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WMSC Commissioner Brief: W-0127 – Runaway Maintenance Vehicle – Southern Ave. Station – July 9, 2021

Prepared for Washington Metrorail Safety Commission meeting on December 7, 2021

Safety event summary:

A Metrorail Roadway Maintenance Machine (RMM), Prime Mover (PM) 65, rolled, not under the control of an operator, approximately 250 feet down a graded section of track near Southern Ave. Station into a location where Metrorail personnel were actively working. The Equipment Operator and the Roadway Worker In-Charge (RWIC) on PM 65 yelled at the workers to get out of the way, and the workers ran out of the way just before the vehicle reached their location. PM 65 collided with a Geismar Track Torquing Machine that was being used as part of overnight work on switch point and stock rail replacement to properly adjust and secure the running rail. The machine is regularly used to torque rail fasteners. Given its weight, the machine is typically placed on the rails from a flatcar using a crane. Due to the work, third rail power was de-energized in the area at the time of the collision.

The work crew did not immediately report this event as required by Metrorail rules and procedures. In an investigative interview, the RWIC stated that they reported the event to their supervisor. That Track and Structures Supervisor reported the collision to Maintenance Operation Control (MOC) in the Rail Operations Control Center (ROCC) at least 11 minutes after the collision occurred. The collision was not directly reported to the rail traffic controllers responsible for this section of the rail system. Approximately 20 minutes after the collision, a rail controller contacted the RWIC and directed them to stop work and to contact them via phone. During the subsequent phone call, the RWIC provided information about the event.

Prior to the collision, the Equipment Operator had moved the prime mover from near where the work crew was working back toward the station platform in order to drop off tools with another crew member working in that area. The Equipment Operator then moved PM 65 back toward the area where the crew was using the track torquing machine and stopped the vehicle. While the Equipment Operator was transitioning from the cab operating station to the remote operating station, the RWIC entered the cab and said the vehicle was rolling down the track. PM 65 continued to roll following activation of the emergency stop pushbutton and following activation of the battery disconnect switch. The RWIC reported that they ran back to the remote station yelling to the work crew to get out of the way.

PM 65 struck the Geismar Track Torquing Machine that was attached to the running rail, causing significant damage to the torquing machine, then came to a stop. The collision also damaged the prime mover.

After the collision, the Equipment Operator moved PM 65 prior to the scene being documented. The Equipment Operator stated they moved the vehicle to reduce what they perceived was a potential risk of fire, since there was fuel leaking from the Geismar Track Torquing Machine. The Equipment Operator then attempted to apply the parking brake from the remote station and took their foot off the service brake pedal, and PM 65 started rolling again until the Equipment Operator put their foot back on the service brake pedal.

Following this event, testing on PM 65 identified an approximately 15 second delay from the time a parking brake application was initiated to the time the parking brakes actually applied and the confirmation light in the cab activated. This delay is not part of the vehicle's design. Follow up inspections identified contaminant build up in exhaust valves on PM 65 that led to the valves becoming stuck closed. Metrorail replaced these valves and then demonstrated that

the braking system then functioned normally (The valves are regularly checked three times per year as part of Metrorail's normal preventive maintenance). The Equipment Operator stated that the vehicle's service brake is intended to be used as a backup to the parking brake air brake system. Each of those are separate from the emergency brake system.

During the investigative interview, the Equipment Operator stated that they followed the procedure to switch from travel mode to remote operation of PM 65 (PM 65 does not have data collection systems such as video monitoring or event recorder that document these actions). The Equipment Operator also stated they performed a standing and rolling brake test in the rail yard prior to entering the mainline using the flatcar brakes. The flatcar had been detached from PM 65 during the work zone setup process and was left on the opposite side of the workers who were using the Geismar Track Torquing Machine. The Equipment Operator stated that their understanding is that a standing brake test should not be done using the service brake or parking brake on Plasser prime movers, such as PM 65, because the brakes can lock up and cause wheel flats when attached to a flatcar. The Equipment Operator also stated they do not use PM 65 service brakes on the mainline, and instead use flatcar brakes except when operating at less than 5 mph in a work area. There is no procedure for checking the service brake and parking brake before taking the unit to the mainline.

Probable cause:

The probable cause of this event was Metrorail's insufficient maintenance and inspection practices of RMM subsystems, which led to an in-service mechanical failure of the braking system due to contaminant build up. Contributing to this event was inadequate pre-trip brake testing procedures and the lack of vehicle-specific training for Metrorail Equipment Operators to ensure a full understanding and effective implementation of vehicle operations and pre-trip inspection requirements.

Corrective Actions:

Metrorail distributed a personnel notice regarding parking brake verification and testing during pre-trip inspection and during operations. Additionally, a service bulletin was issued related to the application and testing process of parking brakes prior to operating a prime mover.

Metrorail repaired PM 65.

The WMSC had previously identified findings and required corrective actions related to RMM operations, including the WMSC's RMM Audit issued on March 9, 2021. These corrective action plans, which Metrorail is in the process of implementing, include equipment operator training and certification, maintenance rules and procedures, and maintenance training.

WMSC staff observations:

Metrorail should continue to follow up on its service bulletins and personnel notices to develop long-term procedures when necessary.

As noted in the RMM Audit, differences between RMM vehicles demonstrate the importance of training and certification for equipment operators on each specific type of vehicle they may operate.

Metrorail has an opportunity to continually improve safety by ensuring preventive maintenance procedures include inspections of all safety equipment, such as inspections of brake pneumatic valves for contaminants.

Metrorail did not properly report this event to the WMSC initially with the appropriate accident-level classification, and did not immediately adjust this classification when notified by the WMSC. Metrorail later made the correction at the WMSC's direction which included required reporting to the Federal Transit Administration (FTA) only after the two-hour window for notifications to the FTA had passed.

Staff recommendation: Adopt final report.

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

FINAL REPORT OF INVESTIGATION A&I E21289

Date of Event:	07/09/2021
Type of Event:	Collision
Incident Time:	01:44 hours.
Location:	Outside of Southern Avenue Station Interlocking, Track 1 at CM F1-287+30
Time and How received by SAFE:	02:20 hours. SAFE/IMO In-Person Notification
WMSC Notification Time:	03:32 hours.
Responding Safety Officers:	WMATA SAFE: No WMSC: No Other: No
Rail Vehicle:	Plasser Prime Mover (PM) 65
Injuries:	No
Damage:	Damaged electrical box on the left rear of PM65, the hydraulic line shifted, and the Geismar Track Torquing Machine was damaged.
Emergency Responders:	CTEM and TRST
SMS I/A Number	20210709#94367

Table of Contents

Abbreviations and Acronyms

AIMS	Advanced Information Management System
ARS	Audio Recording System
CAP	Corrective Action Plan
CCTV	Closed-Circuit Television
CM	Chain Marker
CTEM	Car Track Equipment Maintenance
EDT	Eastern Daylight Time
ESR	Event Scene Release
ETO	Exclusive Track Occupancy
FT	Foul Time
GOTRS	General Orders and Track Rights System
IMO	Incident Management Official
LOTO	Lockout/Tagout
MOC	Maintenance Operation Control
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
PM	Prime Mover
PMC	Plasser American Corporation
RTRA	Office of Rail Transportation
ROCC	Rail Operations Control Center
RWIC	Roadway Worker in Charge
RWP	Roadway Worker Protection
SAFE	Department of Safety and Environmental Management
SMS	Safety Measurement System
TOC	Transportation Operations Center
TRST	Office of Track and Structures
TSMT	Office of Technical Skills Maintenance Training
WMATA	Washington Metropolitan Area Transit Authority
WMSC	Washington Metrorail Safety Commission

Executive Summary

On Friday, July 9, 2021, at approximately 01:55 hours Eastern Daylight Time (EDT), the Maintenance Operation Control (MOC) received a report from an Office of Track and Structures (TRST) Supervisor that at approximately 01:44 hours, Plasser Prime Mover (PM) 65 experienced a brake malfunction. The TRST Supervisor reported PM65 rolled away on an inclined section of track while the Equipment Operator was changing operating positions from the cab to the remote operating station. The Equipment Operator engaged the emergency stop button, but PM65 continued to roll down the incline 100 to 150 feet, colliding with a Geismar Track Torquing Machine before the brakes fully applied, coming to a complete stop. As a result, the ROCC initiated emergency notifications to the respective internal departments.

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 area as the work area was established earlier in the night for switch point and stock replacement near the Southern Avenue Station interlocking. The TRST Roadway Worker in Charge (RWIC) had a Supervisory Power Outage scheduled in GOTRS at Southern Avenue Station, Track 1. The actual work area was Chain Marker (CM) F1-266+70 to F1-312+00 under Exclusive Track Occupancy (ETO) Roadway Worker Protection (RWP). *See Diagram 1 and Appendix F.*

The TRST Equipment Operator indicated during a virtual interview with SAFE, that prior to the incident, the RWIC instructed them to operate PM65 to the Southern Avenue Station platform to drop tools off to another crew member working in that area. After the tools were dropped off, the PM65 Equipment Operator traveled back to the other side of the work zone with the RWIC acting as the Flagman. The Equipment Operator stated they stopped PM65 at CM F1-290+00 and completed the proper sequence to switch from travel mode from the main cab operator's seat to the remote operating station. While transitioning from the cab to the remote station, PM65 began to roll down the incline. The RWIC was walking back into the cab stated that the unit was rolling. The Equipment Operator indicated that they made all attempts to get PM65 to stop. They activated the emergency stop push button, however the unit continued rolling down the incline. The Equipment Operator then turned the red knob battery disconnect switch off, but the unit continued to roll slowly. The RWIC and Equipment Operator both ran back to the remote station yelling to the work crew to get out of the way. PM65 rolled from CM F1-290+00 to F1-287+30, coming to a complete stop after striking and damaging the Geismar Track Torqueing Machine that was attached to the running rail. There were no injuries reported. TRST removed the Equipment Operator from service for post-incident toxicology testing.

Based on AIMS playback, at approximately 01:34 hours, PM65 operated in the direction of Southern Avenue Station, Track 1. At approximately 01:35 hours, PM65 berthed at Southern Avenue Station, Track 1. At approximately 01:35 hours, PM65 operated back in the direction of Congress Heights Station, Track 1. Finally, at approximately 01:37 hours, PM65 came to a stop. There was no other movement identified on the AIMS display. See Diagrams 1 through 4.

Car Track Equipment Maintenance (CTEM) Mechanics responded to the incident scene and inspected PM65. As part of their inspection, they walked around the unit to check PM65 for abnormalities, however nothing was found. The CTEM Mechanics did not inspect the remote operating station brakes or any components at the remote operating station due to the unit being on an incline. They did not want to chance testing the remote brakes since they had already failed once. The brakes in the cab were tested and worked as designed. CTEM determined that PM65 was safe to operate back to the yard from the cab. A CTEM Mechanic stayed on PM65 with the TRST Equipment Operator and proceeded to Branch Avenue Yard without further incident. As PM65 was being transported, a CTEM service truck was shadowing PM65, and four CTEM mechanics were on standby. Once PM65 safely arrived at Branch Avenue Yard, PM65 was taken out of service, and a CTEM Mechanic followed Lockout/Tagout (LOTO) protocols for the unit for further investigation.

SAFE personnel responded to Branch Avenue Yard to conduct an on-site investigation of PM65 on two separate occasions. On July 9, 2021, SAFE observed CTEM perform testing and diagnostics for PM65's brake concerns at Branch Avenue Yard. CTEM identified an approximately 15 second delay between the parking brake application and the brake indicator light activation, which indicated that the full application of the parking brake was delayed. A similar test was performed on Plasser PM62, and the delay was not observed. The service brake, which operates as a separate braking system, operated a designed. As a result, PM65 was moved into the CTEM shop, where inspection and troubleshooting efforts continued.

On July 12, 2021, SAFE observed CTEM perform a brake pneumatic system inspection to inspect for contaminants that could cause quick-release valve failure on PM65. CTEM took apart Quick Exhaust Valve 52 and Quick Exhaust Valve 77 on PM65 and identified that both valves contained a build-up of contaminants. CTEM determined that the contaminants caused both Quick Exhaust Valve Diaphragms to be stuck in the closed position, which likely caused the delay in full parking brake application. CTEM reported that when they changed both Quick Exhaust Valves on PM65, the application of the parking brakes engaged nearly instantaneously with simultaneous parking brake indicator light illuminations. CTEM installed a new anti-compounding valve and replaced the parking brake valve on PM65 as a preventative measure. CTEM performed an operational check after the necessary repairs, and all systems were functioning as designed per the Original Equipment Manufacturer (OEM) manual. **Note:** CTEM reported no contaminants were found in the quick release valves. See Addendix E. The brake system is pneumatic. All PMs were tested for immediate application, for both service and parking brake functions, immediately after the incident. One Plasser PM was found to have a leaking quick-release valve, however it did not impair the brake system. CTEM also conducted a campaign to replace all quick-release valves in all Plasser PMs as an additional measure to improve reliability and safety. See Addendix I. All valves have since been replaced.

After reviewing the Audio Recording System (ARS), there did not appear to be any communication deficiencies over the radio. The On-Call, SAFE Incident Management Official (IMO) notified the Washington Metropolitan Safety Commission (WMSC) and obtained an Event Scene Release (ESR) on Friday, July 9, 2021, at 02:27 hours. SAFE's IMO notified the Transportation Operations Center (TOC) on July 9, 2021, at 04:46 hours, via email when the reported incident was reclassified. WMSC released PM65 for service on July 15, 2021, at 10:34 hours.

The probable cause of the Collision event on July 9, 2021, was a mechanical failure within the braking system due to contaminant build-up. This delay in full brake application resulted in the collision with a Geismar Track Torqueing Machine. Contributing factors to this event included a Human Factors failure to observe the delayed parking brake indicator light illumination and inadequate pre-trip inspection procedure regarding the parking brake test.

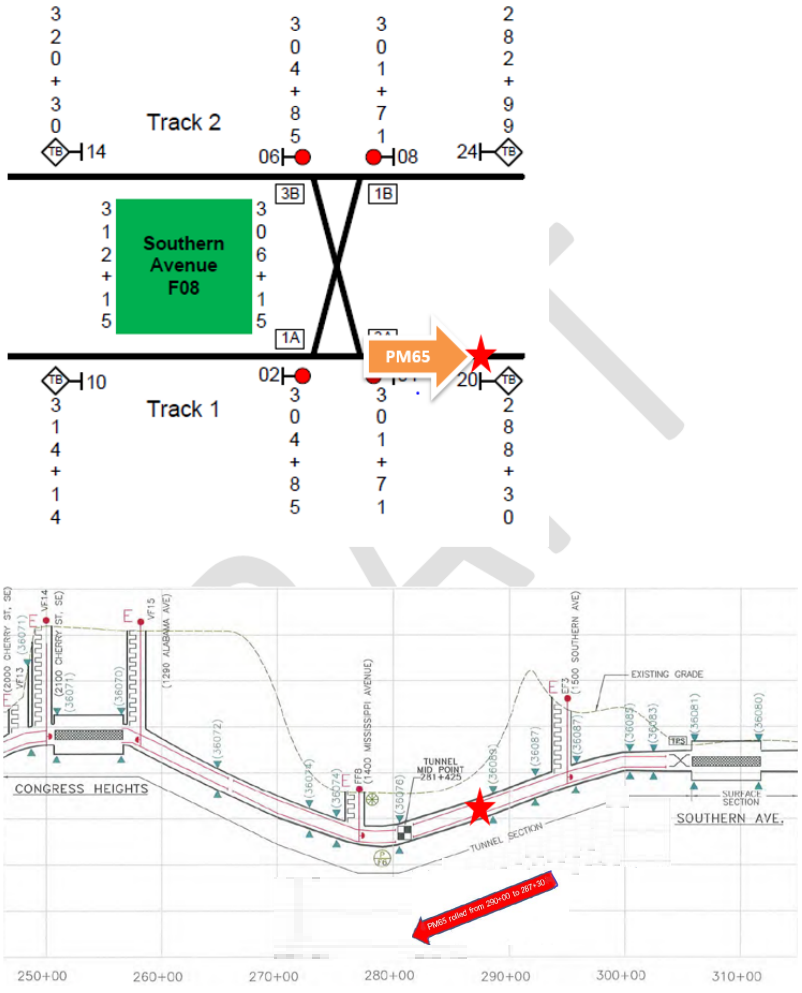
Incident Site

Outside of Southern Avenue Station Interlocking, Track 1 at CM F1-287+30

TRST – GOTRS

Actual – Chain Marker F1-266+70 to F1-312+00
Protected – Chain Marker F1-261+70 to F1-317+00

Field Sketch/Schematics



Note: Field sketches are approximate and not to scale

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 three interviews as part of this investigation. SAFE interviewed:
    - TRST - Equipment Operator B
    - TRST – RWIC Equipment Operator AA
    - CTEM Mechanic - Regional Shop Supervisor

- Informal Interviews – Collected through conversations with individuals during the investigation to provide background and supporting information.
    - TSMT Lead Instructor

- 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 7-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
    - Plasser American Corporation PMC-50 Operation Manual Review
    - Office of Systems Maintenance Communication Section (COMM)
    - Car Track Equipment Maintenance (CTEM) 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)
    - Closed-Circuit Television (CCTV) playback
    - General Orders and Track Rights System (GOTRS)

Investigation

On Friday, July 9, 2021, at approximately 01:55 hours EDT, the MOC received a report from a TRST Supervisor that at approximately 01:44 hours, PM65 experienced a brake malfunction. PM65 rolled down an inclined section of track after parking brake was applied and the Equipment Operator transitioned from the main cab operator's seat to a remote operating station. The Equipment Operator engaged the emergency stop button, however PM65 rolled down the incline

100 to 150 feet, striking a Geismar Track Torqueing Machine before coming to a complete stop. The ROCC initiated emergency notifications to the respective internal departments. Based on the AIMS playback and GOTRS data review, third rail power was already de-energized in the collision area before the incident because the work zone was previously established to conduct switch point and stock replacement.

Chronological ARS Timeline

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

Time	Description
00:16:47 hours	ROCC Radio RTC: Contacted the RWIC and stated breakers had been commanded open in your work location. You have permission to hot stick and confirm third rail power is de-energized under FT protection. Be advised F09-02 signal is red, blue block, and human form is established for your protection. Provide the ROCC with a CM after hot sticking. RWIC: Acknowledged. [Ops 3]
00:24:56 hours	RWIC: Contacted ROCC Radio RTC and reported third rail power is de-energized at CM F1 313+00 and asked for permission to clamp 1A and 3A switches in the normal position at Southern Avenue Station. ROCC Radio RTC: Acknowledged and granted the RWIC permission to clamp 1A and 3A switches in the normal position. [Ops 3]
00:33:52 hours	RWIC: Contacted ROCC Radio RTC and reported third rail power is de-energized at CMs F1 304+00, F1 302+50, and F1 301+00. Also, the RWIC requested to relinquish their FT and use their unit through the interlocking. ROCC Radio RTC: Acknowledged, instructed the RWIC to place their shunts and permitted them to utilize their unit. [Ops 3]
00:42:59 hours	RWIC: Contacted ROCC Radio RTC and asked how do you copy my shunt placement. ROCC Radio RTC: Responded; I copied two good shunts in your work location. At this time, you have permission to place the rest of your safety equipment and begin work. RWIC: Acknowledged. [Ops 3]
01:55:17 hours	TRST Supervisor: Contacted MOC Assistant Superintendent and reported a near-miss with PM65. The TRST Supervisor indicated PM65 was detached from the flatcar and sent to Southern Avenue Station platform to drop off tools to personnel. In the process, the work crew was on the roadway between the flatcar and PM65, and as the unit was backing up, PM65 lost brakes and the work crew ran out the way of the runaway unit. There were no injuries reported and the TRST Supervisor indicated that there was no track infrastructure damage. However, the TRST Supervisor said PM65 ran over and damaged the Geismar. The TRST Supervisor indicated that they are located at Southern Avenue Station, Track 1, CM 287+00, and that the TRST Mechanic, TRST Assistant Superintendent, had been notified already. [Phone] ***Note:*** *Using the ARS playback, SAFE could not review initial communications between the PM65 Equipment Operator and the RWIC, between the RWIC and Supervisor, and between the PM65 Equipment Operator and the ROCC.*
02:04:27 hours	ROCC Radio RTC: Contacted the RWIC and instructed them to stop all work and contact the ROCC via landline. RWIC: Acknowledged. [Ops 3]

Time	Description
02:06:19 hours	RWIC: Contacted the ROCC Assistant Superintendent and reported PM65 lost brakes as the Equipment Operator was backing up in the work area. The RWIC indicated this incident happened at 01:54 hours, and the incident occurred at F1-290+00 and the unit traveled between 100 feet and 150 feet uncontrolled. The RWIC stated that there are two ways to operate PM65 in the cab and remote. The RWIC reported that as the Equipment Operator switched from cab to remote, the brakes never engaged, so the unit started rolling once it switched over. The RWIC stated they were in the process of operating the unit, so chocks were not applied. The RWIC reported that the emergency stop button eventually stopped the unit. ROCC Radio RTC: Responded, the Equipment Operator stated the Geismar stopped the unit. RWIC: Responded; well, the Geismar helped slow the unit down, and then the emergency stop button completely stopped PM65. The RWIC reported there were no injuries because of this incident. However, there is damage to the Geismar equipment and the electrical outlet on PM65. The RWIC said the flatcar was already separated from PM65 at the time of the collision event. ROCC Radio RTC: Responded, do not move the unit and equipment; SAFE is en route. [Phone]
02:32:23 hours	ROCC Assistant Superintendent: Contacted the RWIC and asked did you start any of your work? RWIC: Responded, our work is complete. We need to clean up. [Phone]
02:32:38 hours	CTEM Mechanic: Contacted the ROCC Radio RTC and requested permission to go directly with the RWIC to Southern Avenue Station, Track 1. ROCC Radio RTC: Responded, you have permission. CTEM Mechanic: Contacted the RWIC and requested permission to enter their work area plus three to perform an inspection on PM65. RWIC: Responded, you have permission to enter the work area on Track 1 only; we are at CM 288+00. [Ops 3]
02:45:27 hours	ROCC Assistant Superintendent: Contacted the RWIC and reported that the WMSC had released the scene to clean up the work location. The ROCC Assistant Superintendent instructed the RWIC to take pictures of all the damage, such as the Geismar, electrical outlet, and the PM65. Also, they need the safety briefing, flagmen checklist, and operator's checklist. Additionally, the Equipment Operator that was operating PM65 had been removed from service. RWIC: Responded, so SAFE is not responding to the scene? ROCC Assistant Superintendent: Responded, no, they want the pictures. [Phone]
03:02:32 hours	CTEM Mechanic: Contacted MOC Assistant Superintendent and reported they are about to test the brakes in the cab since the brakes failed in remote mode. [Phone]
03:20:54 hours	ROCC Radio RTC: Contacted the RWIC and asked has the Geismar been removed from the roadway. RWIC: Responded, yes, the Geismar has been removed from the roadway. [Ops 3]
03:24:00 hours	ROCC Assistant Superintendent: Contacted Metropolitan Transit Police Department (MTPD) and reported a near-miss occurred at 01:44 hours, PM65 brakes did not engage when switching from cab operation to remote

Time	Description
	operation and had an uncontrolled roll of 100 feet to 150 feet. PM65 contacted a Geismar machine on the roadway, and the Equipment Operator was able to stop the unit after pushing the emergency stop button. There were no injuries reported, just equipment damage. [Phone]
03:28:44 hours	RWIC: Contacted the ROCC Radio RTC and reported all personnel and equipment are clear of the roadway, the ROCC may restore third rail power at their discretion and tracks are revenue ready. ROCC Radio RTC: Acknowledged and asked was PM65 able to move on its own. RWIC: Responded, that is affirmative; PM65 is operational. [Ops 3]
03:30:19 hours	ROCC Radio RTC: Notified the PM65 Equipment Operator and asked if the Mechanic was on board with you. PM65 Equipment Operator: Responded, yes, the Mechanic is on aboard. ROCC Radio RTC: Responded, verify that all personnel and equipment were clear and safe to move. Be advised you have an absolute block to Branch Avenue Station, Track 1. PM65 Equipment Operator: Acknowledged. [Ops 3]

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

Advanced Information Management System (AIMS)

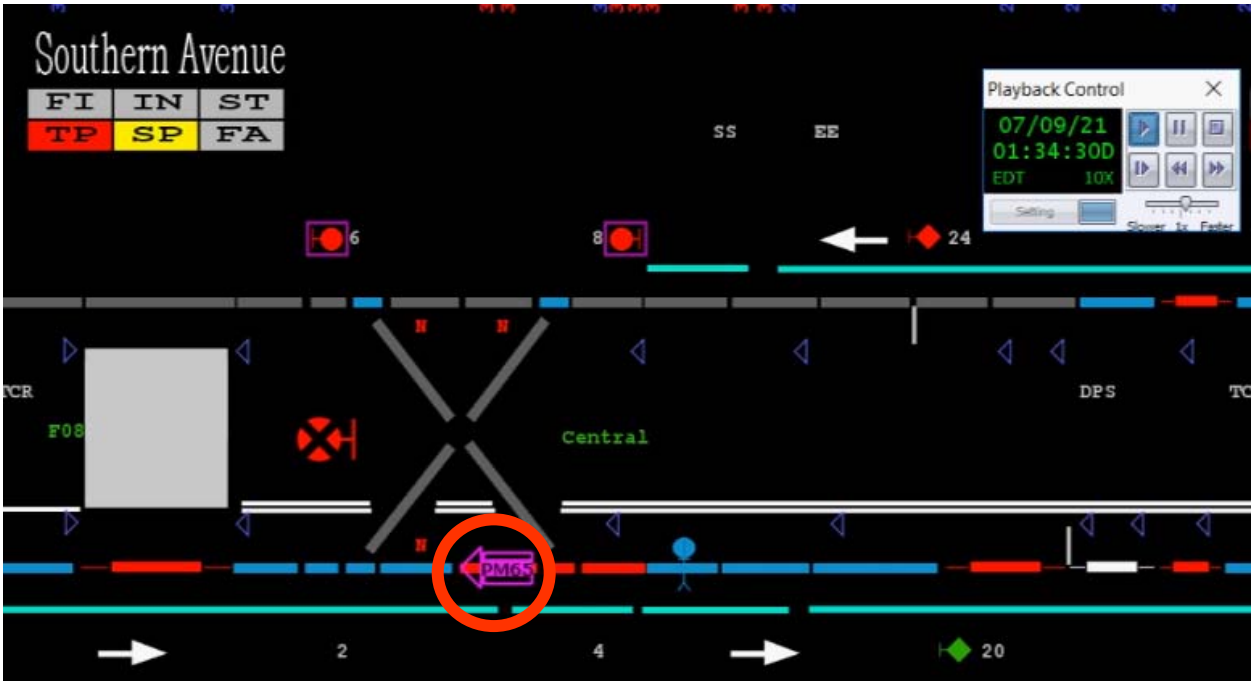


Diagram 1 – At 01:34 hours, the AIMS playback reflected third rail power was de-energized, blue block, and human form status was in place in the TRST work area. Additionally, the AIMS playback showed PM65 moving in the direction of Southern Avenue Station, Track 1.

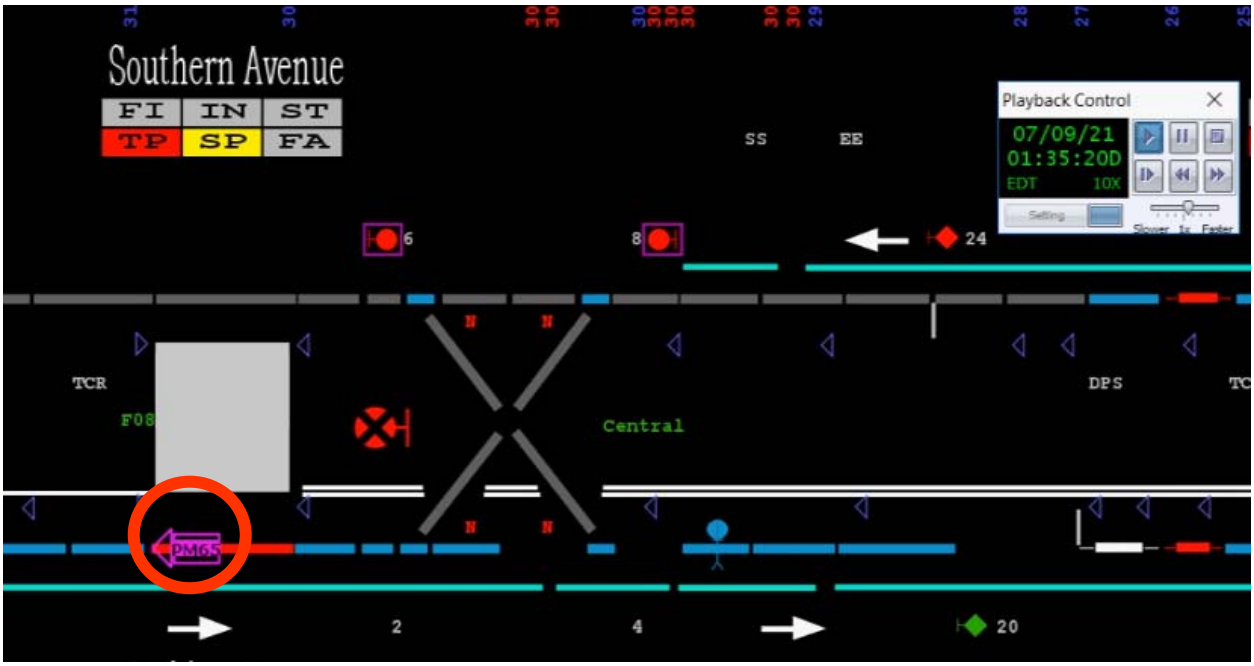


Diagram 2 - Based on the AIMS playback, at 01:35 hours, PM65 berthed at Southern Avenue Station, Track 1.

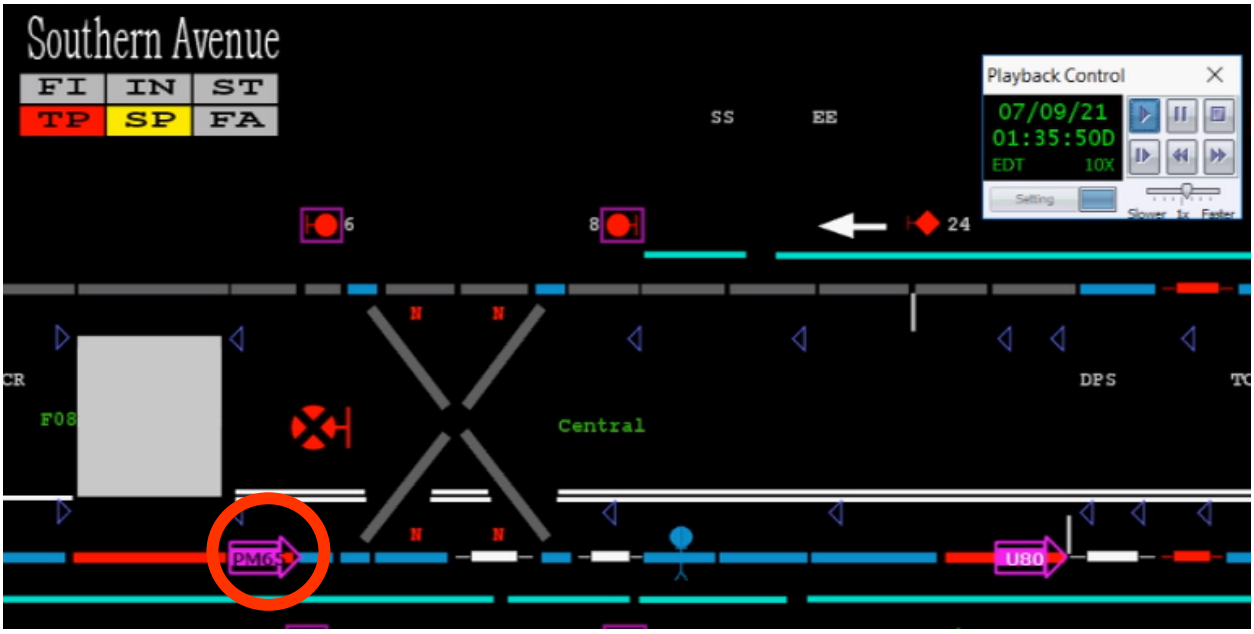


Diagram 3 - Based on the AIMS playback, at 01:35:50 hours showed PM65 was moving in the direction of Congress Heights Station, Track 1.

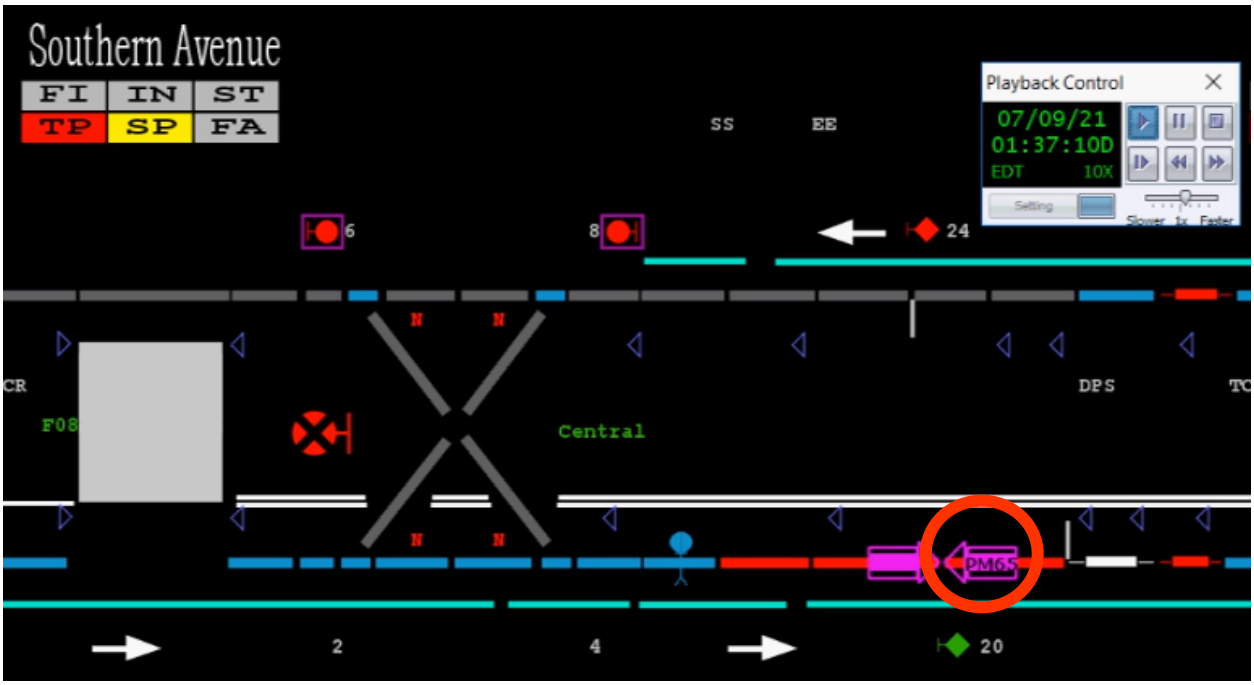


Diagram 4 - Based on the AIMS playback, at 01:37:10 hours, PM65 came to a stop. There was no further movement identified on the AIMS playback.

Figure 1 – Plasser PM65.

Figure 2 – Damaged electrical box on the left rear of PM65.


Figure 3 – Damaged Geismar Track Torquing Machine.

Figure 4 – PM65 Quick Exhaust Valve 77 on the left and Quick Exhaust Valve 52 on the right both replaced.

Figure 5 – PM65 Two Way Check Valve replaced.

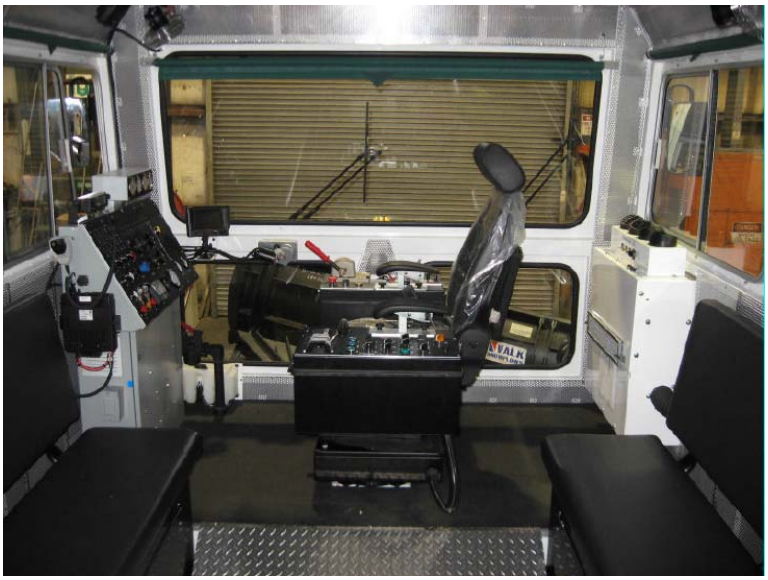


Figure 6 – This is a view of the work cab looking forward toward the operator's seat.

Plasser PMC-50 Operation Manual

Switching from Travel Mode to Remote Operating Station sequence is as follows:

- At the main cab operator's seat:
  - On the B51 panel, select 1st Gear, ensure all axles have engaged.
  - On the B52 panel, set the 'Parking Brake.'
  - On the B51 panel, switch the 'Direction' switch to the "Off" position.
  - On the B51 panel, switch the 'Travel On' switch "Off" and remove the key. This will de-select the B51 travel desk.

Once these steps are applied, the parking brake light will illuminate, which means the parking brake is set and it is safe to exit the operator's seat to the Remote Operating Station. Note: During the virtual interview, the Equipment Operator stated they followed the correct sequence when switching to the Remote Operating Station. **Note:** Below are the figures of the B51 panel located on the left side of the operator's seat and the B52 panel located on the right side of the operator's seat. Both figures are labeled with the correct sequence from the PMC-50 Operation Manual when switching from Travel Mode to Remote Operating Station.

Figure 7 – Left side B51 panel.

Figure 8 – Right side B52 panel.

Office of System Maintenance Communication Section (COMM)

COMM performed a comprehensive radio operational test at Southern Avenue Station, Track 1 and Track 2. 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.

Car and Track Equipment Maintenance (CTEM)

As a result of this event, On July 9, 2021, CTEM personnel performed a post-collision inspection of the affected PM65 unit and identified the below findings:

- Truck Inspection - there was no visual damage or leaks to the drive system. The side frames and bolsters had no visual damage. The rise control friction shoes and bearing adapters were within limits, and the springs had no damage. All truck components were secured. **Note:** CTEM identified damage to the electrical box on the left rear of the unit. Additionally, the hydraulic line shifted between two or three inches to the right. The hydraulic line was loosened at the fitting, straightened, and secured.

- Wheels Inspection - No visual damage was identified.

- Brake Inspection - The brake rigging, cylinders, brake hoses, trunk lines, brake piping, valving, and cocks all had no visual damage or apparent leaks. The friction shoes were greater than ~3/8" and within specification. When performing the rolling brake test (service brake), PM65 stopped as designed without locking up wheels.

- Miscellaneous Equipment Inspection - The horn was operational, lighting operated as designed, and a radio check was performed and operated as designed. The clear camera picture operated as design. **Note:** This Prime Mover is equipped with a rear-facing camera, but it does not record video. On the CTEM inspection form, the camera is listed under “miscellaneous equipment” and prompts the inspector to check for a clear picture and normal operation. The inspector confirmed both.

PM65 Inspection

On July 9, 2021, SAFE observed CTEM perform testing and diagnostics for PM65’s brake concern at Branch Avenue Yard. CTEM performed a simulation scenario of the events that took place with PM65 and PM62. PM62 was used as a performance comparison to PM65. PM62’s brake system worked as designed. The emergency brake valve is intended to release air pressure to activate the spring pressure immediately. However, the emergency brake valve on PM65 was slow to apply and took approximately 15 seconds to activate. CTEM personnel recommended having the emergency brake valve inspected and replaced.

On July 12, 2021, at Branch Avenue Yard, SAFE observed CTEM perform a brake pneumatic system inspection to inspect contaminants that could cause quick-release valve failure on PM65. CTEM took apart Quick Exhaust Valve 52 and Quick Exhaust Valve 77 on PM65 and identified that both valves contained a build-up of contaminants. CTEM reported that the contaminants caused both Quick Exhaust Valve Diaphragms to be stuck in the closed position, which may have caused the delay between the brake indicator light activation and the parking brake application. CTEM reported that when they changed both Quick Exhaust Valves on PM65, the application of the parking brakes engaged instantaneously with the brake indicator light and were operating as designed. However, when CTEM reinstalled the Exhaust Valves that caused failure on PM65, they were unable to duplicate the failure. CTEM reinstalled new Exhaust Valves on PM65, removed the anti-compounding valve, and disassembled them for inspection. All valves operated freely. CTEM installed a new anti-compounding valve and replaced the parking brake valve on PM65 as a preventative measure. 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

CTEM Labor Cost	$2,527.53
CTEM Parts Cost	$273.31
Total CTEM	$2,800.84

Interview Findings

SAFE conducted three interviews via Microsoft Teams. These virtual interviews identified the following key findings associated with this event and are as follows:

During the virtual interview, the Equipment Operator stated that the nature of work was doing switch point and stock replacement at Southern Avenue Station interlocking. After the safety meeting was conducted, they completed a pre-trip inspection using a checklist on PM65 with no deficiencies to report. While in the yard, the only brake tests performed were a standing and rolling brake test using the Flatcar brakes. The Equipment Operator stated that a standing brake test cannot be done using the service brake or the parking brake on the Plasser PM because the brakes can lock up and cause flat spots on the wheels when using a Flatcar. ***Note:*** *CTEM reported it is correct to say that a standing brake test cannot be performed on a Plasser PM. However, a standing brake test can be performed on the flatcar using the flatcar brakes controlled by the PM. The PM's brakes cannot be standing brake tested due to functional design, but the PM can be used to test the flatcar brakes with the train line brake valve.* The Equipment Operator stated they then pushed the Flatcar to the work area from Branch Avenue Station to Southern Avenue Station, communicating with the Flagman on Ops 3. The Equipment Operator stated the work crew always works between the Flatcar and the unit; PM65 was detached from the Flat before starting work. The Equipment Operator stated that they performed the following sequence when switching from cab operation to remote operation. They put the service brake on, which means the unit was stopped, turned the parking brake on, turned the travel switch off, turned the train line brakes off, turned the crane on, and turned the work mode on, which would allow them to operate controls from the remote station. They then proceeded to the back of the unit to the remote station, separated the Flatcar and applied the parking brake and wheel chocks on the unit. While the work was being performed in the work area, the Equipment Operator was instructed by the RWIC to operate PM65 to the Southern Avenue Station platform to drop some tools off to another crew member working at a different location. After the tools were dropped off, the Equipment Operator indicated they switched over from the remote station to the cab operation because they would be going back to the work area. The Equipment Operator indicated that once they made it to the end of the work area, they stopped PM65 on an incline, applied the service brake, applied the parking brake, and the red light illuminated on the left console that indicated the parking brakes were engaged. While sitting in the cab seat, they then proceeded to put PM65 in remote operation by putting the service brake on, applying the parking brake, turning the travel switch off, turning the train line brakes off, turning the crane on, turning the work mode on and that's when PM65 began to roll down the incline. At that point, the RWIC was coming back into the cab from flagging the unit. The RWIC stated that the unit was rolling. The Equipment Operator indicated they activated the emergency stop push button, but the unit continued rolling while on the incline. The Equipment Operator then turned the red knob battery disconnect switch off, but the unit continued to roll slowly. The RWIC and Equipment Operator both ran back to the remote station yelling to the work crew to get out of the way. PM65 eventually stopped but not before contacting the Geismar damaging the Geismar. The Geismar was chocked on the rail to prevent rolling on the roadway before being struck by PM65. The Equipment Operator started PM65 back up and reversed PM65 off the Geismar because they did not know if anything was flammable to ignite a fire due to noticing fuel leaking from the Geismar. After reversing ends, they applied the parking brake while at the remote station and took their foot off the service brake pedal, and the unit started rolling again. The Equipment Operator put their foot back on the service brake pedal, and the RWIC notified the CTEM office to report the incident and request assistance. ***Note:*** *SAFE could not confirm who the CTEM mechanic was and how the CTEM mechanic was notified.* The Equipment Operator indicated this was the first time they experienced an issue like this. The Equipment Operator indicated that they never experienced brake issues on a Plasser PM, and there is no procedure for checking the service brake and parking brake in a pre-trip inspection

before taking the unit to the mainline. The Equipment Operator indicated that they do not use the service brakes on the mainline because it locks the wheels, causing flats, so the Flatcar air brakes are used to stop the unit. On the Plasser PM, they only use the service brakes in the work area when operating five mph to prevent flats on the wheels. The Equipment Operator indicated they had no issues going back and forth with PM65 while in the work area they were unaware of what caused the brakes to disengage. The Equipment Operator indicated that they know the brakes are applied when the brake light comes on, and you can hear a steady hiss of air from the parking brake valve. The Equipment Operator said normally, the brake light activates right away, but in this situation, it was a five-second delay for the brake light to illuminate to let you know the brake was applied. Other than that, they did not identify any other abnormalities with the unit. ***Note:*** *CTEM reported the PM is equipped with spring brake chambers to prevent vehicle roll in the event of loss of air pressure. The spring brake chamber comprises a service brake chamber and a parking brake chamber operating through the same linkage. When the service brake is applied, air fills the service brake causing a diaphragm to move and push out the pushrod to apply the brakes. The rod is retracted by a spring. When the parking brake is applied, by pushing in the parking brake valve, the air is released from the parking brake chamber, allowing a spring to push out the pushrod to apply the brakes. The PM parking brake is applied during normal operation and start-up, and the service brake is released. Once the PM's air pressure reaches the compressor governor's cut-out setting of approximately 110 psi, the operator can apply the service brake and release the parking brake. The service brake valve is graduated, but the parking brake valve is not, thus allowing the operator control of brake shoe pressure to the wheel. When the operator is parking the PM, the operator comes to a stop using the service brake. They then apply the parking brake and release the service brake.*

The RWIC stated that as the Equipment Operator was switching from cab operation back to remote operation, the Equipment Operator may have gotten out of the seat because as they were walking back to the cab area on the deck of the unit, the RWIC noticed the unit was still moving, and notified the Equipment Operator that the unit was still moving. The RWIC stated that they do not believe the Equipment Operator realized the unit was still moving because the Equipment Operator rushed back to the seat, trying to get PM65 to stop. At that point, the RWIC rushed to the remote station to warn the work crew to get out of the way because the unit was moving towards them. The Equipment Operator was finally able to get the unit to shut off and stop, but by that time, the unit had already contacted the Geismar damaging the Geismar. The RWIC indicated they believe the Equipment Operator did everything correct transitioning from cab operation to remote operation, but they believed the brakes failed while on the incline. The RWIC stated the CTEM Mechanic deemed the unit safe to operate back to the yard in cab operation only. The RWIC operated PM65 back to Branch Avenue Yard with the CTEM Mechanic riding with them. The TRST Supervisor escorted the Equipment Operator for post-incident testing and analysis.

CTEM Regional Shop Supervisor stated that on July 9, 2021, at approximately 01:44 hours, they received a call from a TRST Supervisor who reported the collision event and indicated PM65 lost its brakes and rolled. The Regional Shop Supervisor then notified CTEM Mechanics and instructed them to respond. The Regional Shop Supervisor also notified the MOC and the ROCC to let them know they are aware of the event and en route to the incident scene. ***Note:*** *Using the ARS playback, SAFE could not verify communications between personnel stated by the CTEM Regional Shop Supervisor*. The employee indicated they arrived on the scene at approximately 02:45 hours and were granted permission from the RWIC to enter their work area. On their arrival at the incident site, PM65 was secured in place. The Regional Shop Supervisor stated the Equipment Operator said that they were at the remote station and were applying the brakes on PM65, and the unit did not want to stop. However, when they came to the scene to inspect unit operating controls, the unit was in cab operation mode. As a result, the Regional Shop Supervisor

had their CTEM Mechanics check PM65 to ensure that the brakes worked from the cab. Additionally, as part of their inspection, they walked around the unit to check PM65 for abnormalities, with nothing found. The employee stated they did not inspect the remote station brakes or any components at the remote station due to the unit being on a grade, so they did not want to take any chances testing the remote brakes since they already failed once. From there, they tested the brakes in the cab to make sure they were working, then attached PM65 to the flatcar and rode on board PM65 to the Southern Avenue Station platform where they were on a level track. After inspecting PM65's brakes a second time, the employee identified no other issues, and they deemed the unit safe to operate back to the yard. The Regional Shop Supervisor assigned a CTEM Mechanic on PM65 with the TRST Equipment Operator and proceeded to Branch Avenue Yard. The employee stated they instructed the CTEM Mechanic that if they experience any issues while operating back, have the TRST Equipment Operator stop the unit and they will call for a tow. As PM65 was being transported, the employee indicated that a CTEM service truck was shadowing PM65's progress and four CTEM Mechanic were on standby. The employee reported that the CTEM Mechanics said the unit operated as designed going back to Branch Avenue Yard. Once PM65 safely arrived at Branch Avenue Yard, PM65 was taken out of service, and a CTEM Mechanic followed lockout/tagout protocols for the unit for further investigation.

Weather

At the time of the incident, National Oceanic and Atmospheric Administration (NOAA) recorded the temperature as 77° F, light rain, and fog with 86% humidity. The incident occurred within a tunnel section of the rail system. Weather was not a factor in this incident. Weather source: NOAA – Location: Camp Springs, MD.)

Human Factors

Fatigue

Based on SAFE's review of the Equipment Operator 7-day work history, the employee's 7-day work schedule leading up to the incident was compliant with WMATA'S Policy/Instruction10.6/1 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 9.76 hours at the time of the incident. The employee reported 8.5 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

WMATA's Drug and Alcohol Program determined that the Equipment Operator was not in violation of the Drug and Alcohol Policy and Testing Program 7.7.3/6.

Findings

- Lack of a video monitoring system or Event Recorder onboard PM65 precluded actual readings of speed and internal system performance.
- After the collision incident, the RWIC notified their supervisor before informing the ROCC.
- When the CTEM Mechanics arrived at the incident site, the Equipment Operator stated that they were at the remote station and were applying the brakes on PM65, and the unit did not want to stop. However, the unit was in cab operation mode upon inspection by the mechanics. This was likely be a miscommunication between the operator and the mechanics as there were no mechanical findings on the switchover operations.
- ARS playback revealed that at approximately 02:45 hours the ROCC Assistant Superintendent notified the RWIC and reported that the PM65 Equipment Operator had been removed from service. However, based on the review of factual data, SAFE could not confirm if PM65 Equipment Operator's written note in their daily equipment movement and request log was accurate, indicating that they had been removed from service at 03:30 hours.
- Based on Maximo's history, PM65's last Preventive Maintenance Inspection (PMI) was on May 13. 2021. Noted on the report was the PM65 remote station brake valve replaced due to a material failure, i.e., leaking hydraulic fluid (service brake). The braking system involved in this collision was the pneumatic system (parking brake). However, There were no hydraulic leaks mentioned in the CTEM reports provided. **Note:** Based on the CTEM Preventive Maintenance Manual review, there is no 90-Day PMI included in the CTEM PMI cycle for the Plasser Prime Mover. CTEM PMI cycles are scheduled for 120-Day and 2-Year. CTEM has a checklist that describes the specific items to be serviced in the 120-Day and 2-Year PMI. See Appendix J.
- CTEM Mechanics identified a damaged electrical box on the left rear of PM65 and the Geismar Track Torqueing Machine damaged.
- During the post-incident inspection performed at Branch Avenue Yard, CTEM identified a 15-second delay between the full parking brake application and the brake indicator light activation.
- CTEM performed a brake pneumatic system inspection and identified that both valves contained a build-up of contaminants. CTEM replaced both valves on PM65, which corrected the delayed application of braking and indicator light illumination.
- SAFE reviewed the Travel Mode to Remote Operating Station switching process in the Plasser American Corporation PMC-50 Operation Manual. After discussion with personnel from the Office of Technical Skills Maintenance Training (TSMT) Department and the Equipment Operator about the Travel Mode to Remote Operating Station switching process, SAFE identified no discrepancies between the process that was followed by the Equipment Operator and the training.
- On July 13, 2021, Service Bulletin was approved and generated to ensure that the parking brakes have fully applied before leaving the operator's seat or keying OFF the unit. See Appendix B.
- TRST General Superintendent reported that the Service Bulletin for Potential Slow Application of Pneumatic Parking Brakes issued by CENV on July 13, 2021, was received and distributed to all TRST employees.

- Office of Chief Mechanical Officer Rail (CMOR) Manager, Compliance and Safety reported that the current inspection interval on the brake components was appropriate. The CMOR Manager, Compliance and Safety, reported that they met with the manufacturer to see if the valves deemed faulty due to built-up contaminants is a known issue with the equipment. According to the manufacturer, valve malfunctions due to built-up contaminants have not been identified before and are not a common occurrence.
- CTEM reported during their assessments of brake pneumatic valves that no contaminants were found during the inspection. Therefore, no actions related to contaminants were conducted. Failure is suspected to be caused by the type and age of the valve.

Immediate Mitigation to Prevent Recurrence

- The Equipment Operator was removed from service for post-incident testing.
- The PM65 was removed from service for post-incident investigation processes.
- On July 9, 2021, following the uncontrolled movement of PM65. SAFE generated notice to all equipment operating departments regarding the importance of parking brake verification and testing during the pre-use inspection and proper application during operations.

Probable Cause Statement

The probable cause of the Collision event on July 9, 2021, was a delay of the braking application in the braking system on PM65. Full parking brake application was delayed due to contaminants within the pneumatic braking system. This delay allowed the rail vehicle to gain momentum on the graded section of track, ultimately resulting in the collision with the Geismar Track Torquing Machine. Additional contributing factors were the Equipment Operator transitioning from cab operation to remote operation before confirming brakes had applied and performing the transition on a graded section of the track.

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
94367_SAFE CAPS_SAFE 001	(RC-1) Generated notice to personnel regarding the importance of parking brake verification and testing during the pre-use inspection and proper application during operations.	SAFE SRC	07/09/2021 (completed)
94367_SAFE CAPS_CENV _001	(RC-1) Service Bulletin was developed and issued recommending application/testing process for the parking brake prior to operation of Prime Movers. **Note:** CENV reported that the Service Bulletin is sufficient to address this one issue, but an additional step was taken to insert the information in the service bulletin into the operator training curriculum.	CENV SRC	07/13/2021 (completed)
94367_SAFE CAPS_CTEM _001	(RC-1) Made the necessary repairs, installed a new anti- compounding valve, and replaced the parking brake valve on PM65 as a preventative measure. CTEM performed an operational check after the necessary repairs, and all systems were functioning as designed per the OEM manual.	CTEM SRC	07/15/2021 (completed)

Appendices

Appendix A – Interview Summary

Office of Track and Structures (TRST)

Equipment Operator B

The Equipment Operator is a WMATA employee with eight years of service with three years of experience as an Equipment Operator B. The employee held various positions, such as Equipment Operator D and Equipment Operator C. The WMATA employee's RWP Level 2 certification expires in August of 2021, and their last rail certification date was March of 2021. This employee has no history of sleep issues to report.

Based on the SAFE interview, the Equipment Operator stated that on July 8, 2021, they clocked in for duty at 22:00 hours and received a job assignment during their safety meeting to operate PM65. The Equipment Operator indicated that the nature of work was doing switch point and stock replacement at Southern Avenue Station interlocking. After the safety meeting was conducted, they completed a pre-trip inspection using a checklist on PM65 with no deficiencies to report and then operated the unit to the work area. While in the yard, the only brake tests performed were a standing and rolling brake test using the Flatcar brakes. A standing brake test cannot be done on the service brake or the parking brake on the Plasser PM. The Equipment Operator stated they pushed the Flatcar to the work area from Branch Avenue Station to Southern Avenue Station, communicating with the Flagman on Ops 3. The Equipment Operator stated they always work between the Flatcar and the unit; PM65 was detached before starting work. The Equipment Operator stated that they performed the following sequence when switching from cab operation to remote operation. They put the service brake on, which means the unit was stopped, turned the parking brake on, turned the travel switch off, turned the train line brakes off, turned the crane on, and turned the work mode on, which would allow them to operate controls from the remote station.

They then proceeded to the back of the unit to the remote station, separated the Flatcar and applied the parking brake and wheel chocks on the unit. While the work was being performed in the work area, the Equipment Operator was instructed by the RWIC to operate PM65 to the Southern Avenue Station platform to drop some tools off to another crew member working at a different location. After the tools were dropped off, the Equipment Operator indicated they switched over from the remote station to the cab operation because they would be reversing back to the work area. The Equipment Operator indicated that once they made it to the end of the work area, they stopped PM65 on an incline, applied the service brake, applied the parking brake, and the red light illuminated on the left console that indicated the parking brakes were engaged. While seating in the cab seat, they then proceeded to put PM65 in remote operation by putting the service brake on, applying the parking brake, turning the travel switch off, turning the train line brakes off, turning the crane on, turning the work mode on and that's when PM65 began to roll down the incline. At that point, the RWIC was coming back into the cab from flagging the unit. The RWIC stated that the unit was rolling. The Equipment Operator indicated they activated the emergency stop push button, but the unit continued rolling while on the incline. The Equipment Operator then turned the red knob battery disconnect switch off, but the unit continued to roll slowly. The RWIC and Equipment Operator both ran back to the remote station yelling to the work crew to get out of the way. PM65 eventually stopped but not before contacting the Geismar damaging the Geismar. The Geismar was chocked on a car to prevent rolling on the roadway before being struck by PM65. The Equipment Operator started PM65 back up and reversed PM65 off the Geismar because they did not know if anything was flammable to ignite a fire due to

noticing diesel fuel leaking from the Geismar. After reversing ends, they applied the parking brake while at the remote station and took their foot off the [service] brake pedal, and the unit started rolling again. The Equipment Operator put their foot back on the [service] brake pedal, and the RWIC notified the CTEM Mechanic to report the incident. The Equipment Operator indicated this was the first time they experienced an issue like this. The Equipment Operator indicated that they never experienced brake issues on a Plasser PM, and there is no procedure for checking the service brake and parking brake in a pre-trip inspection before taking the unit to the mainline. The Equipment Operator indicated that they do not use the service brakes on the mainline because it locks the wheels, causing flats, so the Flatcar air brakes are used to stop the unit. On the Plasser PM, they only use the service brakes in the work area when operating five mph to prevent flats on the wheels. The employee stated differences between Harsco PM and the Plasser PM when switching from cab operation to remote operation. The Equipment Operator indicated they had no issues going back and forth with PM65 while in the work area they were unaware of what caused the brakes to disengage. The Equipment Operator indicated that they know the brakes are applied when the brake light comes on, and you can hear a steady hiss of air from the parking brake valve. The Equipment Operator said normally, the brake light activates right away, but in this situation, it was a five-second delay for the brake light to illuminate to let you know the brake was applied. Other than that, they did not identify any other abnormalities with the unit.

RWIC - Equipment Operator AA

The Equipment Operator AA is a WMATA employee with eight years of service with two years of experience as an Equipment Operator AA. The employee held various positions, such as Equipment Operator D, Equipment Operator C, and Equipment Operator B. The WMATA employee's RWP Level 4 certification expires in January of 2022, and their last rail certification date was December of 2020. This employee has no history of sleep issues to report.

Based on the SAFE interview, the RWIC stated that on July 8, 2021, they clocked in for duty at 22:00 hours and received a job assignment to be the RWIC during their safety meeting. The RWIC indicated that the nature of work was to do switch point and stock replacement at Southern Avenue Station interlocking. The RWIC stated they completed their RJSB with the work crew when they got to the work area. The RWIC indicated that leading up to the collision event they were on PM65. They dropped off tools to another crew at Southern Avenue Station within their work limits and arrived back at the work area with the Equipment Operator operating PM65. The RWIC was assisting the Equipment Operator with flagging as they entered the work area. As the Equipment Operator was switching from cab operation back to remote operation, the Equipment Operator may have gotten out of the seat because as they were walking back to the cab area on the deck of the unit, the RWIC noticed the unit was still moving, and notified the Equipment Operator that the unit was still moving. The RWIC stated that they do not believe the Equipment Operator realized the unit was still moving because the Equipment Operator rushed back to the seat, trying to get PM65 to stop. At that point, the RWIC rushed to the remote station to warn the work crew to get out of the way because the unit was moving towards them. The Equipment Operator was finally able to get the unit to shut off and stop, but by that time, the unit had already contacted the Geismar damaging the Geismar. The RWIC indicated they believe the Equipment Operator did everything correct transitioning from cab operation to remote operation, but they believed the brakes failed while on the incline. The RWIC stated that the unit rolled 100 feet after the brakes failed. The RWIC said that the Equipment Operator did not report any issues about the unit when operating in the work area. The RWIC stated differences between Harsco PM and the Plasser PM when switching from cab operation to remote operation. Also, the RWIC indicated they had not noticed any delays with the brake light activating right away to confirm that the brakes were engaged. The RWIC indicated that you must have a little experience operating the Plasser PM than other PMs. The RWIC notified their TRST Supervisor immediately when the incident

occurred, and their TRST Supervisor notified MOC. After an assessment, the CTEM Mechanic determined the unit safe to operate back to the yard in cab operation only. The RWIC operated PM65 back to Branch Avenue Yard with the CTEM Mechanic riding with them. The TRST Supervisor escorted the Equipment Operator for post-incident testing and analysis.

Car and Track Equipment Maintenance (CTEM)

Regional Shop Supervisor

The Regional Shop Supervisor is a WMATA employee with 18 years of service with three years of experience as a Regional Shop Supervisor. The employee held various positions, such as Lead Mechanic, Mechanic AA, Mechanic A, Mechanic B, Mechanic C, and Mechanic D. The WMATA employee's RWP Level 2 certification expires May of 2022. This employee has no history of sleep issues to report.

Based on the SAFE interview, the Regional Shop Supervisor stated that on July 9, 2021, at 01:44 hours, they received a call from a TRST Supervisor who reported the collision event and indicated PM65 lost its brakes and rolled. The Regional Shop Supervisor then notified CTEM Mechanics and instructed them to respond. The Regional Shop Supervisor also notified the MOC and the ROCC to let them know they are aware of the event and en route to the incident scene. The Regional Shop Supervisor indicated they arrived on the scene at 02:45 hours and were granted permission from the RWIC to enter their work area. Upon the Regional Shop Supervisor and their CTEM Mechanics arriving at the incident site, PM65 was secured. The Regional Shop Supervisor stated they were able to speak with the TRST Equipment Operator briefly. The Equipment Operator indicated that they were at the remote station and were applying the brakes on PM65, and the unit did not want to stop. However, when they came to the scene to inspect unit operating controls, the unit was in cab operation mode. As a result, the Regional Shop Supervisor had their CTEM Mechanics check PM65 to ensure that the brakes worked from the cab.

Additionally, as part of their inspection, they walked around the unit to check PM65 for abnormalities, with nothing found. The employee stated they did not inspect the remote station brakes or any components at the remote station due to the unit being on a grade, so they did not want to take any chances testing the remote brakes since they already failed once. Also, the employee inspected the damaged Geismar. At that time, the employee thought SAFE personnel were responding to the scene but was later told SAFE needs information and was not responding to the incident. From there, they tested the brakes in the cab to make sure they were working, then attached PM65 to the flatcar and operated PM65 to the Southern Avenue Station platform where they were on a level track. After inspecting PM65 cab brakes a second time, the employee identified no other issues, and they deemed the unit safe to operate back to the yard. The Regional Shop Supervisor assigned a CTEM Mechanic on PM65 with the TRST Equipment Operator and proceeded to Branch Avenue Yard. The employee stated they instructed the CTEM Mechanic that if they experience any issues while operating back, have the TRST Equipment Operator stop the unit and they will call for a tow. As PM65 was being transported, the employee indicated that a CTEM service truck was shadowing PM65 and four CTEM Mechanic were on standby. The employee reported that the CTEM Mechanic said the unit operated as designed going back to Branch Avenue Yard. Once PM65 safely arrived at Branch Avenue Yard, PM65 was taken out of service, and a CTEM Mechanic followed lockout/tagout protocols for the unit for further investigation. At that point, the employee indicated that they gave CMNT Assistant General Superintendent and CMNT Superintendent a call to make them aware of what had occurred. The employee stated that they were not aware of any issues or brake problems with the Harsco PM and the Plasser PM. The employee indicated this was a unique incident and stated that there are differences between Harsco PM and the Plasser PM when switching from cab operation to remote

operation. Note: The Regional Shop Supervisor indicated that since they do not operate PMs anymore and it has been a while since they have performed operating duties on a PM, they could not remember the required sequence when switching from cab operation to remote operation on PM65. The employee was aware of the new Service Bulletin titled Potential Slow Application of Pneumatic Parking approved on July 13, 2021. The employee indicated that they had a briefing about the new Service Bulletin with their team, gave them a copy, and signed the briefing book.

Appendix B – CENV Potential Slow Application of Pneumatic Parking Brakes

ALWAYS CHECK SOURCE DOCUMENT FOR CURRENT REVISION

VEHICLE PROGRAM SERVICES (CENV) SERVICE BULLETIN SIGNED AUTHORIZATION FORM (SAF)	SB X-014 Rev. 00

TITLE: POTENTIAL SLOW APPLICATION OF PNEUMATIC PARKING BRAKES

SERIES RAILCAR:	CTEM	CAR BUILDER:	OTHER	INITIATING DOCUMENT(S):	N/A

ASSOCIATED SBs: N/A

☐ SB to be tracked as a campaign ☐ Manuals are affected (ECN Required)

☐ Information (APPLICABLE FOR QUICKFLOW ONLY) ☐ REPA Tracking

CENV/RAIL VEHICLE ENGINEER	[redacted]	DATE:	Jul 9, 2021
PROGRAM/CENV MANAGER APPROVAL	[redacted]	DATE:	Jul 12, 2021
RQAW	[redacted]	DATE:	Jul 12, 2021
SAFE APPROVAL	[redacted]	DATE:	Jul 12, 2021
CMNT APPROVAL	[redacted]	DATE:	Jul 13, 2021
DEPUTY CMO, CENV APPROVAL	[redacted]	DATE:	Jul 13, 2021

Page 1 of 2

CENV Form: 40.967, Rev. 1.0 06/07/2021

Attachment 1 – Page 1 of 2.

ALWAYS CHECK SOURCE DOCUMENT FOR CURRENT REVISION

VEHICLE PROGRAM SERVICES (CENV) SERVICE BULLETIN INSTRUCTIONS	SBX-014 Rev. 00

POTENTIAL SLOW APPLICATION OF PNEUMATIC PARKING BRAKES

CTEM - CLASS 2: PLASSER PRIME MOVERS

The Plasser Prime Mover pneumatic parking brake systems are designed to apply the brakes by the operator's command and/or in the event of a catastrophic air pressure loss.

It is possible that a malfunctioning brake system could cause this brake application to be delayed.

CENV recommends the parking brake be tested before use to ensure the parking brakes have fully applied prior to leaving the operators station or keying off the unit. This check shall be performed prior to each shift (or operator) change, prior to operating the vehicle.

Signs of delayed parking brake engagement are:

1) If the parking brakes take more than 2 seconds to apply.

2) If there is no sound of rapid air purging when the parking brakes are applied.

3) If there is delayed illumination of the parking brake applied light.
   Note: If the service brakes are applied this light will not illuminate.

4) If a steady hiss of air from the parking brake valve is present after it is released.

If any of these signs are noticed or if it is believed that the vehicle parking brakes are not operating correctly, please notify CTEM at [redacted], by calling [redacted] and talking with a CTEM supervisor or by sending a Deficiency Report per the instruction on CMNT form 50.992.

Attachment 1 – Page 2 of 2.

Appendix C – Notice to Personnel - Parking Brake Application Guidance

Notice to Personnel:

This information is being shared in advance of an official Service Bulletin to be issued by CENV.

As an immediate safety action, all Equipment Operators are advised to pay special attention to the following item during pre-use inspection of Prime Movers and other equipment:

- Brake Test must include visual confirmation of parking brake indicator light activation.
- If the parking brake indicator light does not illuminate or is delayed, secure the unit, contact your supervisor, and have the equipment inspected by a mechanic before putting into service.

Following a good pre-use inspection: Personnel who operate Plasser Prime Movers must not leave the operating console seat or remote station or Key down before the parking brake light is illuminated. This is especially important when operating on any inclines or declines.

In addition, ensure you are completing the most recent and correct "WMATA Class 2 Vehicle Prior to Use Inspection Form" for the equipment.

Plasser Prime Mover Operator's Seat Left-side Controls

Plasser Prime Mover Remote Station Console

Issue Date: July 9, 2021

Attachment 2 – Page 1 of 1. ***Note:*** *This document was shared with all personnel involved in operating Prime Movers, including CAPD, PLNT, CMOR (CMNT/CENV) and TRST staff.*

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

CTEM Post-derailment & Accident Damage Inspection Form

(1 Form per Unit)

DATE:	Jul 9, 2021	**INSPECTOR:**	[redacted]	**UNIT #:**	PM65
INCIDENT #:	8547800	**INCIDENT LOCATION:**	Southern Avenue between chain marker 290-287 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?)	☐ Yes	☒ No
Did the unit contact infrastructure such as a wall or platform? (If Yes, what was contacted?)	☐ Yes	☒ No
Did the unit contact another unit? (If Yes, what unit and where was the contact on the unit?)	☒ Yes	☐ No
Made contact with D41 Geismar track torquing machine		

Truck Inspection:	
Roller bearings - no visual damage and in accordance with Rule 36	NA
Roller bearings - no unusual noises; hand spun or run-by test	NA
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	√
Ride control - friction shoes & bearing adapters within limits and in accordance with Rule 46	√
Springs - no damage, correctly seated and in accordance with Rule 50	√
General - no visual damage, all components secured and in accordance with Rule 74	X
NOTES:	
found damage to electrical box on the left rear of unit and also found hydraulic line moved over to the side a little bite	

Chassis Inspection:	
Chassis and sub-frames - no cracks, twists, other visual damage	NA
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	NA
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	NA
NOTES:	

CMNT Form 50.993, Rev. 0.0 Page 1 of 2 February 01, 2018

CTEM Post-derailment & Accident Damage Inspection Form

Wheel Inspection:	
Wheels - Discoloration, cracks, spalling, and signs of movement	NA
Gauging - Back to back measurement and in accordance with Rule 43	NA
Gauging - Flanges & tread, and in accordance with Rule 41	NA
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	X
Friction shoes - greater than 3/8" and accordance with Rule 12	√
Rolling brake test - unit stop as designed without locking up wheels	√
Hand brake - - no visual damage and applies as designed	NA
General - no visual damage, all components secured and in accordance with Rule 74	NA
NOTES:	

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	X
Cameras - clear picture, operates as designed	√
Emergency equipment - Interlocks emergency valves, E-stops, etc., operate as designed	X
Locks & restraints - mechanical locks and restraints are in place and operate as designed	NA
NOTES:	

Inspection Fault Report:

Parking brake failed to operate as designed. Unit rolled after brake was applied

Also track wrench D41 received excessive damage from the impact sent unit to small equipment repair shop cost estimate

Can unit be returned to service?	☐ Yes ☒ No

Inspector's Signature: [redacted] Date: 2021.07.12 14:06:58 -04'00'

CMNT Form 50.993, Rev. 0.0 Page 2 of 2 February 01, 2018

Appendix E – CTEM Work Order Details

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

Work Order #: 16437293
Type: CM

Status: CLOSE
11/12/2021 13:36

Work Description: Post Incident Inspection: Unintended Movement HRS. 12039
Job Plan Description:

Work Information

Asset: MPM65	PM65, PRIME MOVER, PLASSER, PMC50, S/N 3525	**Owning Office:** TRST		**Parent:**	
Asset Tag: MPM65		**Maintenance Office:** CTEM-BRAN-HVYR		**Create Date:** 07/09/2021 04:43	
Asset S/N: 3525		**Labor Group:** CTEM-BRAN-HVY		**Actual Start:** 07/09/2021 05:16	
Location: 2279	F99, BRANCH AVENUE YARD	**Crew:**		**Actual Comp:** 07/15/2021 10:38	
Work Location: 2693	F90, BRANCH AVENUE YARD, BUILDING (B) S&I, 1ST FLOOR, CTEM SHOP FLOOR	**Lead:**		**Item:** CTEM49200006	
Failure Class: CTEM005	FRICTION BRAKE SYSTEM	**GL Account:** WMATA-02-33380-50499070-041-**********-*****-OPR**			
Problem Code: 2434	N/A CODE (FRICTION BRAKE SYSTEM)	**Supervisor:** [redacted]		**Target Start:**	
Requested By:		**Requestor Phone:**		**Target Comp:**	
Chain Mark Start:		**Chain Mark End:**		**Scheduled Start:**	
Create-Mileage: 0.0		**Complete-Mileage:** 0.0			

Task IDs

Task ID	
10	Arrive at incident and inspect for transport CTEM Night Supervisor reported: Unit was at Suitland between chain markers 290 - 287 track 1 Operator: Meade Report that unit rolled away once park brake was applied PM65 was on a grade and detached from F518, due to equipment in track bed and closeness of F518 we did not attempt to test remote station do to safety concerns. Cab controls all tested good, brakes working as designed at this time. Unit was then moved to platform so brakes could be further inspected and tested from cab. Inspected undercarriage of unit for any damage caused from the collision with D41: Only minor damage. CTEM Mechanic rode with unit to Branch Ave yard under its own power, unit was tagged out. No night shift labor is attached to this work order. Labor was attached to Radio project. 000-400-ABB BRAKE SYSTEM; PRIME MOVER

Component: FLEET **Work Accomp:** RECOVERED **Reason:** INOPERATIVE **Status:** CLOSE **Position:** **Warranty?:** N

WT_plust_woprint.rptdesign 11/12/2021 14:19

Attachment 4 – Page 1 of 3.

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

Work Order #: 16437293
Type: CM

Status: CLOSE
11/12/2021 13:36

Work Description: Post Incident Inspection: Unintended Movement HRS. 12039
Job Plan Description:

Task IDs

Task ID	
20	Brake inspection, Repair, and ops check

[redacted] - Perform testing and diagnostics for brake concern. Parking brake slow to apply. Upon inspection found both front truck quick release valves not exhausting. Replace quick release valves. Unit operates normally.

[redacted] - Assist engineering with brake pneumatic system inspection. Inspect for contaminants that could possibly cause quick release valve failure. No contaminants were found. Reinstall quick release valves that caused failure. Unable to duplicate failure. Reinstall new quick release valves. Remove anti compounding valve and disassembled for inspection. Valve operates freely. Install new anti compounding valve as preventative measure. Also replace parking brake valve. Ops check unit. System operates normally.

[redacted] Perform additional testing per [redacted]. Attempt to simulate condition that caused incident. Condition is believed to have been caused by both front quick release valves (0R50 and OR37B) being stuck in the open position, causing air to flow freely through the valve, but not allowing air to exhaust. To simulate this condition, both QR valves were bypassed. During parking brake application, observed identical symptom as was seen during initial inspection. Parking brake takes 12-15 seconds to apply. As well as service brake slow to release while parking brake is applied. This being caused by air from parking brake cylinder attempting to exhaust onto service brake pilot line. Also, rear truck QR valve is slow to exhaust. This as well is being caused by air from front parking brake cylinder back feeding onto inlet side of rear 0R50 QR valve. This in turn would create a free wheel condition.

Component: 000-400-ABB BRAKE SYSTEM; PRIME MOVER FLEET **Work Accomp:** INSPECTED **Reason:** INSPECTION **Status:** CLOSE **Position:** **Warranty?:** N

30	B-end electrical receptacle box replacement

Installed electrical receptacles on rear of Prime mover - Damaged

Howlin - 7/12/21 - Finish electrical repairs on rear of PM65 - Repair and straighten Hydraulic lines that were damaged.

Component: 000-400-ABH-D00 DISTRIBUTION WIRING **Work Accomp:** REPLACED NEW **Reason:** DAMAGED **Status:** CLOSE **Position:** **Warranty?:** N

Planned Materials

Task ID	Item	Description	Storeroom	Issue Unit	Quantity	Unit Cost	Line Cost
	R23810047	VALVE,BRAKE:PARKING	300	EA	1	$47.66	$47.66
	R23800021	DESICCANT: CONTAINER: CARTRIDGE, FITS: K13R 900-3 BR REGULATOR, TYPE: AIR DRYER	252	EA	2	$56.94	$113.89
	R59750398	BOX,ELECTRICAL:WATERPROOF,1 GANG,2-3/4 IN WD X 4-1/2 IN LG X 1-7/8 IN DP,(5) 3/4 IN KO'S	300	EA	1	$4.59	$4.59
	R23830009	VALVE, SPOOL:	251	EA	1	$100.31	$100.31
						Total Planned Materials:	$266.45

Actual Labor

Task ID	Labor	Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
20	[redacted]	07/09/2021	07/09/2021	06:15	14:00	Y	07:45	00:00	$322.01
20	[redacted]	07/13/2021	07/13/2021	06:15	14:00	Y	07:45	00:00	$322.01
20	[redacted]	07/13/2021	07/13/2021	06:15	14:00	Y	07:45	00:00	$330.06
20	[redacted]	07/09/2021	07/09/2021	06:15	14:00	Y	07:45	00:00	$293.76
20	[redacted]	07/12/2021	07/12/2021	06:15	14:00	Y	07:45	00:00	$322.01
20	[redacted]	07/12/2021	07/12/2021	05:15	14:00	Y	08:45	00:00	$372.65

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Attachment 4 – Page 2 of 3.

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

Work Order #: 16437293
Type: CM

Status: CLOSE
11/12/2021 13:36

Work Description: Post Incident Inspection: Unintended Movement HRS. 12039
Job Plan Description:

Actual Labor

Task ID	Labor	Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
20	[redacted]	07/09/2021	07/09/2021	02:00	06:00	Y	04:00	00:00	$167.03
30	[redacted]	07/13/2021	07/13/2021	06:15	10:00	Y	03:45	00:00	$142.14
30	[redacted]	07/09/2021	07/09/2021	07:15	14:00	Y	06:45	00:00	$255.86
						Total Actual Hour/Labor:	62:00	00:00	$2,527.53

Actual Materials

Task ID	Item	Assetnum	Description	Storeroom	Trans Date	Issue Unit	Quantity	Unit Cost	Line Cost
			Parker OR37B Quick Release valve		07/13/2021		1	$48.06	$48.06
			2 Way Check Valve Sealco 5200 (Plasser 369-251)		07/13/2021		1	$35.99	$35.99
	R23810047		VALVE,BRAKE:PARKING	300	07/12/2021	EA	1	$47.66	$47.66
			Harting Connector P/N 1930016297		07/15/2021		1	$36.70	$36.70
	R59750398		BOX,ELECTRICAL:WATERPROOF,1 GANG,2-3/4 IN WD X 4-1/2 IN LG X 1-7/8 IN DP,(5) 3/4 IN KO'S	300	07/13/2021	EA	1	$4.59	$4.59
	R23830009		VALVE, SPOOL:	251	07/13/2021	EA	1	$100.31	$100.31
								Total Actual Materials:	$273.31

Failure Reporting

Cause		Remedy		Supervisor	Remark Date
1551	DEFECTIVE PART	0004	REPLACED	[redacted]	07/15/2021
Remarks:	Replaced 2 OR50 and 1 OR37B quick release valves for front truck				

WT_plust_woprint.rptdesign 11/12/2021 14:19

Attachment 4 – Page 3 of 3. ***Note:*** *CTEM reported no brake line flushing, and maintenance is performed. The brakes are entirely pneumatic on this equipment.*

Appendix F – TRST GOTRS

GOTRS - GENERAL ORDERS & TRACK RIGHTS SYSTEM
Track Rights Request

Request Summary

Request Number:	202116001701	**Track Access:**	True
Dates Requested:	07/09/2021 00:30 to: 07/09/2021 03:30	**Clear In Ten:**	False
Request Status:	Closed	**Equipment on Track:**	1
Requestor:	[redacted]	**Allow Piggybacks:**	True
Requestor Organization:	TRST/TRACK/MAINTS	**In Piggyback:**	No
Switch Order:		**Power Outage:**	Supervisory
Lock Out / Tag Out:		**Additional AC:**	
Request Title:	TKMSE Switch Point/Stock Replacement		

Location, Work Type and Description

Location:	Mainline
Non-Wayside Location Type:	
Request Type:	Regular
Charge Job Number:	
Contract Number:	
Maximo Work Order:	
Request Group:	No
Location Description:	
Request Description:	Replace Switch Point and Stock Rail
Work Type:	Interlocking Work
Meeting Location:	
PB Meeting Location:	
Tools and Equipment:	Hand Tools, PPE, Safety Equipment
Equipment on Track:	Prime mover and flat

	Track 1	
Actual Work Area:	F266+70	F312+00
Protected Work Area:	F261+70	F317+00

Hot Stick Info. Third Rail Gaps:

From	To	Track ID
F250+20	F301+86	1
F302+18	F302+98	1
F303+26	F370+29	1

Date & Time

Start: 07/09/2021 00:30 **End:** 07/09/2021 03:30

Contacts

As of 07/09/2021 11:24
1 of 4

Attachment 5 – Page 1 of 4.

GOTRS - GENERAL ORDERS & TRACK RIGHTS SYSTEM
Track Rights Request

Request Summary

Request Number:	202116001701	**Track Access:**	True
Dates Requested:	07/09/2021 00:30 to: 07/09/2021 03:30	**Clear In Ten:**	False
Request Status:	Closed	**Equipment on Track:**	1
Requestor:	[redacted]	**Allow Piggybacks:**	True
Requestor Organization:	TRST/TRACK/MAINTS	**In Piggyback:**	No
Switch Order:		**Power Outage:**	Supervisory
Lock Out / Tag Out:		**Additional AC:**	
Request Title:	TKMSE Switch Point/Stock Replacement		

Entered by

[redacted]

Work: [redacted]

Cell: [redacted] **Home:** [redacted]9

Requestor

[redacted]m

Work: [redacted]

Cell: [redacted] **Home:** [redacted]

WMATA Manager

[redacted]

Work: [redacted]

Cell: [redacted] **Home:** [redacted]

Emergency Contact

[redacted]

Work: [redacted]

Cell: [redacted] **Home:** [redacted]

Support

SUPPORT GROUP	Crew Size
TRST/TRACK	5
ESCORT GROUP	**Crew Size**
ATCM	2

Request Change History

Date	Event
06/10/2021 14:37	Request was replicated from Request 202116001700.
06/22/2021 13:26	Request status was changed to Approved
07/02/2021 16:37	Request status was changed to Pending Justification: change in track rights request data
07/02/2021 16:38	Request was edited. Field(s) changed: Location. Location: Track 1 Actual: F290+00 F312+00 Protected: F285+00 F317+00 to Track 1 Actual: F266+70 F312+00 Protected: F261+70 F317+00.
07/02/2021 16:39	Request status was changed to Approved
07/09/2021 02:08	Work Prep was completed.

As of 07/09/2021 11:24
2 of 4

Attachment 5 – Page 2 of 4.

GOTRS - GENERAL ORDERS & TRACK RIGHTS SYSTEM
Track Rights Request

Request Summary

Request Number:	202116001701	**Track Access:**	True
Dates Requested:	07/09/2021 00:30 to: 07/09/2021 03:30	**Clear In Ten:**	False
Request Status:	Closed	**Equipment on Track:**	1
Requestor:	[redacted]	**Allow Piggybacks:**	True
Requestor Organization:	TRST/TRACK/MAINTS	**In Piggyback:**	No
Switch Order:		**Power Outage:**	Supervisory
Lock Out / Tag Out:		**Additional AC:**	
Request Title:	TKMSE Switch Point/Stock Replacement		

Request Change History

Date	Event
07/09/2021 02:45	Work Prep was edited. Field(s) changed: Unit #, Equipment, Requestor Comment. [redacted] Equipment: PM65 [redacted] to PM65 (Coming out and storing at F99 Yard). Requestor Comment: Unit will store at F99 to [redacted]
07/09/2021 03:08	Request status was changed to Opened
07/09/2021 08:22	Request status was changed to Closed

Request Group

Request Number	Description

Piggyback

No active piggybacks found

Red Tag information

Red Tag #: Request is not Red Tag.

Close-Out Summary

Final Status:	Closed
Request To Begin Work:	07/08/2021 23:08
Request to De-Energize:	07/09/2021 00:17
De-Energization Completed; RWIC notified:	07/09/2021 00:17
Hot Stick:	07/09/2021 00:34

From	To	Track ID	Waive(?)	Unit #	Chain Marker	Entered By	Date
F250+20	F301+86	1		[redacted]	F301+00	[redacted]	07/09/2021 00:34
F303+26	F370+29	1		[redacted]	F313+00	[redacted]	07/09/2021 00:26

As of 07/09/2021 11:24
3 of 4

Attachment 5 – Page 3 of 4.

GOTRS - GENERAL ORDERS & TRACK RIGHTS SYSTEM
Track Rights Request

Request Summary

Request Number:	202116001701	**Track Access:**	True
Dates Requested:	07/09/2021 00:30 to: 07/09/2021 03:30	**Clear In Ten:**	False
Request Status:	Closed	**Equipment on Track:**	1
Requestor:	[redacted]	**Allow Piggybacks:**	True
Requestor Organization:	TRST/TRACK/MAINTS	**In Piggyback:**	No
Switch Order:		**Power Outage:**	Supervisory
Lock Out / Tag Out:		**Additional AC:**	
Request Title:	TKMSE Switch Point/Stock Replacement		

F302+18 F302+98 1 [redacted] F302+18 [redacted] 07/09/2021 00:34

Permission Given To Setup Work Site:	07/09/2021 00:34
Start Work:	07/09/2021 00:43
Work Site Cleared by Requestor:	07/09/2021 03:29
OCC Comments:	
OCC Assistant Superintendent Comments:	
Requestor Comments:	

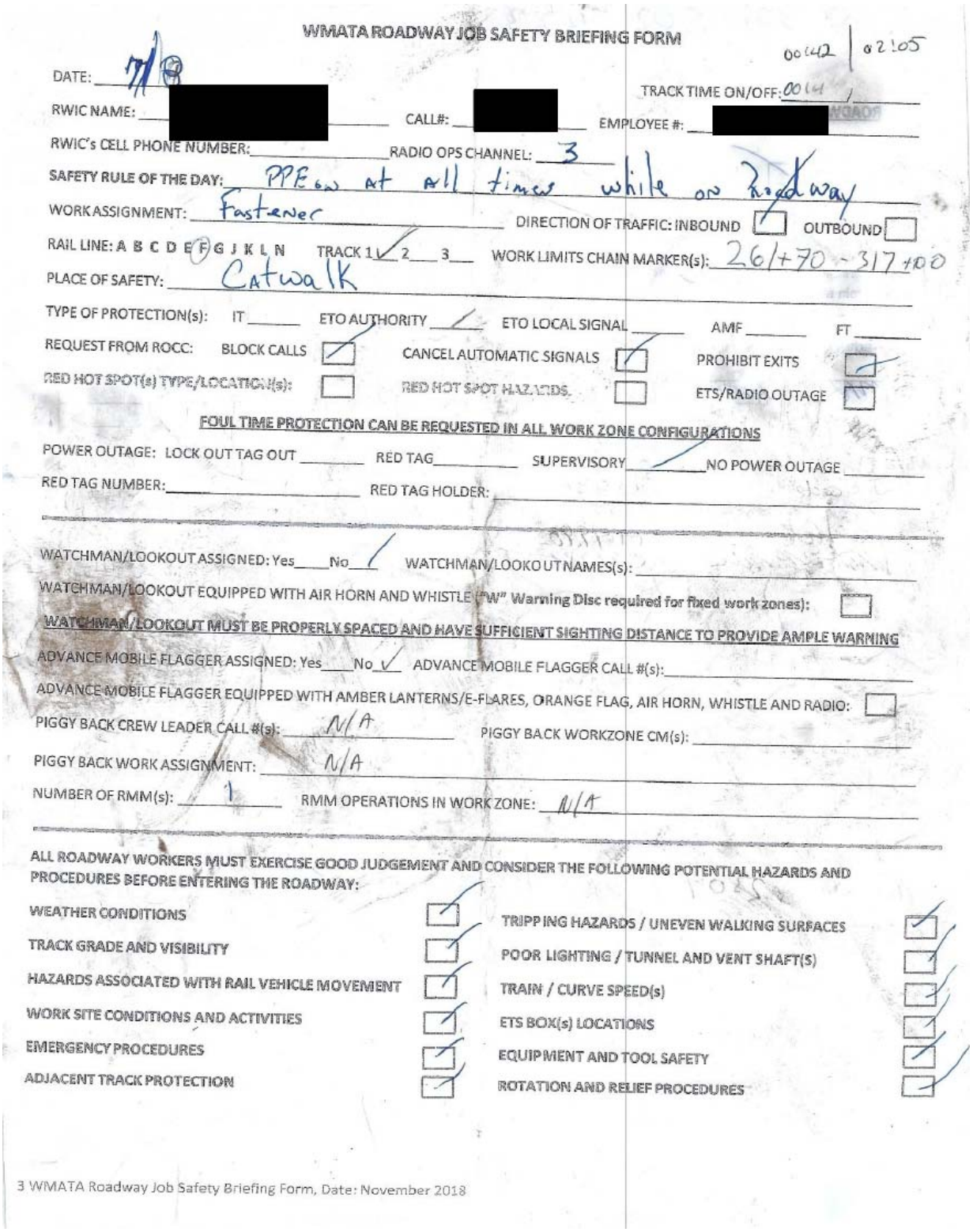
OCC Delays

Delay #	From	To	Reason	Re-Hot Stick Done
1	07/09/2021 02:26	07/09/2021 03:29	Placed on delay due to a Safety Incident at F08	

As of 07/09/2021 11:24
4 of 4

Attachment 5 – Page 4 of 4.

Appendix G – TRST Roadway Job Safety Briefing Form



WMATA ROADWAY JOB SAFETY BRIEFING FORM

00142 | 02105

DATE: 7/8

RWIC NAME: [redacted] CALL#: [redacted] EMPLOYEE #: [redacted]

TRACK TIME ON/OFF: 0014 /

RWIC's CELL PHONE NUMBER: RADIO OPS CHANNEL: 3

SAFETY RULE OF THE DAY: PPE on at all times while on Roadway

WORK ASSIGNMENT: Fastener DIRECTION OF TRAFFIC: INBOUND ☐ OUTBOUND ☐

RAIL LINE: A B C D E F G J K L N TRACK 1 ✓ 2 ___ 3 ___ WORK LIMITS CHAIN MARKER(s): 26/+70 - 317+00

PLACE OF SAFETY: Catwalk

TYPE OF PROTECTION(s): IT _____ ETO AUTHORITY ✓ ETO LOCAL SIGNAL _____ AMF _____ FT _____

REQUEST FROM ROCC: BLOCK CALLS ☐ CANCEL AUTOMATIC SIGNALS ☐ PROHIBIT EXITS ☐

RED HOT SPOT(s) TYPE/LOCATION(s): ☐ RED HOT SPOT HAZARDS ☐ ETS/RADIO OUTAGE ☐

FOUL TIME PROTECTION CAN BE REQUESTED IN ALL WORK ZONE CONFIGURATIONS

POWER OUTAGE: LOCK OUT TAG OUT _____ RED TAG _____ SUPERVISORY ✓ NO POWER OUTAGE _____

RED TAG NUMBER: _____ RED TAG HOLDER: _____

WATCHMAN/LOOKOUT ASSIGNED: Yes ___ No ✓ WATCHMAN/LOOKOUT NAMES(s): _____

WATCHMAN/LOOKOUT EQUIPPED WITH AIR HORN AND WHISTLE ("W" Warning Disc required for fixed work zones): ☐

WATCHMAN/LOOKOUT MUST BE PROPERLY SPACED AND HAVE SUFFICIENT SIGHTING DISTANCE TO PROVIDE AMPLE WARNING

ADVANCE MOBILE FLAGGER ASSIGNED: Yes ___ No ✓ ADVANCE MOBILE FLAGGER CALL #(s): _____

ADVANCE MOBILE FLAGGER EQUIPPED WITH AMBER LANTERNS/E-FLARES, ORANGE FLAG, AIR HORN, WHISTLE AND RADIO: ☐

PIGGY BACK CREW LEADER CALL #(s): N/A PIGGY BACK WORKZONE CM(s): _____

PIGGY BACK WORK ASSIGNMENT: N/A

NUMBER OF RMM(s): 1 RMM OPERATIONS IN WORK ZONE: N/A

ALL ROADWAY WORKERS MUST EXERCISE GOOD JUDGEMENT AND CONSIDER THE FOLLOWING POTENTIAL HAZARDS AND PROCEDURES BEFORE ENTERING THE ROADWAY:

WEATHER CONDITIONS	✓	TRIPPING HAZARDS / UNEVEN WALKING SURFACES	✓
TRACK GRADE AND VISIBILITY	✓	POOR LIGHTING / TUNNEL AND VENT SHAFT(S)	✓
HAZARDS ASSOCIATED WITH RAIL VEHICLE MOVEMENT	✓	TRAIN / CURVE SPEED(s)	✓
WORK SITE CONDITIONS AND ACTIVITIES	✓	ETS BOX(s) LOCATIONS	✓
EMERGENCY PROCEDURES	✓	EQUIPMENT AND TOOL SAFETY	✓
ADJACENT TRACK PROTECTION	✓	ROTATION AND RELIEF PROCEDURES	✓

3 WMATA Roadway Job Safety Briefing Form, Date: November 2018

Attachment 6 – Page 1 of 2.

[redacted]

WMATA ROADWAY JOB SAFETY BRIEFING FORM

ROADWAY WORKERS HAVE THE RIGHT AND RESPONSIBILITY TO INITIATE A GOOD FAITH CHALLENGE WHEN NECESSARY

Inspect PPE ☑ Inspect RWP Sticker ☑ Inspect Radio(s) Certification Due Date ☐ Perform Radio Check(s) ☑

ROADWAY WORKER ACKNOWLEDGEMENT

I understand and agree with all aspects of the Roadway Job Safety Briefing I just received. I feel I am adequately protected from any train movement or roadway hazards. I understand I have a responsibility to conduct myself in a safe manner at all times.

Roadway Worker Signature	Employee/Contractor ID #	Crew Leader(s) Signature/ID#	Radio Call #
[redacted]	[redacted]	[redacted]	

RWIC COMMENTS: 2307 / 0017 / 0042 / stop work / 205 / 0145 Enroute 0154 clear 329

RWIC SIGNATURE: [redacted] DATE/TIME: July 09, 2021 / 22:00

RELIEVING RWIC: _____ DATE/TIME: _____

GOOD FAITH CHALLENGE INFORMATION

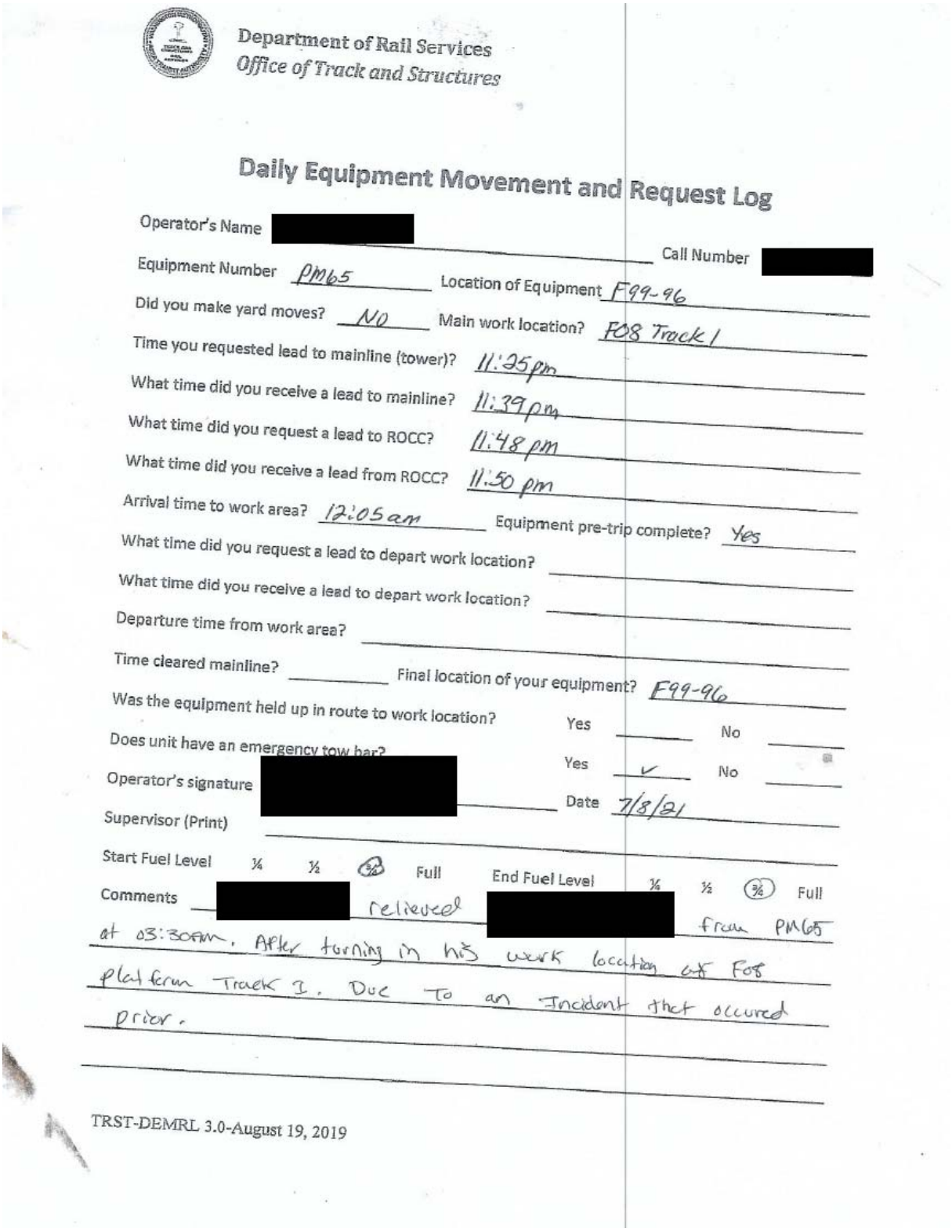
EMPLOYEE(s) NAME: _____ EMPLOYEE(s)# _____ DATE/TIME _____

RWP ISSUE(s) _____ ISSUED RESOLVED: Yes___ No___

Rv. 3 WMATA Roadway Job Safety Briefing Form, Date: November 2018

Attachment 6 – Page 2 of 2.

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



Department of Rail Services
Office of Track and Structures

Daily Equipment Movement and Request Log

Operator's Name [redacted] Call Number [redacted]

Equipment Number PM65 Location of Equipment F99-96

Did you make yard moves? NO Main work location? FOS Track 1

Time you requested lead to mainline (tower)? 11:25 pm

What time did you receive a lead to mainline? 11:39 pm

What time did you request a lead to ROCC? 11:48 pm

What time did you receive a lead from ROCC? 11:50 pm

Arrival time to work area? 12:05 am Equipment pre-trip complete? Yes

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? F99-96

Was the equipment held up in route to work location? Yes No

Does unit have an emergency tow bar? Yes ✓ No

Operator's signature [redacted] Date 7/8/21

Supervisor (Print)

Start Fuel Level ¼ ½ (¾) Full End Fuel Level ¼ ½ (¾) Full

Comments [redacted] relieved [redacted] from PM65 at 03:30am. After turning in his work location at FOS platform Track 1. Due To an Incident that occured prior.

TRST-DEMRL 3.0-August 19, 2019

Attachment 7 – Page 1 of 3.

WMATA CLASS 2 RAIL VEHICLE PRIOR TO USE INSPECTION

Initials (Operator /Flagman)	
JM	1. Check for wheel chocks and that the required quantity for unit(s) in consist are present.
JM	2. Check angle cocks, train line seals, air tool and drain valves. (Open or close as required).
JM	3. Check main engine for proper oil level.
JM	4. Check for any loose, broken, torn, cracked, or leaking components as you make your walk around inspection.
JM	5. If using auxiliary components such as cranes, generators and compressors, check all controls, movements, fluid levels, and safety devices.
JM	6. Start machine and check all switches, gauges, and warning indicators.
JM	7. Check for sufficient air pressure and if equipped with A-9, make sure it is at 90 psi in the release position.
JM	8. Check transmission for correct oil level and any abnormal sounds or functions.
JM	9. Ensure all equipment, tools, supplies or loose debris are secured on decks and not posing any safety hazards.
JM	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.
JM	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.
JM	12. Gas cylinders should be secured and in their proper location.
JM	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.
JM	14. Check fuel and hydraulic tanks for proper level.
JM	15. Check all wheels, brakes, visible linkage, and suspension on all rolling stock vehicles.
JM	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.
JM	17. Turn on and inspect all lighting on unit(s) in consist for any defects or problems.
JM	18. Check that back up alarms and horns sound.
JM	19. Fire extinguishers should be charged and secured. Sign the monthly inspection log (if not already signed).
JM	20. Verify the radio(s) is/are able to transmit and receive clearly.
JM	21. Inspect all items in flagman's booth for proper operation and functionality.
JM	22. Ensure loads are secure, evenly distributed and are not hanging over the side or ends of flat car.
JM	23. Check all Flat Car emergency dump valves and hand brakes.
JM	24. Inspect hi-rail components for thin flanges, leaking cylinders, safety pins, tires, shunts, and proper tuck when on hi-rail.
JM	25. Perform a rolling brake test (all class 2 vehicles).
JM	26. Perform standing brake test (all flatcars, PM26-PM53 only).
JM	27. Verify the intercom headsets are able to transmit and receive clearly (if applicable).
JM	28. 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:

Print Name(s): [redacted] **ID# (s):** [redacted]

Signature(s): [redacted] **Equipment#:** PM65/F518

Yard or location where inspection is performed: F99-96

Date: 7/8/21 **Time of Inspection:** 11:10pm

TRST-TRK-FORM-C2RVPUIC-REV-5.0 DocControlMgr: BB 4/28/20

Attachment 7 – Page 2 of 3.

Department of Rail Services
Office of Track and Structures

Flat Car Walk-Around Inspection Checklist

No.	Items to Check	Defective	OK	Comment
1.	Check air angle valve position.		V	
2.	Journal boxes (if so equipped).		V	
	A. Check the journal box trough for the lubricator pad and oil. (No water or debris)		V	
	B. Is there a sufficient amount of clean oil to saturate the pad?		V	
3.	Are wheel chocks correctly in place?		V	
4.	Check flat car hand break.		V	
5.	Check draw bar coupling, if disconnected from Prime Mover.		V	
6.	Check all lights for proper operation and damage.		V	
7.	Check all break shoes for excessive wear.		V	
8.	Check train line hose fitting for gasket.		V	
9.	Check load. Make sure it is evenly distributed and properly secured.		V	
10.	Check flat car for material or tools that may be hanging over the dynamic envelope.		V	
11.	Check all air connections for damage or air leaks (i.e., "O" ring).		V	
12.	Check fire extinguisher for charge and proper mounting.		V	
13.	Check horn.		V	

Comments:

Flag-person Name: [redacted] Date: 07.08.21 Flatcar # 519

Operator's Name: [redacted] Date: July 08, 2021

Supervisor's Name: [redacted] | Initial: M.H Date: July 08, 2021

TRST-FCWAC 3.0-August 19, 2019

Attachment 7 – Page 3 of 3.

Appendix I – CTEM Equipment Reliability Update

CTEM Equipment Reliability Update

ERU: 2108-01

Title: Quick Release Valve Replacement

Document #:	ERU2108-01
Models:	PMC50

Revision Number	Reason / Description	Revision Issue Date
0	New	8/4/2021

Washington Metropolitan Area Transit Authority

ERU Number: 2108-01

ERU Title: Quick Release Valve Replacement

ERU Revision Level: 0 ERU Revision Date: 8/4/2021

Approval Signature: [redacted]

[redacted]

CTEM Superintendent
Office of Car Maintenance (CMNT) - Car Track Equipment (CTEM)

Attachment 8 – Page 1 of 2.

CTEM
Equipment Reliability Update
ERU: 2108-01

Models:
PMC50

Title:
Quick Release Valve Replacement

This Equipment Reliability Update (ERU) is being issued to all CTEM Personnel.

Background:

The PMC50 Prime Movers are equipped with four quick release valves. During investigation of multiple failure issues, it has been noted that the diaphragm of the valve has approximately a 5-year life span. These valves have been in service for several years beyond there expected life.

Correction:

To maintain equipment reliability and safety all PMC50 quick release valves are to be replaced. A supply of new valves has been purchased specifically for this project to ensure the maximum life of the seals.

Replacement of valves shall be documented on Maximo workorders set up by the Technical department for tracking.

Do not use stocked valves for this campaign, valves will be provided per unit.

Truck mounted quick release valves, Parker OR50, Plasser 167-827

Frame mounted quick release valves, Parker OR37, Plasser 167-819

Attachment 8 – Page 2 of 2.

Appendix J – CTEM PMI Plasser Prime Mover Checklist

Plasser Prime Mover PMC-50 **Mechanic's Checklist**

MACHINE NUMBER	DATE

Annotate with Mechanic's Initials when PM is completed.
120-DAY PM

1 WASHING AND CLEANING

_____	1.1	CLEAN EXTERIOR AND UNDERCARRIAGE	_____	1.2	CLEAN CAB

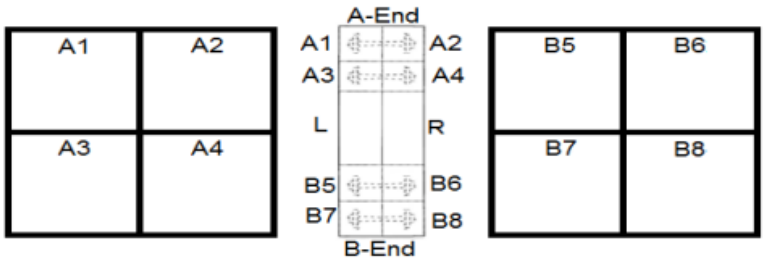
2 MAIN ENGINE

_____	2.1	REPLACE ENGINE OIL AND OIL FILTER	_____	2.11	CHECK RADIATOR COOLANT LEVEL, CONDITION, AND CAP
_____	2.2	REPLACE FUEL TANK WATER SEPARATOR FILTER	_____	2.12	INSPECT ENGINE MOUNTS
_____	2.3	REPLACE FUEL FILTER ELEMENTS	_____	2.13	INSPECT AND LUBRICATE MAIN ENGINE COMPARTMENT HARDWARE
_____	2.4	DRAIN WATER FROM FUEL TANK	_____	2.14	CHECK OPEN CRANKCASE VENTILATION
_____	2.5	REPLACE AIR CLEANER ELEMENTS	_____	2.15	SERVICE BATTERIES
_____	2.6	CHECK AIR INTAKE HOSES, CONNECTIONS, AND SYSTEM	_____	2.16	CHECK ENGINE ELECTRICAL CONNECTIONS AND WIRING
_____	2.7	INSPECT EXHAUST SYSTEM, MUFFLER, CLAMPS, AND MOUNTS	_____	2.17	INSPECT WATER PUMP
_____	2.8	INSPECT FAN DRIVE BELTS AND LUBRICATE FAN DRIVE PULLEY	_____	2.18	INSPECT AND TEST PNEUMATIC SYSTEM
_____	2.9	INSPECT ALTERNATOR DRIVE BELT	_____	2.19	INSPECT FUEL TANK
_____	2.10	INSPECT RADIATOR, FINS, HOSES, FITTINGS, DRAIN, AND FAN	_____	2.20	START ENGINE AND CHECK FOR LEAKS

MACHINE NUMBER	DATE

3 WHEELS AND DRIVE TRAIN

_____	3.1	INSPECT WHEELS AND AXLES	_____	3.3	LUBRICATE GEARBOX AXLE BEARINGS AND SHIFT LINKAGE SHAFTS
_____	3.2	INSPECT DRIVE MOTORS AND AXLE GEARBOXES	_____	3.4	INSPECT TRUCKS AND TORQUE ARMS



4 BRAKES

_____	4.1	INSPECT BRAKE EQUIPMENT	_____	4.4	CHECK PISTON STROKE INDICATOR
_____	4.2	INSPECT BRAKE SHOES	_____	4.5	PERFORM A9 VALVE TEST
_____	4.3	LUBRICATE BRAKE ARMS	_____	4.6	INSPECT BRAKE LINES AND FITTINGS

5 HYDRAULIC SYSTEM

_____	5.1	INSPECT HYDRAULIC RESERVOIR	_____	5.7	INSPECT PUMP GEARBOX
_____	5.2	CHECK HYDRAULIC FLUID LEVEL AND QUALITY	_____	5.8	INSPECT HOSES
_____	5.3	REPLACE HAND PUMP FILTER	_____	5.9	INSPECT HYDRAULIC OIL COOLER, PUMPS, LINES, VALVES, AND MANIFOLDS
_____	5.4	CHECK BREATHER FILTER	_____	5.10	INSPECT AND TEST EMERGENCY PUMP
_____	5.5	REPLACE RETURN FILTER	_____	5.11	INSPECT AND LUBRICATE HOSE REELS
_____	5.6	REPLACE CHARGE PUMP FILTERS			

MACHINE NUMBER	DATE

6 CHASSIS

_____	**6.1**	INSPECT CHASSIS	_____	**6.4**	DRAIN AIR TANK MOISTURE
_____	**6.2**	INSPECT TOW BARS, TOW EYES, AND TIE DOWN EYES	_____	**6.5**	INSPECT OILER CUP AND WATER SEPARATOR CUPS
_____	**6.3**	INSPECT COUPLERS	_____	**6.6**	INSPECT OUTRIGGERS AND LIMIT SWITCHES

7 WORKING COMPONENTS

_____	**7.1**	INSPECT CRANE CONTROLS	_____	**7.7**	GREASE BOOM LIFT CYLINDER PINS
_____	**7.2**	LUBRICATE BOOM SECTIONS	_____	**7.8**	GREASE ROTATION GEARBOX UPPER BEARING
_____	**7.3**	CHECK ROTATION GEARBOX OIL LEVEL	_____	**7.9**	INSPECT AND LUBRICATE LOAD LINE
_____	**7.4**	INSPECT AND LUBRICATE ROTATION GEAR	_____	**7.10**	INSPECT AND LUBRICATE ANTI-TWO BLOCK AND CABLE ROLLERS
_____	**7.5**	CHECK CRANE WINCH GEARBOX OIL LEVEL	_____	**7.11**	INSPECT AND GREASE sheave INSPECT AND GREASE SHEAVE
_____	**7.6**	CHECK CRANE WINCH BRAKE OIL LEVEL			

MACHINE NUMBER	DATE

8 CAB

_____	8.1	INSPECT DOORS AND EXTERIOR	_____	8.9	INSPECT AIR CONDITIONING CONDENSER UNIT
_____	8.2	INSPECT WINDOWS	_____	8.10	INSPECT FIRE EXTINGUISHER
_____	8.3	INSPECT OPERATOR'S EQUIPMENT, CONTROLS, AND SEATS	_____	8.11	INSPECT INTERIOR AND EXTERIOR LIGHTING
_____	8.4	CHECK STORAGE CABINETS	_____	8.12	INSPECT HORNS AND ALARMS
_____	8.5	CHECK COMMON HARDWARE, FASTENERS, AND LATCHES	_____	8.13	INSPECT RADIO
_____	8.6	INSPECT CAB INTERIOR	_____	8.14	INSPECT AND TEST INTERCOM
_____	8.7	CLEAN CAB A/C FILTER	_____	8.15	CHECK EMERGENCY SHUTDOWN
_____	8.8	REPLACE CAB AIR PRESSURIZER FILTER			

9 GENERATOR

_____	9.1	REPLACE GENERATOR ENGINE OIL AND OIL FILTER	_____	9.8	SERVICE BATTERIES
_____	9.2	REPLACE GENERATOR FUEL FILTER ELEMENT	_____	9.9	CHECK GENERATOR ENGINE ELECTRICAL CONNECTIONS AND WIRING
_____	9.3	REPLACE GENERATOR AIR CLEANER ELEMENTS	_____	9.10	INSPECT CONTROL PANEL
_____	9.4	INSPECT RADIATOR, FINS, HOSES, FITTINGS, DRAIN, AND FAN	_____	9.11	TEST GROUND FAULT CURRENT INTERRUPTER AND RECEPTACLES
_____	9.5	CHECK RADIATOR COOLANT LEVEL, CONDITION, AND CAP	_____	9.12	INSPECT GENERATOR ENGINE MOUNTS
_____	9.6	INSPECT EXHAUST SYSTEM, MUFFLER, CLAMPS, AND MOUNTS	_____	9.13	INSPECT AND LUBRICATE GENERATOR ENGINE COMPARTMENT HARDWARE
_____	9.7	INSPECT GENERATOR FAN BELT	_____	9.14	START ENGINE AND CHECK FOR LEAKS

MACHINE NUMBER	DATE

10 AUXILIARY COMPRESSOR

_____	**10.1**	REPLACE COMPRESSOR OIL AND OIL FILTER	_____	**10.10**	INSPECT COMPRESSOR ENGINE MOUNTS
_____	**10.2**	REPLACE COMPRESSOR ENGINE OIL AND OIL FILTER	_____	**10.11**	CHECK OPEN CRANKCASE VENTILATION
_____	**10.3**	REPLACE COMPRESSOR FUEL FILTER ELEMENTS	_____	**10.12**	SERVICE BATTERIES
_____	**10.4**	REPLACE COMPRESSOR AIR FILTERS	_____	**10.13**	CHECK COMPRESSOR ENGINE ELECTRICAL CONNECTIONS AND WIRING
_____	**10.5**	CHECK AIR INTAKE HOSES, CONNECTIONS, AND SYSTEM	_____	**10.14**	INSPECT AND LUBRICATE COMPRESSOR COMPARTMENT HARDWARE
_____	**10.6**	INSPECT EXHAUST SYSTEM, MUFFLER AND TURBOCHARGER	_____	**10.15**	CHECK CONTROL PANEL
_____	**10.7**	INSPECT COMPRESSOR DRIVE BELTS	_____	**10.16**	START ENGINE AND CHECK FOR LEAKS
_____	**10.8**	INSPECT RADIATOR, FINS, HOSES, FITTINGS, DRAIN, AND FAN	_____	**10.17**	CHECK AIR PRESSURE
_____	**10.9**	CHECK RADIATOR COOLANT LEVEL, CONDITION, AND CAP			

11 PLOW (SEASONAL)

_____	**11.1**	INSPECT PLOW	_____	**11.3**	LUBRICATE PLOW DAMPENER AND LOCK
_____	**11.2**	INSPECT PLOW HYDRAULIC COMPONENTS			

MACHINE NUMBER	DATE

12 2-YEAR PM

____	**12.1**	DRAIN AND REFILL MAIN ENGINE COOLING SYSTEM, REPLACE WATER TEMPERATURE REGULATOR AND COOLANT FILTER	____	**12.15**	DRAIN AND REFILL PUMP GEARBOX OIL
____	**12.2**	PRESSURE TEST MAIN ENGINE COOLING SYSTEM	____	**12.16**	DRAIN AND REPLACE HYDRAULIC FLUID
____	**12.3**	CLEAN MAIN ENGINE CRANKCASE BREATHER	____	**12.17**	REPLACE HYDRAULIC SUCTION FILTER
____	**12.4**	CHECK AND ADJUST MAIN ENGINE VALVE CLEARANCES	____	**12.18**	TORQUE CRANE BOLTS
____	**12.5**	INSPECT MAIN ENGINE TURBOCHARGER	____	**12.19**	DRAIN AND REPLACE CRANE WINCH GEARBOX OIL
____	**12.6**	INSPECT MAIN ENGINE FAN DRIVE BEARING	____	**12.20**	DRAIN AND REPLACE CRANE WINCH BRAKE OIL
____	**12.7**	DRAIN AND REFILL GENERATOR ENGINE COOLING SYSTEM, REPLACE WATER TEMPERATURE REGULATOR	____	**12.21**	DRAIN AND REPLACE ROTATION GEARBOX OIL
____	**12.8**	PRESSURE TEST GENERATOR ENGINE COOLING SYSTEM	____	**12.22**	REPLACE AIR DRYER DESICCANT FILTER
____	**12.9**	CHECK AND ADJUST GENERATOR ENGINE VALVE CLEARANCES	____	**12.23**	REPLACE 24V AIR TANK SPITTER VALVE

MACHINE NUMBER	DATE

_____	**12.10**	DRAIN AND REFILL AUXILIARY COMPRESSOR COOLING SYSTEM, REPLACE WATER TEMPERATURE REGULATOR	_____	**12.24**	INSPECT BEARINGS
_____	**12.11**	PRESSURE TEST AUXILIARY COMPRESSOR COOLING SYSTEM	_____	**12.25**	INSPECT BRAKE BEAM AND WEAR LINER
_____	**12.12**	REPLACE AUXILIARY COMPRESSOR AIR/OIL SEPARATOR ELEMENT	_____	**12.26**	CHECK COUPLER HEIGHT
_____	**12.13**	CLEAN AUXILIARY COMPRESSOR STRAINER ELEMENT	_____	**12.27**	INSPECT AND CLEAN AIR CONDITIONING EVAPORATOR
_____	**12.14**	DRAIN AND REFILL AXLE GEARBOX OIL	_____	**12.28**	PERFORM HYDRAULIC PRESSURE CHECKS

13 FUNCTIONAL/OPERATIONAL TESTS

_____	**13.1**	TEST PROPULSION AND BRAKING	_____	**13.3**	TEST PLOW FUNCTION
_____	**13.2**	TEST CRANE FUNCTION			

Appendix K – Root Cause Analysis