connector, and PM35 would be going to Brentwood Yard. <u>Radio RTC</u> : Acknowledged. <u>TRST Supervisor</u> : Responded, a medium speed restriction would be implemented from CM C1-053+00 to CM C1-054+00.
05:51:52 hours	<u>Radio RTC</u> : Initiated third rail power restoration procedures.
05:53:02 hours	<u>TRST Supervisor</u> : Notified Radio RTC and reported a medium speed restriction would be implemented from CM C1-052+00 to CM C1-054+00.
06:04:31 hours	<u>Radio RTC</u> : Notified PM35 Equipment Operator Three and gave them an absolute block to clear Signal C04-02 and standby for Lunar Signal and correct rail alignment after clearing. [Ops 2]
06:11:59 hours	<u>TRST Supervisor</u> : Notified Radio RTC and asked do you have an estimated arrival time for the test train. <u>Radio RTC</u> : Responded, landline the ROCC.
06:14:31 hours	<u>TRST Supervisor</u> : Notified ROCC Assistant Superintendent and asked if you have an estimated arrival time for the test train. <u>ROCC Assistant Superintendent</u> : Responded, the test train was holding at West Falls Church pocket track.
06:18:35 hours	<u>Radio RTC</u> : Notified TR06 Equipment Operator and stated verify lunar and correct rail alignment at Signal C02-02 you have an absolute block to Signal C02-04, do not exceed 5 mph, and TRST personnel would be standing by. <u>Equipment Operator Four</u> : Reported to Radio RTC that the TRST Mechanic would physically walk TR06 from Farragut West Station into the C&A Connector. [Ops 2]
06:24:45 hours	<u>TRST Mechanic</u> : Notified the Radio RTC and reported they were clear of Signal C02-26. [Ops 2]
06:32:45 hours	<u>TRST Mechanic</u> : Notified the Radio RTC and reported TR06 was properly chocked and secured in the C&A Connector. [Ops 2]
06:39:47 hours	<u>Radio RTC</u> : Notified the TRST Mechanic and stated Signal D02-08 was red, all prohibit exits blue block human form were in place at this time, you have permission under FT protection to exit the C&A connector and walk back to McPherson Square Station platform, Track 2.
06:42:41 hours	<u>TRST Mechanic</u> : Notified the Radio RTC and reported they were clear of the roadway and relinquished their FT.
06:55:05 hours	<u>TRST Supervisor</u> : Notified Radio RTC and reported a good track inspection with test Train ID 776 at Farragut West Station, Track 1, and verified it was safe for train movement. <u>Radio RTC</u> : Acknowledged.
06:56:05 hours	<u>Radio RTC</u> : Alerted all Train Operators on Ops 2 normal service resumed from Foggy Bottom Station to McPherson Square Station on Track 1 with speed no greater than 35 mph.

Advanced Information Management System (AIMS)

Based on the Advanced Information Management System (AIMS) playback and General Orders and Track Rights System (GOTRS) data review, third rail power was already de-energized in the derailment area prior to the incident due to the ROCC conducting prep work for a weekend shutdown.

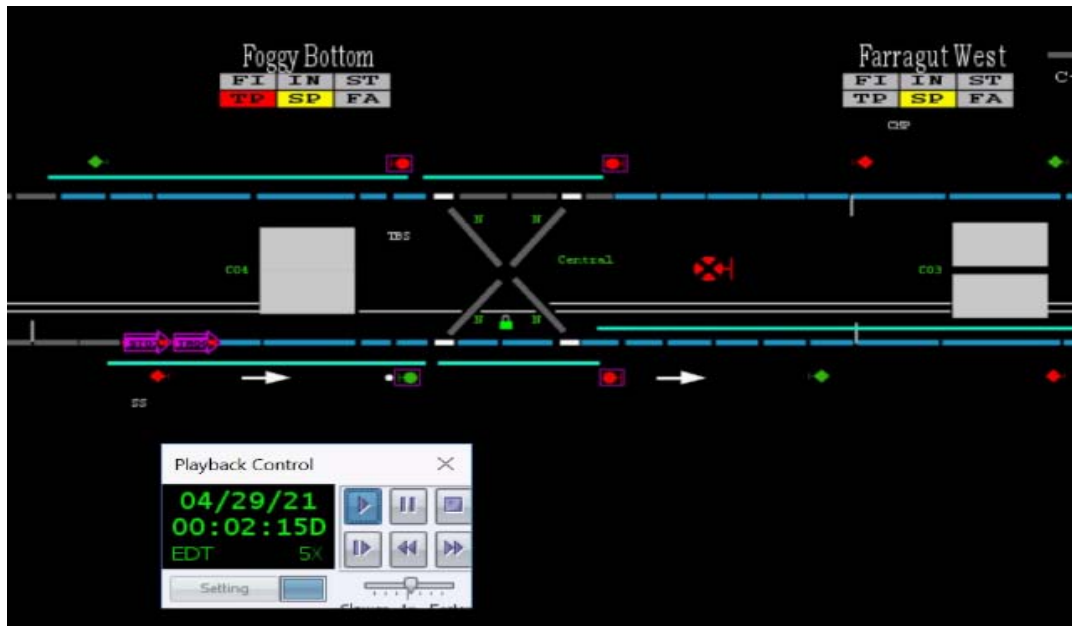


Diagram 2 - Based on the AIMS playback, at 00:02:15 hours, the teal symbol on the AIMS power display shows that the third rail power was de-energized before TR06 entered Foggy Bottom Station, Track 1.

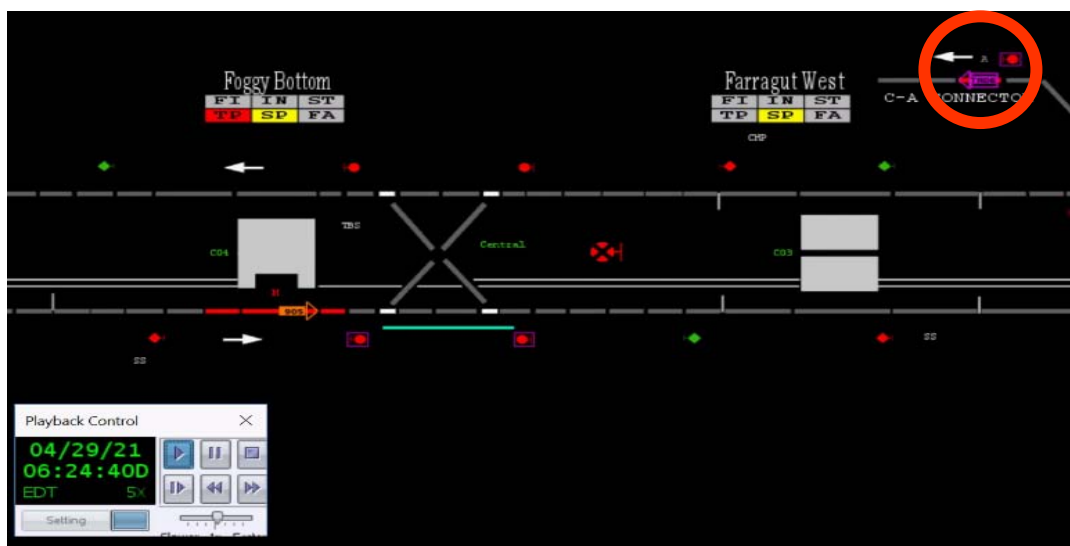


Diagram 3 – Based on the AIMS playback, at 06:24:40 hours after the re-rail operation, TR06 was chocked and secured in the C&A Connector.

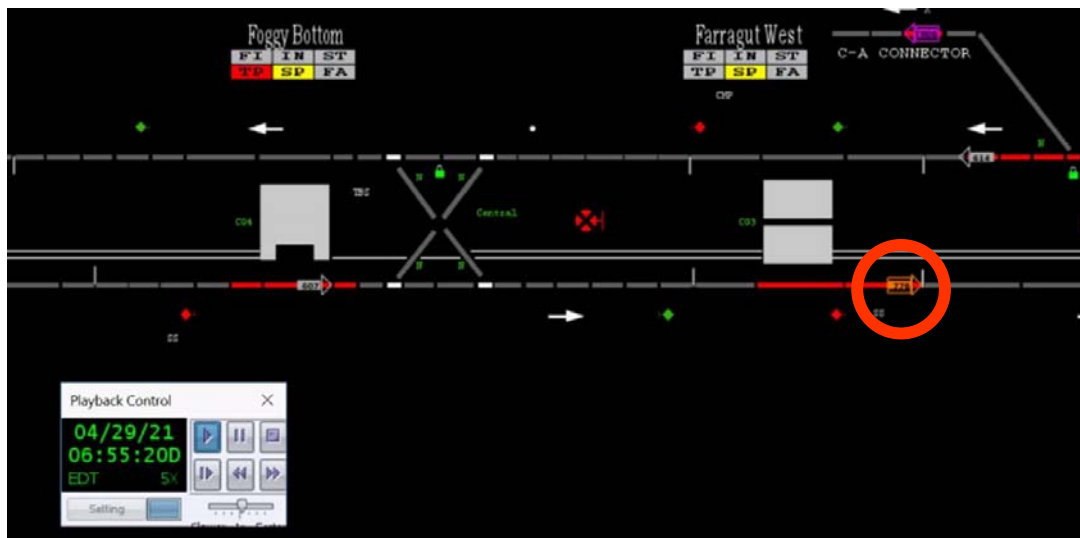


Diagram 4 - Based on the AIMS playback, at 06:55 hours, non-revenue Train ID 776 went through the affected area to perform inspection and was not occupied at the time of the inspection.

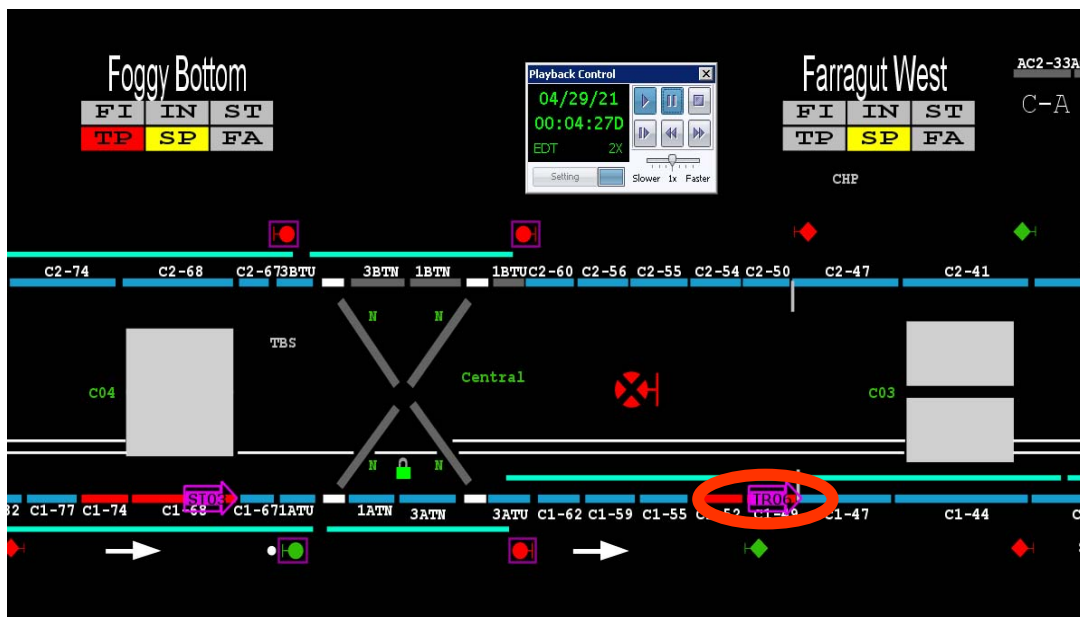


Diagram 5 - Based on the AIMS playback, at 00:04:27 hours, TR06 came to a stop, occupying track circuits C1-52 and C1-49.

The Office of IT Systems & Software (ITSS)

ITSS track circuit occupancy chart revealed speed calculation for the mostly-shunting machine labeled TR06 in AIMS playback. Based on AIMS playback, TR06 came to a stop, occupying track circuits C1-52 and C1-49 at 00:04:27 hours. The black diagonal line drawn through the green occupancies on the occupancy chart showed TR06 moving 2955 feet in the 109 seconds before it stopped. This translates to an average speed of 27 ft/s or 18.4 mph.

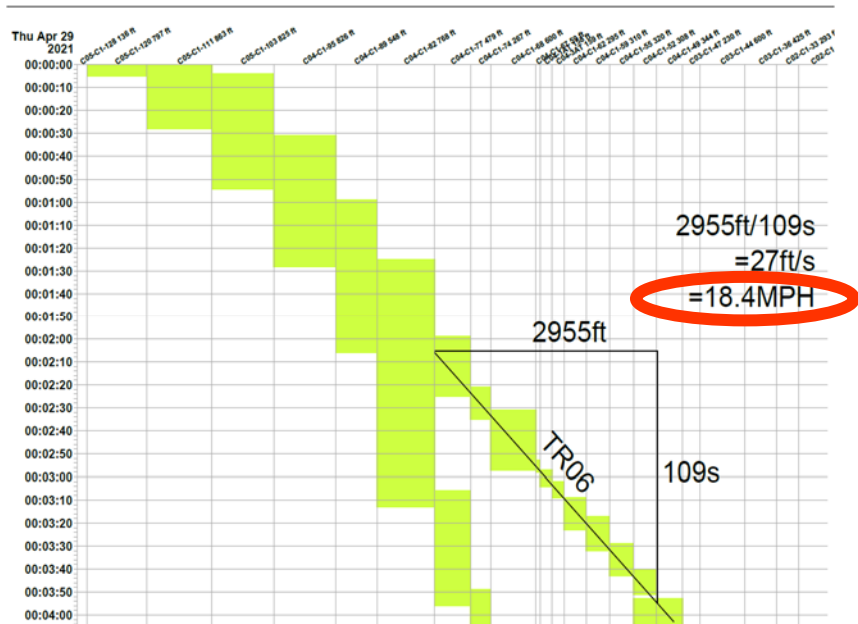


Diagram 6 – This illustration represents a track occupancy chart showing the calculation of TR06's average speed. The black diagonal line drawn through the green occupancies on the occupancy chart shows TR06 moving 2955 feet in the 109 seconds before it stopped; 2955 feet in 109 seconds is 27 ft/s or 18.4 mph.

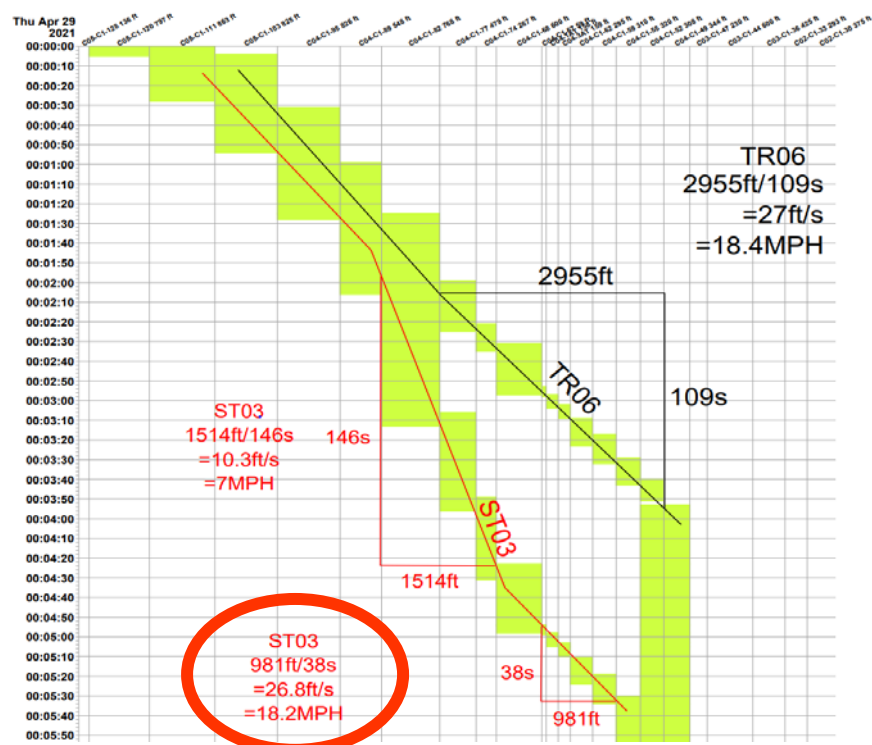


Diagram 7 – This illustration represents a track occupancy chart showing the calculation of ST03's average speed. ST03 progress and speed calculations are shown in red in two distinct segments. First, ST03 traveled at an average speed of 7 mph, from 00:01:57 hours to 00:04:23 hours. Then, from 00:04:23 hours to 00:04:54 hours, ST03 accelerated (increased its speed). As a result, ST03 traveled at an average speed of 18.2 mph, from 00:04:54 hours to approximately 00:05:32 hours.

Office of System Maintenance Communication Section (COMM)

COMM personnel performed a comprehensive radio operational test at Farragut West Station, Tracks 1 and 2, and tunnel areas. The test was successful, and the signal was at an optimal level.

After reviewing the Audio Recording System playback, there did not appear to be any communication deficiencies over the radio.

Automatic Train Control Maintenance (ATCM)

ATCM conducted a visual inspection of the incident area and determined no damage to any ATCM equipment.

TR06 derailed directly over Wee-Z-Bond-23 at CM C1-52+25. Wee-Z-Bond-23 affects track circuits C1-52 and C1-49. The Wee-Z-Bond cables were disconnected temporarily from the J-Bar to get the jacks under the rail vehicle for re-rail efforts. ATCM reported no apparent damage to any ATC equipment. Based on the ATCM compliance review of the area and of the event, ATCM has determined there was no ATCM equipment in the area to be a contributing factor to the reported event.

Automatic Train Control Engineering (ATCE)

Automatic Train Control Engineering (ATCE) engineers indicated that the ATC system could not determine where the derailment took place. TR06 traveled through the Foggy Bottom Station, Interlocking with a clear signal and both switches in normal correspondence. The rail vehicle then continued traveling inbound until it stopped roughly 1200 feet from the Foggy Bottom Station Interlocking.

ATCE Analysis:

Time	Description
00:02:31 hours	The Rail vehicle occupied Foggy Bottom Station, Track 1 platform, track circuit C1-68.
00:02:53 hours	The Rail vehicle proceeded inbound and occupied track circuit C1-67.
00:02:57 hours	The rail vehicle occupied track circuit 1AT, indicating it has passed Signal C04-02 while clear. Signal C04-02 then dropped to stop.
00:03:09 hours	Both track circuits 1AT and 3AT were vacant, which indicated the rail vehicle had cleared the interlocking.
00:03:15 hours	Signal C04-02 then re-cleared because it was fled.
00:03:17 hours	The Rail vehicle continued to move inbound on Track 1 until it occupied track circuits C1-52 and C1-49.
00:03:40 hours	ATCE indicated no other track occupancy. The rail vehicle had stopped moving where the rail vehicle is shunting both track circuits C1-52 and C1-49.

The AIMS data was reviewed from April 28, 2021, at 23:50:00 hours, to April 29, 2021, at 00:20:00 hours. The initial conditions at the Foggy Bottom Station Interlocking were Signal C04-02 was clear and fled, switch 1A and switch 3A was in the normal position.

At 00:02:31 hours, a rail vehicle occupied the Foggy Bottom Station, Track 1 platform track circuit, C1-68. The rail vehicle then proceeded to move inbound. At 00:02:57 hours, the rail vehicle occupied track circuit 1AT, indicating it has passed Signal C04-02 while clear. Signal C04-02 then dropped to stop. At 00:03:09 hours, both track circuits 1AT and 3AT were vacant, which indicated the rail vehicle had cleared the interlocking. Signal C04-02 then re-cleared at 00:03:15 hours because it was fledged. The Foggy Bottom Station Interlocking runs from CM 67+58 to CM 64+41.

The rail vehicle proceeds inbound on Track 1 until it occupied track circuits C1-52 and C1-49. These two track circuits remained occupied for several hours, indicating the rail vehicle stopped moving at a point where it was shunting both track circuits.

The common bond for track circuits C1-52 and C1-49 is located at CM-052+25, which gave a rough location where the rail vehicle came to a stop. The nature of the WMATA fixed block track circuit signaling system does not allow for accurate location reporting beyond the track circuit(s) occupied.

The ATC system cannot determine where the derailment took place. The rail vehicle traveled through the Foggy Bottom Station, Interlocking with a clear signal and both switches in normal correspondence. The rail vehicle then continued traveling inbound until it stopped roughly 1200 feet from the Foggy Bottom Station Interlocking.

Car and Track Equipment Maintenance (CTEM)

As a result of this event, both CTEM and CENV personnel performed a post-derailment inspection of the affected TR06 unit and identified the following:

- Truck Inspection
 - Pillow-block bearing on left front shifted toward B end ~3/8", outer axle bearing collar shifted ~1/4". Shifting appears recent and was likely caused by the derailment.
- Chassis Inspection
 - Left Rear suspension axle pivot arm at guides - worn ~1/4". Appeared unrelated to the incident. The bracket for the rail fork bent and cracked.
- Brake Inspection
 - Left rear brake shoe cracked. Standing brake check performed instead of rolling brake check.
- Miscellaneous Equipment Inspection
 - Camera system monitor is inoperative. The left tie gripper is missing a lock pin. The right main work arm lock pin is broken. Suspension alarm and work over speed alarm function as intended.

CTEM indicated that the front left suspension shifting, and rail fork damage appears to have resulted from the derailment. In addition, the rear suspension arm guide wear and inoperative camera monitor system would likely not contribute to vehicle derailment. On June 30, 2021, CTEM performed an operational check after the necessary repairs, and all systems are functioning as designed per the Original Equipment Manufacturer (OEM) manual. See Appendix E.

CTEM Cost Analysis:

Parts	\$13.00
Labor	\$12,996.00
Total	\$13,009.00

Office of Track and Structures (TRST)

As a result of this event, a track inspection was performed on April 29, 2021, at the derailment area between CM C1-052+00 to CM C1-053+00. Based on the review of the work order details, the TRST maintenance team performed rail fastener maintenance, track gauge correction, and installed new studs to restore the derailment area to a state of good repair for normal speed. See Appendix F.

TRST Cost Analysis:

TRST Labor Cost	\$2,107.18
TRST Contractor Labor Cost	\$0.00
TRST Material Cost	\$864.41
Total	\$2,968.82

Interview and Written Statement Findings

SAFE conducted one interview via Microsoft Teams and received one written statement. This virtual interview and written statement identified the following key findings associated with this event and are as follows:

TR06 Equipment Operator

During the virtual interview, the Equipment Operator AA stated a convoy block was implemented, and their scope of work was to lead the convoy block to transport TR06 from West Falls Church Yard to Alexandria Yard. The Equipment Operator AA performed a ground walk around before moving TR06 from the storage area at West Falls Church Yard. The Equipment Operator AA indicated that TR06 was not adequately secured prior to their inspection, so before moving TR06, the Equipment Operator AA had to secure TR06 and insert the lockup pins to the TR06 Gripper Jaw component. NOTE: Investigation was unable to substantiate the statement about improper securement. The Equipment Operator AA indicated that once they got on the mainline, the air spring suspension system was not working correctly and bouncing while traveling. The Equipment Operator AA stated that they identified the defect of TR06's suspension system not operating as designed during their pre-trip inspection in West Falls Church Yard and documented it but never informed their supervisor, Interlocking Operator, or a CTEM mechanic. The Equipment Operator AA stated since TR06's suspension system was not working correctly in travel mode, they stopped TR06 on the mainline and switched TR06 from travel to work mode. The Equipment Operator AA indicated that putting TR06 in work mode tightens up the air spring suspension system and drops TR06 lower to the ground, which they thought would help prevent a lot of the bouncing while traveling. At that point, the Equipment Operator AA never reported the concern of the condition of the air spring suspension system and continued operating. The Equipment Operator AA reported that they found out through a conversation with a mechanic that it is not recommended to troubleshoot TR06 by operating in work mode. However, the Equipment Operator was unable to recall the date of this reported conversation.

The Equipment Operator AA stated they had not received any refresher training on the equipment or emergency events, however the investigation determined that the Operator received the required equipment operation recertification on April 19, 2021. The Equipment Operator AA stated that they did not exceed 15 mph while operating TR06. The Equipment Operator AA was not aware of any rules in the MSRPB regarding convoy block operations. TR06 entered and exited Foggy Bottom Station and cleared the Interlocking at CM C1-064+40 without incident. The Equipment Operator AA reported that after passing the Interlocking, they operated approximately 15 feet out of a restricted view curve, and TR06's front left truck derailed and made contact with the third rail.

The Equipment Operator AA reported that they called their Assistant Superintendent via phone to report the derailment and then informed the ROCC over the radio by announcing "Emergency, Emergency, Emergency." The Equipment Operator AA was granted FT to perform a ground walk around, and they reported damage to roadway components, including studs on the running rails, third rail cover boards, and insulators and brackets to the ROCC. The Equipment Operator AA said ST03 was approximately 100 feet behind their machine when they derailed, and there was no communication between them other than when the Equipment Operator operating ST03 received permission to hot stick. NOTE: Based on ARS playback, at approximately 00:06 hours, both employees operating in the convoy block stated they did not have an approved, certified working hot stick. The Equipment Operator AA indicated that they don't operate TR06 often, but it's only for transportation purposes when they do. The Equipment Operator AA has not undergone any refresher training for familiarization with TR06. There were no unusual conditions on the roadway reported before the derailment. The Equipment Operator AA stated that they don't remember any procedure to notify the ROCC before notifying their supervisor. The Equipment Operator AA reported they had not been trained for emergency events, and that's why they told their supervisor first, and they were in shock.

ST03 Equipment Operator Written Statement

The ST03 Equipment Operator AA reported in a written statement on April 29, 2021, they were Operating ST03 with TR06 in a convoy block going in the direction of Farragut West Station, Track 1. The ST03 Equipment Operator AA indicated that all of a sudden, they heard over the radio TR06 Operator announced "Emergency, Emergency, Emergency," to the ROCC on Ops 2. The ST03 Equipment Operator AA indicated they found out over the radio that TR06 had derailed. The ST03 Equipment Operator AA indicated that the ROCC then instructed them to stop their vehicle, which was approximately 400 feet to 500 feet behind TR06. The ST03 Equipment Operator AA indicated they did not see TR06 when the unit derailed and only heard about it over the radio.

Weather

At the time of the incident, National Oceanic and Atmospheric Administration (NOAA) recorded the temperature as 70° F and mostly cloudy with 70% humidity. The derailment occurred within a tunnel section of the rail right-of-way. Weather was not a contributing factor to the incident. Weather source: NOAA – Location: Washington, DC.)

Human Factors

Fatigue

Based on SAFE's review of the Equipment Operator AA 30-day work history, the employee's 30-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. The employee reported feeling fully alert at the time of the incident. The employee reported experiencing no symptoms of fatigue in the time leading up to the incident.

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 employee was awake for 5.56 hours at the time of the incident. The employee reported seven hours of sleep in the 24 hours preceding the incident. The off-duty period was 16 hours which provides an opportunity for 7-9 hours of sleep. The employee reported no issues with sleep.

Since fatigue evidence and risk factors were not present, the biomathematical fatigue modeling application (SAFTE-FAST Web SFC) was not applied.

Post-Incident Toxicology Testing

After reviewing the Equipment Operator AA's post-incident testing results, it was determined that the Equipment Operator AA was not in violation of the Drug and Alcohol Policy and Testing Program 7.7.3/6.

Findings

- There is no video monitoring system or Event Recorder onboard TR06.
- TR06 was traveling at an average speed of 18.4 mph per ITSS track circuit occupancy speed calculation.
- Based on AIMS playback, TR06 came to a stop, occupying track circuits C1-52 and C1-49 at approximately 00:04 hours.
- Based on ARS playback, at approximately 00:06 hours, both employees operating in the convoy block did not have an approved, certified working hot stick.
- ATCM conducted a visual inspection of the incident area and determined no damage to any ATCM equipment.
- The ATC system could not determine where the derailment took place.
- Based on ARS playback, at approximately 00:22 hours, the Radio RTC confirmed that Equipment Operator Two operating ST03 exited ST03 and walked up to TR06 to check on Equipment Operator AA without being granted permission by the ROCC. Equipment Operator Two was not in compliance with MSRPH SOP 4.168, which states, "Employees shall not enter upon the roadway or cross the tracks except when absolutely necessary in the performance of their duties and permission has been granted by ROCC."
- Once the Equipment Operator AA became aware that their machine derailed, they notified their supervisor first before informing the ROCC.

- Based on ARS playback, at approximately 04:58 hours, the ROCC initiated single-tracking between Foggy Bottom Station to McPherson Square Station, Track 2, which concluded at 06:56 hours.
- Based on ARS playback, it could not be confirmed whether involved personnel complied with all aspects of SOP 1A, Command, Control, and Coordination of Emergencies on the Rail System to notify the Fire Department, however the role of On-Scene Commander and announcement of SOP 1A protocols were performed by the Radio RTC.
- Based on the AIMS playback, at approximately 06:55 hours, non-revenue Train ID 776 went through the affected area to perform inspection and was not occupied at the time of the inspection.
- TRST's investigation verified that an alarm was installed on TR06 to warn the operator that the unit is not in proper mode for travel. The Equipment Operator AA acknowledged that the alarm on TR06 activated when they switched it from travel mode to work mode. It remained activated before the derailment. The Equipment Operator AA failed to follow MSRPH Cardinal Rule Section 4.3, which states, "Employees shall not alter or render inoperative and safety devices on vehicles, equipment, structures and/or any other WMATA property, except as authorized by these rules or other WMATA procedures, and then only when proper measures are taken to safeguard personnel and equipment."
- The Equipment Operator AA failed to follow MSRPH Cardinal Rule Section 1.32, which states, "Employees involved in, witnessing or informed of an accident or incident, to include near misses, on the Metrorail system shall inform their supervisor, Transit Police, ROCC and/or other appropriate authority as soon as possible, and shall file written report."
- The Equipment Operator AA failed to follow MSRPH Cardinal Rule Section 1.54, which states, "Employees shall not willfully destroy, or through neglect, indifference, or misuse, cause loss of or damage to WMATA property, customer's property or fellow employee's property."
- In the TRST final investigation report, SAFE discovered that the Equipment Operator AA used a screw spike to replace a missing locking pin to secure the gripper claw as a temporary fix.
- TRST Management reported the work mode on a Tie Remover should only be used when the unit is being operated in a work area for the purpose of installing ties. Air is released from the suspension system in work mode, causing the unit's front end to lose flexibility. As a result, moving the unit in work mode can result in derailment. For this reason, the unit should always be in travel mode when moving from one location to another.
- The Equipment Operator AA completed Equipment Operator recertification training on April 19, 2021. Additionally, the Equipment Operator AA completed the Nordco Bundle Course specifically on TR06 led by the vendor on October 25, 2018. Refresher training on specific pieces of equipment is not part of the recertification process.

Immediate Mitigation to Prevent Recurrence

- The Equipment Operator was removed from service for post-incident testing.
- The TR06 was removed from service for post-incident investigation processes.
- The immediate derailment area was inspected by TRST, and temporary repairs were made.
- A medium-speed restriction was implemented in the derailment area to restore normal revenue service.

Probable Cause Statement

The probable cause of the derailment event on April 29, 2021, was the Equipment Operator failing to respond to an active warning device (alarm) while traveling in Work Mode while operating TR06. Contributing to the derailment was improper decision-making by the Equipment Operator during the pre-trip inspection. After discovering discrepancies with the work equipment, the Operator failed to notify a supervisor or mechanic to assess the vehicle's readiness for travel. For example, the Equipment Operator found one of the four gripper claw pins was missing. Rather than properly report the missing part and document the issue, the Operator used a screw spike to replace the missing pin as a temporary fix. While on the mainline, the Operator again failed to report mechanical concerns with the equipment when they observed that the stabilization system was not working correctly, causing the front end of TR06 to bounce on the tracks. Instead of properly reporting the concern, they stopped TR06, switched from travel mode to work mode, and continued. To prevent and warn operators against traveling in work mode, the equipment has an alarm system installed. The alarm operated as designed, however, and the operator continued to travel while in work mode.

Due to traveling in work mode, the air was released from the suspension system, which caused TR06's front end to lose flexibility. This rigidity was a likely contributing factor of the resulting derailment.

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	Responsible Party	Due Date
93036_SAFE CAPS_CTEM_001	(RC-1) Procure all parts to fix the equipment on TR06. Once the unit has been repaired, CTEM will perform a required operational check to ensure all systems are functioning as designed.	CTEM SRC	8/1/2021
93036_SAFE CAPS_TSMT_001	(RC-1) Technical Skills Maintenance Training (TSMT) conducted a virtual stand down for TRST maintenance managers and above on June 9, 2021. The virtual stand-down was converted into Computer-Based Training (CBT) in the Enterprise Learning Management (ELM) for all TRST personnel to complete. The virtual stand-down reviewed the derailment incident as part of the contents.	TSMT SRC	7/31/2021
93036_SAFE CAPS_TRST_001	(RC-1) Provide refresher training for the Equipment Operator AA when they return to duty on June 30, 2021. The refresher training will focus on the proper operations of a Tie Remover and reporting defects identified immediately.	TRST SRC	8/1/2021
93036_SAFE CAPS_SAFE_001	(RC-1) SAFE developed a Safety Bulletin to emphasize the proper operation and movement of Class 2 vehicles in a convoy block.	SAFE SRC	To Be Determined (TBD)

Appendices

Appendix A – Interview Summary

Office of Track and Structures (TRST)

Equipment Operator AA

The Equipment Operator AA is a WMATA employee with 19.5 years of service with approximately five months of experience as an Equipment Operator AA. The WMATA employee's RWP Level 2 certification expires July 31, 2021. This employee has no history of sleep issues to report.

Based on the SAFE interview, the Equipment Operator AA stated they arrived at Greenbelt Yard at 22:00 hours, and their manager conducted a toolbox meeting. The Equipment Operator AA was assigned to lead a convoy to transport TR06 from West Falls Church Yard to Alexandria Yard. After the toolbox meeting, the Equipment Operator AA was transported in a WMATA Non-revenue vehicle to West Falls Church Yard, where TR06 was stored. The Equipment Operator AA performed a ground walk around before moving TR06 from the storage area. The Equipment Operator AA indicated that TR06 was not adequately secured, so before moving TR06, the Equipment Operator AA had to secure TR06 and insert the lockup pins to the TR06 Gripper Jaw component. After performing their pre-trip inspection of TR06, the Equipment Operator AA notified West Falls Church Yard Interlocking Operator and requested a lead from Signal K99-130 to C99.

The Equipment Operator AA received a block to Signal K06-18, traveling no more than 5 mph, and then requested to enter the mainline to go to Alexandria Yard. The Equipment Operator AA indicated that once they got on the mainline, the air spring suspension system was not working correctly and bouncing while traveling. The Equipment Operator AA stated that they identified the suspension system issue during their pre-trip inspection in West Falls Church Yard and documented it but never informed a mechanic. By the Equipment Operator AA's own admission, since TR06's suspension system was not working correctly in travel, they stopped TR06 on the mainline and switched TR06 from travel mode to work mode. The Equipment Operator AA indicated that putting TR06 in work mode tightens up the air spring suspension system and drops TR06 lower to the ground. They thought this would help prevent a lot of the bouncing while traveling. The Equipment Operator AA never reported the concern of the condition of the air spring suspension system and just continued operating TR06. The equipment Operator AA found out through a conversation with a mechanic that it is not recommended to troubleshoot TR06 by operating in work mode. However, the date of this conversation's occurrence was not confirmed by the Equipment Operator AA. The Equipment Operator AA indicated they received training on operating TR06 on October 25, 2018, but did not receive training on troubleshooting or emergency events. The Equipment Operator AA stated it's a known problem that the air spring suspension system is not functioning as designed because they reported these issues to the mechanics in the past. NOTE: Based on the data captured and reviewed, this report could not be substantiated. The Equipment Operator AA indicated they did not exceed 15 mph when operating TR06. The Equipment Operator AA was not aware of any rules in the MSRPH regarding convoy block operations. The Equipment Operator AA stated they entered and exited Foggy Bottom Station, cleared the interlocking, came approximately 15 feet out of the curve, and TR06 front left truck derailed and made contact with the third rail. The Equipment Operator AA reported they called their Assistant Superintendent via phone of the derailment and then informed the ROCC over the radio announcing (Emergency, Emergency, Emergency). The Equipment Operator AA was

granted FT to perform a ground walk around. The Equipment Operator AA reported damage to studs on the running rails, third rail cover boards, insulators, and brackets to the ROCC. The Equipment Operator AA said ST03 was approximately 100 feet behind their machine when they derailed, and there was no communication between them other than when the Equipment Operator operating ST03 received permission to hot stick. The Equipment Operator AA indicated that they don't operate TR06 often, and it's only for transportation purposes when they do. The Equipment Operator AA hasn't undergone any training for familiarization of TR06. There were no unusual conditions on the roadway reported before the derailment. The Equipment Operator AA stated that they don't remember any SOP stating to notify the ROCC before notifying their supervisor. The Equipment Operator AA reported they had not been trained for emergency events, and that's why they told their supervisor first and because they were in shock.

Office of Track and Structures (TRST)

Equipment Operator AA (Written Statement)

The Equipment Operator AA is a WMATA employee with nine years of service.

The Equipment Operator AA stated in a written statement on April 29, 2021, they were Operating ST03 with TR06 in a convoy block going in the direction of Farragut West Station, Track 1. The ST03 Equipment Operator AA indicated that all of a sudden, they heard over the radio TR06 Operator announced (Emergency, Emergency, Emergency) to the ROCC on Ops 2. The ST03 Equipment Operator AA indicated they found out over the radio that TR06 had derailed. The ST03 Equipment Operator AA indicated that the ROCC then instructed them to stop their vehicle, which was approximately 400 feet to 500 feet behind TR06. The ST03 Equipment Operator AA indicated they did not see TR06 when the unit derailed and only heard about it over the radio.

Appendix B – Photographs and Illustrations



Figure 1 - TR06. This machine is a single-operator, climate-controlled, enclosed cab machine.

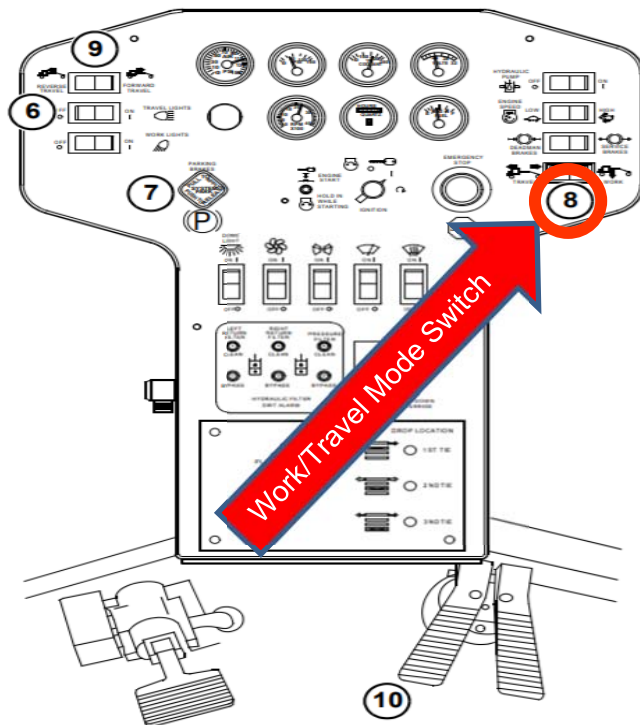


Figure 2 - This illustration represents the TR06 operator's center-enclosed cab panel. The Equipment Operator AA placed the work/travel switch to the work mode.



Figure 3 - TR06 derailed between CM C1-052+00 to CM C1-053+00 and made contact with the third rail.



Figure 4 - TR06 derailed between CM C1-052+00 to CM C1-053+00 and made contact with the third rail.

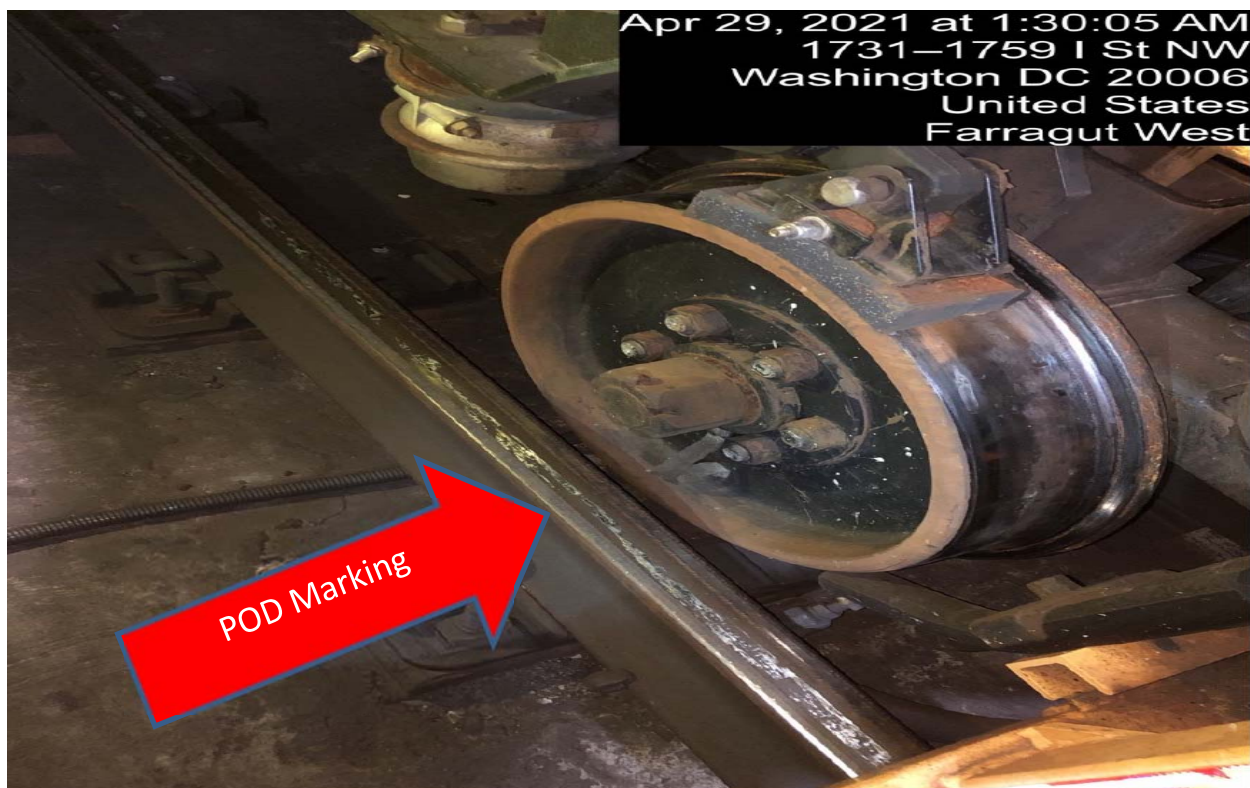


Figure 5 - Wheel climb Point of Derailment (POD) marking of TR06's front truck. The Point of Rest (POR) was approximately 3-6 inches away from the derailment location.

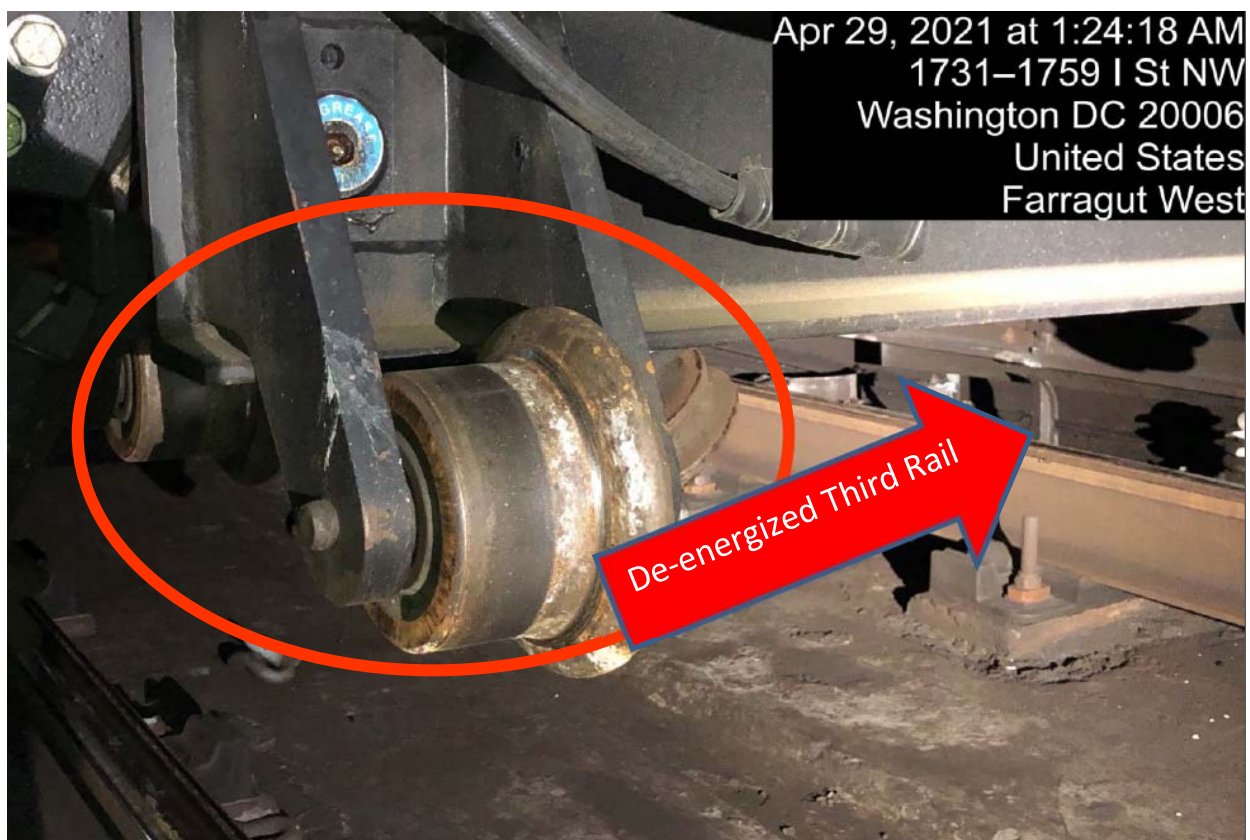


Figure 6 – TR06 rail clamp rollers, frame wheels derailed, and TR06 contacted the third rail.



Figure 7 – TR06 rail clamp rollers, frame wheels derailed, and TR06 contacted the third rail.

Appendix C – CTEM Post-derailment & Accident Damage Inspection Form



CTEM Post-derailment & Accident Damage Inspection Form

(1 Form per Unit)

DATE: Apr 30, 2021 INSPECTOR: [REDACTED] UNIT #: TR06
INCIDENT #: 93036MX INCIDENT LOCATION: B52+30 Track 1

GUIDELINES:

- This form is to be used for all rail vehicles involved in derailments, accidents.
- This form is to function as a guide to assist in ensuring that all vehicles are inspected to ensure that they still meet standards for operation.
- Some reference to codes and standards may be required to complete this inspection form.
- All inspection items on this form are to be marked as:

✓ = Passed X = Failed NA = Not Applicable UC = Unable to Check

NOTE: Any items that have failed are to be documented in the "Inspection Fault Report" field included on this form.

Incident Information:		(NOTE: Use blank field under each question for additional information if answered Yes.)
Did the unit contact the 3rd rail? (If Yes, where was the contact on the unit?)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Did the unit contact infrastructure such as a wall or platform? (If Yes, what was contacted?)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Did the unit contact another unit? (If Yes, what unit and where was the contact on the unit?)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

Truck Inspection:	
Roller bearings - no visual damage and in accordance with Rule 36	X
Roller bearings - no unusual noises; hand spun or run-by test	✓
Bearing Adapters - within wear limits and in accordance with Rule 37	NA
Drive systems - no visual damage or leaks	✓
Side frames and bolsters - no visual damage and in accordance with Rule 47 & 48	NA
Ride control - friction shoes & bearing adapters within limits and in accordance with Rule 46	NA
Springs - no damage, correctly seated and in accordance with Rule 50	✓
General - no visual damage, all components secured and in accordance with Rule 74	✓
NOTES:	
AREMA Vehicle; Tram out 7/16" overall (1/8 allowable). Pillow-block bearing on left front shifted toward B end ~3/8", outer axle bearing collar shifted ~1/4". Shifting appears recent and was likely caused by derailment.	

Chassis Inspection:	
Chassis and sub-frames - no cracks, twists, other visual damage	X
Center plates and side bearing - no visual damage and in accordance with Rule 60, 61, and 62	NA
Body & decking - no structural, cladding, or decking damage	✓
Loading - load is balanced and secure	NA
Coupler and draft arrangement - no visual damage and in accordance with Rule 16	NA
General - no visual damage, all components secured and in accordance with Rule 74	✓
NOTES:	
Left Rear suspension axle pivot arm at guides - worn ~1/4". Appears unrelated to incident. Bracket for rail fork bent and cracked.	

CMNT Form 50.993, Rev. 0.0

Page 1 of 2

February 01, 2018

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Attachment 2 – Page 1 of 2.

Date: 04/29/2021 Time: 00:04 hours.
Draft Final Report Rev. 1 – Derailment
E21168

Rev. 1 Drafted By: SAFE 705 – 08/29/2021
Rev. 1 Reviewed By: SAFE 71 – 09/01/2021
Rev. 1 Approved By: SAFE 71 – 09/03/2021

Page 31



CTEM Post-derailment & Accident Damage Inspection Form

Wheel Inspection:	
Wheels - Discoloration, cracks, spalling, and signs of movement	✓
Gauging - Back to back measurement and in accordance with Rule 43	✓
Gauging - Flanges & tread, and in accordance with Rule 41	✓
General - no visual damage	✓
NOTES:	

Brake Inspection:	
Brake rigging & cylinders - no visual damage or apparent leaks	✓
Brake hoses & trunk lines - no visual damage or apparent leaks	✓
Brake piping, valving and cocks - no visual damage or apparent leaks	✓
Brake operation - passes functional test	✓
Friction shoes - greater than 3/8" and accordance with Rule 12	X
Rolling brake test - unit stop as designed without locking up wheels	UC
Hand brake - no visual damage and applies as designed	NA
General - no visual damage, all components secured and in accordance with Rule 74	✓
NOTES:	
Left rear brake shoe cracked. Standing brake check performed instead of rolling brake check.	

Miscellaneous Equipment Inspection:	
Horn - operational	✓
Lighting - operates as designed	✓
Radio - perform radio check, operates as designed	✓
Propulsion and braking controls - all controls operate as designed	✓
Cameras - clear picture, operates as designed	X
Emergency equipment - Interlocks emergency valves, E-stops, etc., operate as designed	✓
Locks & restraints - mechanical locks and restraints are in place and operate as designed	X
NOTES:	
Camera system monitor inoperative. Left tie gripper missing lock pin. Right main work arm lock pin broken. Suspension alarm and work over speed alarm function as intended.	

Inspection Fault Report:	
Front left suspension shifting and rail fork damage appears to have resulted from derailment. Rear suspension arm guide wear and camera would likely not contribute to vehicle derailment.	
Track testing to be performed following repairs	
Maximo WO#: 16300841	

Can unit be returned to service?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
----------------------------------	---------------------------------------------------------------------

Inspector's Signature:	
------------------------	--

CMNT Form 50.993, Rev. 0.0

Page 2 of 2

February 01, 2018

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Attachment 2 – Page 2 of 2.

Date: 04/29/2021 Time: 00:04 hours.
Draft Final Report Rev. 1 – Derailment
E21168

Rev. 1 Drafted By: SAFE 705 – 08/29/2021
Rev. 1 Reviewed By: SAFE 71 – 09/01/2021
Rev. 1 Approved By: SAFE 71 – 09/03/2021

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Appendix D – TRST Daily Equipment Movement and Pre-Trip Inspection Log

Track and Structures

Daily Equipment Movement and Request Log

Operator's Name [REDACTED] Call Number [REDACTED]
Equipment Number TR206 Location of Equipment K99
Did you make yard moves? 0 Main work location? transport
Time you requested lead to mainline (tower)? 2316
What time did you receive a lead to mainline? 2319
What time did you request a lead to ROCC? 2327
What time did you receive a lead from ROCC 2333
Arrival time to work area? _____ Equipment pre-trip complete? 2310
What time did you request a lead to depart work location? _____
What time did you receive a lead to depart work location? _____
Departure time from work area? _____
Time cleared mainline? _____ Final location of your equipment? _____
Was equipment held up in route to work location? Yes or No
Does unit have an emergency tow bar? Yes or No
Operator's Signature [REDACTED] Date 4-28-2021
Supervisor (Print) _____
Start Fuel Level $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ Full End Fuel Level $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ Full
Comments _____

Document# 201503-003

Attachment 3 – Page 1 of 2.

WMATA CLASS 2 RAIL VEHICLE PRIOR TO USE INSPECTION

Initials (Operator /Flag Person)

1. Check for wheel chocks and that the required quantity for unit(s) in consist are present.
2. Check angle cocks, train line seals, air tool and drain valves. (Open or close as required).
3. Check main engine for proper oil level.
4. Check for any loose, broken, torn, cracked, or leaking components as you make your walk around inspection.
5. If using auxiliary components such as cranes, generators and compressors, check all controls, movements, fluid levels, and safety devices.
6. Start machine and check all switches, gauges, and warning indicators.
7. Check for sufficient air pressure and if equipped with A-9, make sure it is at 90 psi in the release position.
8. Check transmission for correct oil level and any abnormal sounds or functions.
9. Ensure all equipment, tools, supplies or loose debris are secured on decks and not posing any safety hazards.
10. If equipped and scheduled for use, inspect work head assemblies for wear, out of adjustment and damage. Check oil fill reservoirs and grease all fittings.
11. If equipped, inspect E-couplers, tow bars, and revenue train couplers. Make sure all tools are properly stored and secured while maintaining proper housekeeping of materials and equipment.
12. Gas cylinders should be secured and in their proper location.
13. Ensure all work heads and components such as crane booms, outriggers, measuring buggies, clamp frames, plows, turn tables and extension arms are pinned and locked with safety devices prior to travel.
14. Check fuel and hydraulic tanks for proper level.
15. Check all wheels, brakes, visible linkage, and suspension on all rolling stock vehicles.
16. Check for cracked, broken, missing windows and side boards. Make sure there are no bent or loose railings, steps, or cabinet enclosures that are missing safety chains, locks or latches.
17. Turn on and inspect all lighting on unit(s) in consist for any defects or problems.
18. Check that back up alarms and horns sound.
19. Fire extinguishers should be charged and secured. Sign the monthly inspection log (if not already signed).
20. Verify the radio(s) is/are able to transmit and receive clearly.
21. Inspect all items in flagman's booth for proper operation and functionality.
22. Ensure loads are secure, evenly distributed and are not hanging over the side or ends of flat car.
23. Check all Flat Car emergency dump valves and hand brakes.
24. Inspect hi-rail components for thin flanges, leaking cylinders, safety pins, tires, shunts, and proper tuck when on hi-rail.
25. Perform a stretch test. ☐ Successful Test ☒ N/A
26. Perform a rolling brake test (all class 2 vehicles).
27. Perform standing brake test (all flatcars, PM26-PM53 only).
28. Verify the intercom headsets are able to transmit and receive clearly (if applicable).
29. Operators and Pilots have reviewed, and have in their possession, mainline and yard maps showing their intended routing, curves and interlockings and restrictions and other vital information.

Note: When transporting units for PMI, make ensure cabs, decks, platforms and operating stations are clear and free from trash, debris, tools, materials and supplies.

Notes/Comments:

When in travel Mode, unit Front Bounce Left to Right

Print Name(s):

ID# (s):

Signature(s):

Equipment#:

Yard or location where inspection is performed:

K99

Date:

4-28-2021

Time of Inspection:

2300

TRST-CMP-FRM-C2RVPUIC-REV.5.2 | 04122021

Attachment 3 – Page 2 of 2.

Appendix E – CTEM Work Order Details



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

Page 1 of 3
MX76PROD

Work Order #: 16300841
Type: CM



Status: CLOSE
08/24/2021 14:06

Work Description: TR06 Derailed while transporting at Farragut West B1 52+30
Job Plan Description:

Work Information					
Asset: MTR06	TR06, TRIPP MACHINE, NORDCO, S/N 760504-11	Owning Office: TRST-TRAK-ALEX	Parent:		
Asset Tag: MTR06		Maintenance Office: CTEM-ALEX-HVYR	Create Date: 04/29/2021 06:53		
Asset S/N: 760504-11		Labor Group: CTEM-NCAR-HVY	Actual Start: 04/29/2021 07:27		
Location: 1213	C99, ALEXANDRIA YARD	Crew:	Actual Comp: 06/30/2021 10:14		
Work Location: 1977	C03, FARRAGUT WEST, STATION	Lead:	Item: CTEM49200037		
Failure Class: CTEM009	TRUCKS / DRIVE_TRAIN	GL Account: WMATA-02-33380-50499070-041-*****OPR**	Target Start:		
Problem Code: 1115	AXLES	Supervisor: [REDACTED]	Target Comp:		
Requested By:		Requestor Phone: [REDACTED]	Scheduled Start:		
Chain Mark Start:		Chain Mark End:			
Create-Mileage: 0.0		Complete-Mileage: 0.0			

Task IDs					
Task ID					
10	Rerail Unit and Transport				
	<p>MOC called at 12:16am, arrived on sight at 12:45, checked in and got briefed, safety officers were [REDACTED] and [REDACTED], TR06 was derailed at chain marker B52+30 Track 1, Did not get Emergency Red tag till 2:20 after work area was set up we were able to start work at 3:20, Unit back on rail 4:28, after on rail had a air look at Turbo 2000, by passed so unit could be moved, unit was put in a pocket track, will be transported 4/29/21</p> <p>4/29/2021 [REDACTED]</p> <p>Went to McPherson SQ to move machine to D99.</p>				
Component: 000-400-AJ0 CTEM_TIE REMOVER_INSERTER	Work Accomp: RECOVERED	Reason: IMPROVED RELIABILITY	Status: CLOSE	Position:	Warranty?: N
20	Post Derailment Inspection / Repairs				
	<p>[REDACTED] 5-3-21</p> <p>Drove to Greenbelt to pick up two axles and help pull the old ones out</p> <p>[REDACTED] removed front and rear axles to replace both</p> <p>[REDACTED] performed repairs to broken anti derailer, and swapped parts onto new axles</p> <p>5-5-21 [REDACTED]</p> <p>Repair-re-welded - left side work head lock pin, repair gripper pins-1 on left and 1 on right, re connect</p> <p>[REDACTED] and [REDACTED] 6-18-21</p> <p>Installed rear axle made sure the axles are square and true. Installed drive chains and lowered the unit back on the floor</p> <p>[REDACTED] and [REDACTED] 6-22-21</p> <p>Replaced some stickers, cleaned up mess around unit and drove around the loop for testing</p> <p>tested unit, and finished putting back together [REDACTED]</p> <p>Unit tested without any issues. Operated as designed.</p> <p>Parts added to this work order by mistake have negative off-set costs to zero out price.</p>				
Component: 000-400-AJZ INSPECTION; TIE REMOVER/	Work Accomp: INSPECTED	Reason: INSPECTION	Status: CLOSE	Position:	Warranty?: N
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Attachment 4 – Page 1 of 3.



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

Page 2 of 3
MX76PROD

Work Order #: 16300841
Type: CM



Status: CLOSE
08/24/2021 14:06

Work Description: TR06 Derailed while transporting at Farragut West B1 52+30
Job Plan Description:

Planned Materials										
Task ID	Item	Description	Storeroom	Issue Unit	Quantity	Unit Cost	Line Cost			
	R42400110	HOOK:PEAR SHAPE,1/4 IN DIA X 3-5/16 IN OAL X 1-11/16 IN HT X 9/16 IN THD,ZINC PLATED	259	EA	2	\$2.25	\$4.50			
	R18360172	HOOK:RIGID EYE SNAP,#1, 5/8 IN EYE,STAINLESS STEEL,1K,ROHR/BREDA BARRIER	259	EA	2	\$4.25	\$8.50			
							Total Planned Materials:	\$13.00		
Actual Labor										
Task ID	Labor		Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
10			04/29/2021	04/29/2021	00:00	07:40	Y	07:40	00:00	\$264.28
10			04/29/2021	04/30/2021	20:15	01:00	Y	04:45	00:00	\$163.74
10			04/29/2021	04/29/2021	01:00	07:49	Y	05:00	01:50	\$277.84
10			04/29/2021	04/29/2021	00:00	06:00	Y	06:00	00:00	\$206.83
20			06/22/2021	06/22/2021	09:00	14:00	Y	05:00	00:00	\$197.47
20			05/07/2021	05/07/2021	06:00	14:00	Y	08:00	00:00	\$314.37
20			05/06/2021	05/06/2021	06:00	14:00	Y	08:00	00:00	\$314.37
20			05/06/2021	05/06/2021	06:00	14:00	Y	08:00	00:00	\$315.95
20			05/04/2021	05/04/2021	06:00	14:00	Y	08:00	00:00	\$314.37
20			05/04/2021	05/04/2021	06:00	14:00	Y	08:00	00:00	\$315.95
20			05/03/2021	05/03/2021	06:00	14:00	Y	08:00	00:00	\$314.37
20			04/30/2021	04/30/2021	06:00	14:00	Y	08:00	00:00	\$314.37
20			04/30/2021	04/30/2021	06:00	14:00	Y	08:00	00:00	\$314.37
20			05/03/2021	05/03/2021	06:00	14:00	Y	08:00	00:00	\$315.95
20			05/03/2021	05/03/2021	06:00	14:00	Y	08:00	00:00	\$314.37
20			05/07/2021	05/07/2021	06:00	14:00	Y	08:00	00:00	\$315.95
20			05/03/2021	05/03/2021	06:15	14:00	Y	07:45	00:00	\$306.07
20			05/05/2021	05/05/2021	06:00	14:00	Y	08:00	00:00	\$314.37
20			05/05/2021	05/05/2021	06:00	14:00	Y	08:00	00:00	\$314.37
20			06/18/2021	06/18/2021	06:00	14:00	Y	08:00	00:00	\$315.95
20			06/18/2021	06/18/2021	06:00	14:00	Y	08:00	00:00	\$315.95
20			06/23/2021	06/23/2021	06:00	14:00	Y	08:00	00:00	\$314.37
20			06/22/2021	06/22/2021	09:00	14:00	Y	05:00	00:00	\$197.47
							Total Actual Hour/Labor:	169:10	01:50	\$6,653.10

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08/24/2021 14:08

Attachment 4 – Page 2 of 3.



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

Page 3 of 3
MX76PROD

Work Order #: 16300841
Type: CM



Status: CLOSE
08/24/2021 14:06

Work Description: TR06 Derailed while transporting at Farragut West B1 52+30
Job Plan Description:

Actual Materials									
Task ID	Item	Assetnum	Description	Storeroom	Trans Date	Issue Unit	Quantity	Unit Cost	Line Cost
	R42400110		HOOK:PEAR SHAPE,1/4 IN DIA X 3-5/16 IN OAL X 1-11/16 IN HT X 9/16 IN THD,ZINC PLATED	259	06/22/2021	EA	2	\$2.25	\$4.50
			DZ120925 Oil Line		08/24/2021		1	-\$28.69	-\$28.69
	R18360172		HOOK:RIGID EYE SNAP #1, 5/8 IN EYE,STAINLESS STEEL, 1K,ROHR/BREDA BARRIER	259	06/28/2021	EA	2	\$4.25	\$8.50
			54267175 Pin, Suspension pivot		06/23/2021		1	\$0.00	\$0.00
			34940010 L.H. Axle Suspension Frame		06/23/2021		1	\$0.00	\$0.00
			34940010 L.H. Axle Suspension Frame		06/23/2021		1	\$4,787.30	\$4,787.30
			RE545538 BOLT KIT		08/24/2021		1	-\$20.98	-\$20.98
			RE545538 BOLT KIT		06/07/2021		1	\$20.98	\$20.98
			T77814 O Ring		06/07/2021		2	\$1.35	\$2.70
			DZ120925 Oil Line		06/07/2021		1	\$28.69	\$28.69
			54267175 Pin, Suspension pivot		08/24/2021		1	-\$89.88	-\$89.88
			T77814 O Ring		08/24/2021		1	-\$2.70	-\$2.70
			34940010 L.H. Axle Suspension Frame		08/24/2021		1	-\$4,787.30	-\$4,787.30
			54267175 Pin, Suspension pivot		06/23/2021		1	\$89.88	\$89.88
Total Actual Materials:								\$13.00	
Failure Reporting									
Cause		Remedy			Supervisor		Remark Date		
1025	ACCIDENT/COLLISION/DERAIL			1571	DERAIL INSPECTION RECD			06/23/2021	
Remarks: Rerailed unit / transported / made repairs and performed operational testing									

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08/24/2021 14:08

Attachment 4 – Page 3 of 3.

Appendix F – TRST Work Order Details



16300948
Type: CM

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



Page 1 of 2
MX76PROD

Status: INPRG
05/03/2021 09:45

Work Description: EMERGENCY CORE / C03 - C04 TRK#1 Fastener Maint. Gauge Correction
Job Plan Description:

Work Information											
Asset: TC1	C-LINE, TRACK-1 EQUIPMENT PARENT			Owning Office: TRST	Parent:						
Asset Tag:				Maintenance Office: TRST-TRAK	Create Date: 04/29/2021 00:00						
Location: C	ORIM, C Line, Huntington			Labor Group: TRST-TRAK-SHCP	Actual Start: 05/03/2021 09:45						
Work Location:				Crew:	Actual Comp:						
Failure Class: TRSTRAIL	TRST, RAIL			GL Account: WMATA-33-33620-50499180-042-CIP0024_33*****-CAP**.....2021*****							
Problem Code: D09	CRACKED / SPLIT			Supervisor:	Target Start:						
Requested By: [REDACTED]				Requestor Phone:	Target Comp:						
Chain Mark Start: 45				Chain Mark End: 65	Scheduled Start:						
Task IDs											
Task ID											
10	INSTALLED NEW STUDS										
Component: 200-F06 STUDS											
Work Accompl: INSTALLED Reason: DAMAGED Status: INPRG Position: L Warranty?: N											
Start Marker: 52	Start Offset: 25	Quantity: 7	Linear Footage: 25	Square Footage:	Actual Start: 04/29/2021						
End Marker: 52	End Offset: 50	Actual Finish: 04/30/2021									
20	90001 LEVEL 1 QUALITY CHECK										
Component:											
Work Accompl: COMPLETED - WORK OR TASK Reason: Status: INPRG Position: Warranty?: N											
Start Marker: 52	Start Offset: 25	Quantity:	Linear Footage:	Square Footage:	Actual Start: 04/29/2021						
End Marker: 52	End Offset: 50	Actual Finish: 04/30/2021									
Actual Labor											
Task ID	Labor	Start Date	End Date	Start Time	End Time	Regular Hours	Regular Line Cost	Premium Hours	Premium Line Cost	Total Line Cost	
10	INSTALLED NEW STUDS	04/29/2021	04/30/2021	22:00	06:00	8.00	\$225.85	0.00	\$0.00	\$225.85	
10	INSTALLED NEW STUDS	04/29/2021	04/30/2021	22:00	06:00	8.00	\$248.19	0.00	\$0.00	\$248.19	
10	INSTALLED NEW STUDS	04/29/2021	04/30/2021	22:00	06:00	8.00	\$322.23	0.00	\$0.00	\$322.23	
10	INSTALLED NEW STUDS	04/29/2021	04/30/2021	22:00	06:00	8.00	\$264.60	0.00	\$0.00	\$264.60	
10	INSTALLED NEW STUDS	04/29/2021	04/30/2021	22:00	06:00	8.00	\$275.77	0.00	\$0.00	\$275.77	

WT_plus1_woprnt_TRST.rptdesign

05/3/2021 09:49

Attachment 5 – Page 1 of 2.



16300948
Type: CM

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



Page 2 of 2
MX76PROD

Status: INPRG
05/03/2021 09:45

Work Description: EMERGENCY CORE / C03 - C04 TRK#1 Fastener Maint. Gauge Correction
Job Plan Description:

Actual Labor											
Task ID	Labor	Start Date	End Date	Start Time	End Time	Regular Hours	Regular Line Cost	Premium Hours	Premium Line Cost	Total Line Cost	
		04/29/2021	04/30/2021	22:00	06:00	8.00	\$261.98	0.00	\$0.00	\$261.98	
		04/29/2021	04/30/2021	22:00	06:00	8.00	\$248.47	0.00	\$0.00	\$248.47	
		04/29/2021	04/30/2021	22:00	06:00	8.00	\$216.17	0.00	\$0.00	\$216.17	
		04/29/2021	04/29/2021	05:00	06:00	1.00	\$43.92	0.00	\$0.00	\$43.92	
Total Actual Labor:							\$2,107.18	\$0.00	\$0.00	\$2,107.18	

Failure Reporting			
Cause	Remedy	Supervisor	Remark Date
Remarks:			

Child Work Order										
Work Order	Description	Asset	Failure Class	Position Code	Problem Code	Start Marker	Start Offset	End Marker	End Offset	Status
16300581	C03 C1 52+00 TO 53+00 DERAILMENT TRACK UNIT 87 NOTIFIED EN ROUTE.	TC0	TRSTSTRC		1572					CLOSE

Attachment 5 – Page 2 of 2.

Appendix G – Root Cause Analysis

