

**Vehicle Securement Investigation**  
**Washington Metropolitan Area Transit Authority**  
**(WMATA)**

**FINAL REPORT**



Federal Transit Administration  
U.S. Department of Transportation  
1200 New Jersey Avenue, SE  
Washington, DC 20590

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## Acronyms

FTA	Federal Transit Administration
FWSO	FTA WMATA Safety Oversight
MSRPH	Metr rail Safety Rules and Procedures Handbook
NTSB	National Transportation Safety Board
OR	Operating Rule
PO	Permanent Order
QAAW	Office of Quality Assurance and Warranty
RTRA	Office of Rail Transportation
SOP	Standard Operating Procedure
SR	Safety Rule
WMATA	Washington Metropolitan Area Transit Authority

## 1.0 Executive Summary

This report documents findings and required actions resulting from an investigation conducted by the Federal Transit Administration (FTA) into rail vehicle securement practices at the Washington Metropolitan Area Transit Authority (WMATA) Metrorail system. As described in this report, this investigation resulted in six (6) findings and six (6) required actions WMATA must take to address FWSO's findings. The FTA will formally issue these findings and required actions in Safety Directive 16-6.

Failure to properly secure unattended trains presents a significant safety risk across the rail transit industry. Unsecured and unattended trains or equipment can move in rail yards and on the mainline track, creating the potential for collisions with other trains, equipment, passengers or workers. The rail transit industry has experienced several incidents over the last few years, including one high-profile incident in Chicago in 2013. These events amplify the need for the proper application of safety devices, parking brakes, handbrakes, and chocks to prevent unintended train movement.

The FTA WMATA Safety Oversight (FWSO) Office initiated this investigation at WMATA because, over the last two years, WMATA reported three incidents of unintended train movement, including one incident in 2015 in which an improperly secured rail vehicle collided with another vehicle. In addition to the general safety concerns associated with such events, these specific incidents raised questions regarding how rail transit vehicles were stored and protected against unintentional movement in WMATA's rail yards and work zones.

FWSO's investigation focused on three distinct categories of review:

- (1) Redundant securement for rail vehicle storage;
- (2) Rules and procedures; and
- (3) Employee training.

FWSO initiated its investigation at the end of February in 2016, and concluded its investigation at the end of July 2016.

Through the course of this investigation, FWSO reviewed Metrorail's yard operations for conformance with WMATA's rules and standard operating procedures, including specific requirements for train preparation and storage during layovers between rush hours, nighttime layovers, and longer-term storage. During this investigation, FWSO discovered a widespread lack of compliance with WMATA's internal rules for both revenue passenger trains and maintenance machines and equipment located in rail yards.

Since FTA assumed oversight in October 2015, WMATA has taken a number of critical steps to address identified safety deficiencies in the Metrorail system. For example, during this investigation, FWSO met with WMATA's rail vehicle maintenance, vehicle engineering, and rail transportation departments to discuss and review options for revising operating rules and establishing new practices to ensure securement of unattended vehicles. However, there is more that must be done to ensure proper vehicle securement of unattended vehicles in the WMATA Metrorail system.

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As directed by Safety Directive 16-6, WMATA must develop corrective action plans to address the findings of this report and the related required actions. FWSO will review, provide feedback on and request changes as appropriate, and approve WMATA's corrective action plans and will monitor the agency's progress to implement the safety improvements.

## 2.0 Introduction

This report documents findings and required actions resulting from an investigation conducted by the Federal Transit Administration (FTA) into rail vehicle securement practices at the Washington Metropolitan Area Transit Authority (WMATA) Metrorail system. As described in this report, this investigation resulted in six (6) findings and six (6) required actions WMATA must take to address FWSO's findings. The FTA will formally issue these findings and required actions in Safety Directive 16-6.

### 2.1 Overview

Failure to properly secure unattended trains presents a significant safety risk across the rail transit industry. Unsecured and unattended trains or equipment can move in rail yards and on the mainline track, creating the potential for collisions with other trains, equipment, or workers. These incidents raise serious safety concerns regarding the proper application of safety devices, parking brakes, and other securement devices to prevent unintended train movement.

Over the last few years, the rail transit industry has experienced several high-profile instances of unintended vehicle movement, including the 2013 “ghost train” incident at the Chicago Transit Authority (CTA). On September 30, 2013, an unattended and unsecured train rolled out of CTA's West Side rail yard, accelerated on the mainline to a speed of 24 miles per hour, then collided with a passenger train at Harlem station. This collision injured 33 passengers and the train operator, and resulted in estimated property damage of \$6.4 million. As a result of its investigation into this accident, the National Transportation Safety Board (NTSB) issued Urgent Safety Recommendation R-14-03 to FTA<sup>1</sup>:

*Issue a safety advisory to all rail transit properties asking them to review their operating and maintenance procedures for stored unoccupied cars to ensure the propulsion and brake systems are left in a condition that would not facilitate unintended movement and that redundant means of stopping unintended rail car movements, such as wheel chocks and/or a derails are used.*

In response to the NTSB's Urgent Safety Recommendation, FTA issued an “Urgent Safety Advisory – Unintended Train Movements” on October 4, 2013<sup>2</sup> to the Nation's rail transit agencies. The safety advisory urged rail transit agencies, including WMATA, to immediately “review their operating and maintenance procedures for stored, unoccupied cars to ensure: (1) the propulsion and brake systems are left in a condition that would not facilitate unintended movement and (2) redundant means of stopping unintended rail car movements, such as wheel chocks and/or derails, are used.”

Despite the FTA's and the NTSB's guidance to the rail transit industry in response to the September 2013 incident, WMATA experienced three instances of unintended train movement

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<sup>1</sup> See <http://www.nts.gov/investigations/AccidentReports/Reports/RAB1502.pdf>.

<sup>2</sup> FTA Urgent Safety Advisory - Unintended Train Movements, October 4, 2013.

requiring investigation as safety events between 2014 and the date on which FTA initiated its vehicle securement investigation. These safety events include the following:

**April 21, 2014 Rollaway**

On April 21, 2014, while a track crew removed a piece of rail from the trackbed, a roadway maintenance vehicle rolled unintentionally within the work area between Van Ness and Tenleytown Stations. The vehicle rolled approximately 500 feet before coming to a complete stop. A track supervisor performed a safety stand down immediately after the incident. No injuries or damage were reported.

**January 9, 2015 Rollaway**

On January 9, 2015 at a Shady Grove Yard storage track, a roadway maintenance vehicle rolled unintentionally after being uncoupled from its consist, which is a group of rail vehicles making up a multiple-unit train. This uncoupled vehicle collided with a motor vehicle parked across the storage track. The collision resulted in minor damages to the roadway maintenance vehicle and the motor vehicle, but did not result in any injuries.

**December 4, 2015 Rollaway**

On December 4, 2015, the New Carrollton Yard interlocking operator instructed two yard operators to move a two-car revenue passenger consist. The operators coupled two, 2-car consists, and moved the unit with one operator at each cab end, beyond the interlocking signal to clear it in preparation for proceeding to the storage tracks. Upon uncoupling the consists, one of the consists rolled an undefined distance towards the storage tracks, stopping only when the yard operator aboard applied the vehicle's handbrake to prevent further rolling. No injuries or damage were reported as a result of this incident.

In light of the general safety concerns and these three specific incidents on the WMATA Metrorail System since 2014, the FTA WMATA Safety Oversight (FWSO) Office initiated this investigation. This investigation focused on three main categories: redundant securement of rail vehicles, rules and procedures, and employee training. The investigation began at the end of February in 2016, and concluded at the end of July 2016.

## 2.2 Investigation Process and Activities

To conduct this investigation, FWSO reviewed Metrorail's current vehicle storage practices and yard operations for conformance with WMATA's rules and standard operating procedures. This included a review of specific requirements for train preparation and storage during layovers between rush hours, nighttime layovers, and longer-term storage. FWSO also consulted vehicle manufacturer recommendations for each series of rail vehicle in WMATA's fleet, as well as comparison to industry standards and best practices to prevent unintended train movement. In addition, FWSO worked with WMATA's quality and safety departments to conduct inspections in rail yards and interviews with operations and maintenance personnel regarding vehicle securement practices and interpretations of operating rules.

## 3.0 Vehicle Securement at WMATA

### 3.1 WMATA Rules and Procedures

The WMATA Metrorail system details its rail vehicle securement requirements in its standard operating procedures (SOP), Operating Rules (ORs), safety rules, and temporary orders. These requirements are intended to prevent unintended train movement in various scenarios across the rail system using handbrakes, chocks, and derail devices, which are devices placed on the track that force the wheels of a moving train off the rail, derailing the train and causing it to stop.

For example, WMATA OR 3.126, as detailed in the Metrorail Safety Rules and Procedures Handbook (MSRPH), requires employees to secure revenue passenger trains using handbrakes and specifies a minimum car spacing distance to protect against unintended movement. Specifically, OR 3.126 requires:

*When storing [revenue passenger trains], operators shall:*

- a. Secure cars being stored a minimum distance of two (2) feet apart at all storage locations, yards and/or tail tracks;*
- b. Set handbrakes on at least two cars;*
- c. Set a sufficient additional number of handbrakes for the grade on which the cars are being stored;*
- d. Ensure that the cars being stored are not fouling other tracks; and*
- e. If the consist is to be stored for more than 15 days, the consist shall be chocked and blue flagged.*

This OR also establishes standards for the securement of roadway maintenance vehicles, such as machines, rolling stock, and equipment designed only for maintenance purposes. Specifically, OR 3.126 requires:

*When storing [roadway maintenance vehicles], operators shall:*

- a. Set parking brakes<sup>3</sup> on all locomotives, prime movers, cars, and any other wheeled units in the consist;*
- b. Apply wheel stops or chocks to both sides of one wheel, on one axle, of each truck in the consist; and*
- c. Perform a "walk-around" inspection to ensure brakes are properly applied, chocks or stops are in place, and no equipment is fouling any other tracks.*

These requirements are intended to provide reasonable protection against unintended vehicle movement, and integrate with other securement requirements to be implemented by train operators during a variety of normal and abnormal situation. Appendix A identifies all vehicle

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<sup>3</sup> The MSRPH generally uses the term "handbrake" for revenue passenger vehicles and "parking brake" for roadway maintenance machines, however the terms are used interchangeably in other WMATA documentation. For consistency, this report utilizes the term handbrake to refer to this on-board securement mechanism on all WMATA rail vehicles.



securement requirements applicable for rail transit vehicles used in passenger service or to support maintenance.

### 3.2 Vehicle Securement Practices at WMATA

As a result of inspections conducted in WMATA's rail yards in February and March of 2016, FWSO confirmed that WMATA train operators do not apply handbrakes to rail vehicles stored in rail yards overnight as required in WMATA's safety rules and procedures. In addition, FWSO inspections found that railcars were not being separated by the required distance when stored in rail yards, and that chocks and blue flags were not being used on vehicles stored for longer than 2 weeks as required.

During interviews conducted in April and May 2016, FWSO noted universal misunderstandings among WMATA employees regarding the agency's rules and procedures for vehicle storage and securement, and the specific safety risks that they are designed to address. Further, due to challenges in applying handbrakes, the length of time required to apply them, and the difficulty in confirming their disengagement prior to moving trains under power, supervisors in rail transportation and car maintenance generally discourage use of these safety devices.

Applying handbrakes to prevent unintended movement of railcars in the yard is a common safety practice in the rail transit industry. Handbrakes in railcars are designed to provide a critical safety redundancy in the event that primary braking function is lost due to power failure, railcar air lines freezing, improperly coupled railcars, multiple compressor failures, or other malfunctions.

WMATA initially developed handbrake securement rules to prevent unintended train movement in the rail yard, which can have potentially catastrophic consequences. The FWSO discovered in interviews with veteran WMATA employees that WMATA initially applied handbrakes as specified in OR 3.126 in recognition of the importance of this redundant securement for unattended vehicles stored in rail yards overnight.

As the system expanded and received additional rail cars in the late 1970s and early 1980s, growing maintenance needs and limited storage in the existing rail yards necessitated constant movement and re-location of railcars to make and break-up train consists for service. Because WMATA determined this activity required a greater level of manpower to complete, the agency did not prioritize time or availability of its personnel to set and release handbrakes during overnight layovers on stored rail cars.

WMATA did not take actions to formally mitigate this deviation from its rules and procedures, such as installing permanent derails in yards or using chocks for securement, nor did WMATA officially revise the rule through its rulebook committee and process. The rule remains in the MSRPB but is consistently not implemented.

## 4.0 Previous FTA Findings and WMATA Actions

On December 8-9, 2015, FWSO inspected the performance of Daily Safety Tests<sup>4</sup> and yard storage activities at WMATA’s West Falls Church Rail Yard. This inspection raised concerns regarding WMATA’s general compliance with OR 3.126. Specifically, FWSO found that employees did not set handbrakes in accordance with OR 3.126 requirements “b.” or “c.”.

As a result of this inspection activity, FWSO requested that WMATA conduct an internal audit of its compliance with OR 3.126 at all rail yards and implement corrective actions to address any findings. The WMATA’s Office of Quality Assurance and Warranty (QAAW) conducted an audit, including field observations and management interviews, from December 18-22, 2015 at all of WMATA’s rail yards, the results of which are displayed in *Table 1* below. As a result of this audit QAAW issued the following findings:

1. Handbrakes are not routinely set on trains stored in the rail yard;
2. Trains stored in the rail yard for more than 15 days are not routinely chocked and blue flagged; and
3. Trains are not always stored a minimum of two feet apart in the rail yard.

<b>Compliance with Operating Rule 3.126 Provisions as Observed by QAAW</b>								
<b>Operating Rule 3.126 Sub-Element</b>	<b>Alexandria Yard</b>	<b>Branch Avenue Yard</b>	<b>Brentwood Yard</b>	<b>Glenmont Yard</b>	<b>Greenbelt Yard</b>	<b>New Carrollton Yard</b>	<b>Shady Grove Yard</b>	<b>West Falls Church Yard</b>
Two feet min. distance between cars	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Handbrakes set on at least two cars	No	No	No	No	No	No	No	No
Additional handbrakes set for grade	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cars not fouling other tracks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
15+ days, chocked and blue flagged	No	N/A	No	N/A	No	No	N/A	N/A

Table 1: MSRPH OR 3.126 Compliance by Rail Yard

<sup>4</sup> Daily Safety Tests are performed by technicians on each rail car. The technician does a vehicle walk around, undercar inspection, and vehicle walk through observing and testing various safety critical devices. Any identified deficiencies are corrected prior to releasing the car for revenue service.

During this audit, QAAW found that requirements for setting handbrakes on revenue vehicles in the rail yard are “knowingly not adhered to” because most WMATA employees do not believe that “laying-up” revenue vehicles in the rail yard overnight constitutes “storage.” In response to its observed system-wide lack of compliance with the requirements of OR 3.126, QAAW issued a corrective action request to the Office of Car Maintenance and the Office of Rail Transportation (RTRA) along with its report. A response to the request was due to QAAW and to FWSO on January 18, 2016.

Failing to receive the corrective action request response as required, FWSO followed up with a letter to WMATA on February 17, 2016 with specific requirements. In that letter, FWSO notified WMATA that, since OR 3.126 still remained in effect, FWSO expects WMATA to put an immediate mitigation plan in place through the issuance of a bulletin, temporary order, or other document, clarifying the exact status of the rule, and the actions that train operators are required to take in securing rail vehicles.

In addition, within 30 days from the date of its letter, FWSO requested the following items:

1. A detailed schedule and milestone activities for the OR 3.126 rule revision, including performance of safety risk analysis;
2. Clarification and copies of training materials referenced in the following statement from the report: “RTRA stated that all operators are trained in applying and releasing handbrakes on trains, but are not trained to store rail cars according to MSRPH 3.126”;
3. A copy of the bulletin, temporary order, or other document issued to train operators which states the requirements for a two-foot separation between stored trains and instructs them to use reference points to recognize this distance; and
4. Clarification regarding plans to update the MSRPH to reference the automatic engagement and release of handbrakes on the 7000 series railcars.

During February and March of 2016, FWSO inspectors continued to observe yard operations and to confirm that train operators were not applying handbrakes, chocks or other means of redundant securement. FWSO inspectors also conducted additional interviews with train operators and representatives from rail car maintenance and engineering.

FWSO found that the terms “storing” or “laying-up” are not defined in the MSRPH. Based on discussions with QAAW and subsequent interviews with WMATA employees, FWSO determined that many WMATA employees understand the term “storing” to mean securing a train in the rail yard for an indefinite period of time. Based on this understanding, a train that is temporarily “laid-up” in the rail yard is not considered “stored,” and would therefore not fall under OR 3.126.

While this interpretation of the term “storing” may explain current practices, it fails to comply with the intent behind the associated rules and procedures. SOP Number 45, Removing Revenue Vehicles from Service on Mainline and at Terminal Locations, currently directs train operators “... to adhere to MSRPH Operating Rule 3.126 (Storing Class 1 Vehicles)” prior to going out-of-service on the mainline “and/or prior to laying-up in rail yards.” As detailed in *Appendix A* of

this report, the MSRPH outlines numerous scenarios and situations during which handbrakes or other redundant securement method must be applied.

In response to the FWSO’s inquiries, WMATA proposed adding definitions for “storage” and “laying up” in the MSRPH Glossary of Terms. However, in its correspondence to WMATA on February 17, 2016, FWSO cited concerns regarding changing a safety critical rule in the MSRPH without first engaging the agency’s formal rule revision and safety analysis process to ensure that the change will adequately address the underlying safety concerns.

On March 22, 2016, WMATA provided a schedule and plan to revise its OR 3.126 to clarify when and how many handbrakes are needed for revenue passenger trains stored in the yard. *Table 2* below summarizes WMATA’s proposed rule revision.

<b>Proposed Operating Rule 3.126 Revision Schedule</b>		
<b>Activities</b>	<b>Activity Description</b>	<b>Estimated Completion Date</b>
Discuss Proposed Rule Revision	Hold meeting internal stakeholders to discuss proposed rule revision	02/26/16
Research Best Practices	Contract other Rail Transit Agencies to collect feedback on their approach to rail vehicle securement (handbrake usage)	02/29/16
Distribute First Draft of Rule Revision	Distribute first draft of OR 3.126 rule revision Permanent Order (PO) to internal stakeholder for review and comment	03/07/16
Review Draft Rule Revision	Hold follow-up meeting with internal stakeholders to review first draft of the PO	03/10/16
Distribute Second Draft of Rule Revision	Distribute second draft of PO for review and comment	03/11/16
Issue Two Foot Distance Personnel Notice	Issue Personnel Notice – Storing Trains Two Feet Apart in Yards and Terminals	03/18/16
Finalize Rule Revision	Update PO to include all review comments.	03/31/16
Draft White Paper	[Vehicle Engineering] to issue first draft of a white paper that provides a technical explanation describing the circumstances under which handbrakes should be applied.	04/15/16
Submit Rule Revision Package	Submit proposed rule revision and white paper to SAFE for Review and comment.	04/29/16
Issue Rule Revision PO	Issue rule vision PO to Operators	----
Update MSRPH	Add content of PO to MSRPH	----

Table 2: WMATA Rule Revision Schedule

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In April, changes in safety leadership at WMATA, along with ongoing dialogue with FWSO regarding potential options to improve vehicle securement practices in rail yards and work zones, led WMATA's rail transportation and vehicle maintenance departments to reconsider the approach outlined in *Table 2*. WMATA halted work on the Permanent Order outlining the rule revision to introduce new definitions for "layup" and "storage," but have indicated their commitment to addressing the findings and required actions outlined in this report, which includes steps to enhance vehicle securement and enforce securement rules and operating procedures.

## 5.0 New Findings and Required Actions

FWSO's investigation finds that WMATA exhibits a general lack of compliance with its own rules and procedures designed to ensure securement of unattended vehicles, including revenue passenger train vehicles and roadway maintenance vehicles in rail yards. As a result of this investigation, FWSO issues six (6) findings and six (6) required actions over three distinct categories:

- Category 1: Redundant securement for rail vehicle storage;
- Category 2: Rules and procedures; and
- Category 3: Employee training.

These findings and required actions are detailed below by category and presented in *Table 3*.

### 5.1 Category 1: Redundant Securement for Rail Vehicle Storage

- Finding 1: WMATA does not provide redundant protection when securing unattended rail vehicles.
- Required Action FTA-VSC-16-001: WMATA must complete its assessment regarding the safety risks from unintended train movement in rail yards and the implications of widespread non-compliance with WMATA Operating Rule 3.126, and propose a new approach for implementing a redundant protection system that addresses this safety concern to FTA for review and approval.

WMATA does not comply with its OR 3.126 requirements to set handbrakes on unattended rail vehicles in the yards. WMATA does not apply handbrakes to trains and vehicles stored overnight in rail yards and FWSO found several instances where vehicles stored for longer than 15 days were not secured with chocks and blue flags as required. Given the potentially catastrophic consequences of the failure of the vehicle's primary braking function, vehicles left unattended, even overnight, should be subject to a redundant system to prevent unintended movement.

Several effective redundant means to stop unintended rail vehicle movement are available. Rail car repair shops often use wheel chocks placed on the rail immediately in front of a wheel to prevent the wheel from rolling in the direction of the chock. Wheel chocks are placed on the rail immediately in front of a wheel to prevent the wheel from rolling in the direction of the chock. As noted in *Appendix A* of this report, there are several scenarios where WMATA requires the use of chocks for maintenance vehicles.

In addition to wheel chocks, derails are commonly used to stop unintended rail vehicle movement. A derail is a mechanical device placed on the track that forces the wheels of a moving train off the rail, derailing the train and causing it to stop. Derails are commonly placed in locations to prevent rail vehicles from entering mainline tracks where they could collide with other vehicles. Currently, WMATA uses temporary derails to protect work areas pursuant to SOP Number 28 Protection for Roadway Workers and Establishment of Third Rail Power

Outages and Work Areas on the Roadway. WMATA could install permanent derails in its rail yards to prevent unintended rail vehicle movement onto mainline track.

FWSO finds that, while WMATA may not use the onboard handbrake mechanism as an overnight redundant protection, reasonable alternatives exist to ensure rail vehicle securement and to prevent the potentially catastrophic consequences from unintended rail vehicle movement.

## 5.2 Category 2: Rules and Procedures

- Finding 2: WMATA does not disseminate clear, concise and unambiguous rules and procedures regarding vehicle securement.
- Required Action FTA-VSC-16-002: WMATA must revise its Metrorail Safety Rules and Procedures Handbook and supporting Standard Operating Procedures to unambiguously reflect its new approach for protecting against unintended train movement in rail yards.

The most commonly cited reason for non-compliance with OR 3.126 is the interpretation of the word “storing”, a word which is not defined in the MSRPH. Interview responses indicate that many WMATA employees understand the term “storing” to mean securing a train in the rail yard for an indefinite period of time. However, other MSRPH sections and SOPs require the application of handbrakes in temporary situations and emergency response. In the absence of clear guidance, WMATA employees do not consistently utilize handbrakes.

- Finding 3: WMATA does not maintain its MSRPH in accordance with its own rules and procedures.
- Required Action FTA-VSC-16-003: WMATA must update its approach for managing Temporary Orders to ensure that expired Temporary Orders are promptly removed from the Metrorail Safety Rules and Procedures Handbook and supporting Standard Operating Procedures as required.

WMATA revised SOP Number 12, Version 1.0 via Temporary Order T-14-21 with an approval date of February 2012. However, the MSRPH, dated March 2016, does not reflect this updated procedure. This is in direct conflict with WMATA’s internal requirement that no temporary order exist for a period of greater than one year before becoming incorporated into the associated SOP. WMATA must ensure that it updates SOPs in accordance with its temporary orders with every update and reissuance of its MSRPH.

- Finding 4: WMATA failed to perform a comprehensive rules compliance program for OR 3.126.
- Required Action FTA-VSC-16-004: WMATA must revise its “Yard Rules Compliance Checks” checklist consistent with revised Metrorail Safety Rules and Procedures Handbook rules, and ensure that employees conducting the compliance checks are properly trained on yard rules.

The FWSO reviewed the documentation provided for the yard rules compliance checks performed by WMATA. This form provides spaces for the auditor to note compliance, non-compliance, or to note that the requirement is not applicable. When auditing OR 3.126 (b): “Set

handbrakes on at least two cars” and OR 3.126 (c): “Set a sufficient additional number of handbrakes for the grade on which the cars are being stored”, WMATA noted that these rules were not applicable.

### 5.3 Category 3: Employee Training

- Finding 5: WMATA does not ensure that its employees have a comprehensive and universal understanding of the rules for vehicle securement.
- Required Action FTA-VSC-16-005: WMATA must develop and provide training to all rail transportation and car maintenance personnel regarding the new requirements for protecting against unintended train movement in rail yards.

WMATA employees generally do not understand the intent behind or implementation of OR 3.126. WMATA must train its operators and periodically assess their knowledge and implementation of securement rules and procedures. Additionally, in its internal audit of vehicle securement, QAAW noted that, “Rail Transportation stated that all operators are trained in applying and releasing handbrakes on trains, but are not trained to store rail cars according to MSRP 3.126.”

- Finding 6: WMATA does not ensure that its train operator training materials are updated to reflect the 7000 series rail cars.
- Required Action FTA-VSC-16-006: WMATA must update its train operator training materials to address the 7000 series vehicles, including the location and automatic operation of handbrakes.

In response to the FWSO’s request for train operator training materials on vehicle securement WMATA provided its Train Operation Reference Guide, as dated Revised April 2011. The guide does not include the 7000 series railcars. Although handbrakes on the 7000 series cars are automatically applied when the railcar is turned off and automatically released when the railcar is turned on, and do not require the manual application of handbrakes as in the previous series, WMATA must ensure that its training materials are up-to-date and comprehensive.



<b>Vehicle Securement Investigation Category 1: Redundant securement for rail vehicle storage</b>		
<b>Finding</b>	<b>Required Action</b>	
1 WMATA does not provide redundant protection when securing unattended rail vehicles.	FTA-VSC-16-001	WMATA must complete its assessment regarding the safety risks from unintended train movement in rail yards and the implications of widespread non-compliance with WMATA Operating Rule 3.126, and propose a new approach for implementing a redundant protection system that addresses this safety concern to FTA for review and approval.
<b>Vehicle Securement Investigation Category 2: Rules and Procedures</b>		
<b>Finding</b>	<b>Required Action</b>	
2 WMATA does not disseminate clear, concise, and unambiguous rules and procedures regarding vehicle securement.	FTA-VSC-16-002	WMATA must revise its Metrorail Safety Rules and Procedures Handbook and supporting Standard Operating Procedures to unambiguously reflect its new approach for protecting against unintended train movement in rail yards.
3 WMATA does not maintain its MSRPH in accordance with its own rules and procedures.	FTA-VSC-16-003	WMATA must update its approach for managing Temporary Orders to ensure that expired Temporary Orders are promptly removed from the Metrorail Safety Rules and Procedures Handbook and supporting Standard Operating Procedures as required.
4 WMATA failed to perform a comprehensive rules compliance program for OR 3.126.	FTA-VSC-16-004	WMATA must revise its “Yard Rules Compliance Checks” checklist consistent with revised Metrorail Safety Rules and Procedures Handbook rules, and ensure that employees conducting the compliance checks are properly trained on yard rules.
<b>Vehicle Securement Investigation Category 3: Employee Training</b>		
<b>Finding</b>	<b>Required Action</b>	
5 WMATA does not ensure that its employees have a comprehensive and universal understanding of the rules for vehicle securement.	FTA-VSC-16-005	WMATA must develop and provide training to all rail transportation and car maintenance personnel regarding the new requirements for protecting against unintended train movement in rail yards.
6 WMATA does not ensure that its train operator training materials are updated to reflect the 7000 series rail cars.	FTA-VSC-16-006	WMATA must update its train operator training materials to address the 7000 series vehicles, including the location and automatic operation of handbrakes.

Table 3: Vehicle Securement Investigation Findings and Required Actions Matrix

## Appendix A: WMATA Operating Rules (OR), Safety Rules (SR), and Standard Operating Procedures (SOP)<sup>5</sup>

<b>WMATA Operating Rules For Vehicle Securement</b>	
Rule Number	Operating Rule
OR 3.49	When coupling to a train with any brakes cut out, employees must not release the handbrake on the defective cars until the coupling has been made.
OR 3.50	When uncoupling from cars with any brakes cut out, employees must apply handbrakes before uncoupling.
OR 3.51	Prior to moving a train with all friction brakes cut out on both cars of a married pair, with that pair of cars located on the operating or trailing end of the train, ROCC shall dispatch a person qualified in train operations to ride in the pair with the brakes cut out. The responsibility of this person is to secure the train (cut brakes back in and apply a handbrake on at least one car) in case of a pull-apart.
OR 3.105	When one or more work cars are cut away from the work train at the work site, they shall be secured with handbrakes, wheel stops and chocks.
OR 3.106	Operators shall secure Class II vehicles while they are stopped within the work area. When the vehicle is left unattended, the vehicle shall be secured with handbrakes. When stopped on a low grade, sufficient handbrakes shall be applied at the low end of the grade to be certain the vehicle is secured.
OR 3.107	Before re-coupling to any cars that have been cut away from the Class II vehicle, the operator shall check that handbrakes on cars are set and wheel chocks and stops are in place. After the coupling is made and the vehicle is charged up, the stops and chocks shall be removed and the handbrakes released.
OR 3.114	The vehicle flag person shall assist the operator of a Class II vehicle in securing the vehicle at the work site by placing wheel chocks, stops and by setting handbrakes. Likewise, the vehicle flag person shall assist the operator in removing wheel chocks and stops in preparation for train movement. The vehicle flag person shall assist the operator in properly securing all booms and outriggers prior to moving the equipment (Ref. Rules 3.126 and 3.127).
OR 3.132	After positioning their vehicle in the shop, operators shall initially secure the cars with sufficient handbrakes.
OR 3.136	When storing Class I Rail Vehicles, operators shall: <ol style="list-style-type: none"> <li>a. Secure cars being stored a minimum distance of two (2) feet apart at all storage locations, yards and/or tail tracks;</li> <li>b. Set handbrakes on at least two cars;</li> <li>c. Set a sufficient additional number of handbrakes for the grade on which the</li> </ol>

<sup>5</sup> Taken directly from WMATA's Metrorail Safety Rules and Procedures Handbook (MSRPH), March 2015 electronic update.

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	<p>cars are being stored;</p> <p>d. Ensure that the cars being stored are not fouling other tracks; and</p> <p>e. If the consist is to be stored for more than 15 days, the consist shall be chocked and blue flagged.</p> <p>When storing Class II Rail Vehicles, operators shall:</p> <p>a. Set parking brakes on all locomotives, prime movers, cars, and any other wheeled units in the consist;</p> <p>b. Apply wheel stops or chocks to both sides of one wheel, on one axle, of each truck in the consist; and</p> <p>c. Perform a "walk-around" inspection to ensure brakes are properly applied, chocks or stops are in place, and no equipment is fouling any other tracks.</p>
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**WMATA Safety Rule For Vehicle Securement**

Rule Number	Safety Rule
SR 4.025	<p>Safety chocks shall be placed under wheels of rail vehicles when:</p> <p>a. Service brakes are cut out and handbrakes are not applied;</p> <p>b. Handbrakes are defective and the train is to be secured;</p> <p>c. Maintenance is being performed on the brake system;</p> <p>d. Trucks are to be removed from the vehicle; and</p> <p>e. There is a possibility that the vehicle could move during maintenance.</p>

**WMATA Standard Operating Procedures For Vehicle Securement**

SOP Number	Standard Operating Procedure
<b>Fire and Smoke on Cars</b>	
SOP 7.5.8.6.5	After power is removed, the Train Operator shall return to the affected cars and apply the handbrakes on both cars.
SOP 7.5.8.6.6	If the fire prevents applying the handbrakes on both cars, the Train Operator shall apply the handbrake on the unaffected car and notify the ROCC Supervisor of the car that the hand brake was applied.
<b>Fires of Major Proportions</b>	
SOP 7.5.10	When fire on the car is of major proportions and the unaffected cars can be uncoupled, handbrakes shall be applied on one or both of the affected cars before uncoupling.
SOP 7.5.10.1.3	Return to the affected car pair, apply a handbrake on the unaffected car and notify the ROCC Supervisor of the car that the hand brake was applied.
SOP 7.5.10.1.3	If the train is disabled between stations and the safety of passengers is endangered, the Train Operator shall secure the train with handbrakes and evacuate passengers

<b>WMATA Standard Operating Procedures For Vehicle Securement</b>	
SOP Number	Standard Operating Procedure
	in accordance with SOP # 4.

<b>WMATA Standard Operating Procedures For Vehicle Securement</b>	
SOP Number	Standard Operating Procedure
<b>Mainline Train Collisions</b>	
SOP 11.5.3.1.1	Secure the damaged cars on the train with handbrakes.
SOP 11.5.4.7	If the train is disabled between stations and the safety of the customers is endangered, the ROCC Supervisor shall instruct the Train Operator to secure the train with handbrakes and evacuate the customers in accordance with SOP #4.
<b>Collisions with Persons</b>	
SOP 26.5.2.4	Secure the train by setting handbrakes.
<b>Traction Power Faults</b>	
SOP 3.5.4.1.1	Secure their trains with handbrakes.
<b>Work Train Consists and Operation</b>	
SOP 23.5.3.2	When one or more work cars are cut away from the work train at the work site, they shall be secured with handbrakes and chocks or stops.
SOP 23.5.3.3	Work Train Operators shall secure work trains while they are stopped within the work area. When the work train is left unattended, it shall be secured with handbrakes and chocks or stops at all times. When stopped on a low grade, sufficient handbrakes shall be applied at a low grade to be certain the work train is secured.
SOP 23.5.3.4	Before re-coupling to any cars that have been away from the work train, the operator shall check and ensure that handbrakes on the car are set, wheels are chocked or stops are in place. After coupling is made and the train is charged up, the stops or chocks shall be removed and the handbrakes released.
SOP 23.5.3.6	The person flagging shall assist the Operator in securing the work train at the work site by placing wheel chock or stops and setting handbrakes.
<b>Roadway Worker Protection and Establishment of Third Rail Power Outages and Work Areas on the Roadway</b>	
SOP 28.5.16.1.2	Ensure that a handbrake has been applied on at least one railcar.

<b>WMATA Standard Operating Procedures For Vehicle Securement</b>	
SOP Number	Standard Operating Procedure
<b>Mainline Train Derailments</b>	
SOP 9.4.4.5	Securing the train and apply sufficient handbrakes on all cars.
SOP 9.5.2.1.1	Secure the train and apply handbrakes on all cars.
SOP 9.5.4.2.1	Secure the train and place handbrakes on all the cars.
SOP 9.5.5.1.7	If the safety of the customers is endangered, the ROCC Supervisor shall instruct the Train Operator to secure the train with handbrakes and evacuate the customers in accordance with SOP # 4 – Customer Evacuation from Trains.
<b>Undesired Uncoupling or Pull Apart of Cars in a Train</b>	
SOP 13.5.1.6	If the emergency application of brakes was due to a train pull-apart, the Train Operator shall secure the rear section with handbrakes and notify the customers of the delay. If the train is disabled between stations, close and lock the end door on both cars at the location where the train parted.
SOP 13.5.2.1.4	Secure both sections of the train with handbrakes.
SOP 13.5.3.1.5	Close the train doors, and secure both sections with handbrakes.
SOP 13.5.4.1.8.1	Notify the customers in the section that was being operated of the delay via the train PA system secure the operating console and cab and apply handbrakes.
SOP 13.5.4.1.8.2	Go to the other section of the train notify the customers in this section of the delay and apply handbrakes.
SOP 13.5.6.1.3	Secure both sections with handbrakes and investigate the pull-apart.
<b>Recovery Operations</b>	
SOP 32.5.6.1.5.2	Apply handbrake on the lead pair.
SOP 34.5.2.3	The CMNT emergency desk in ROCC shall document in MAXIMO the condition of the train at the time of storage that may hinder its safe movement (trucks cut/out, damaged equipment, 3rd rail power removed, wheel chocks, handbrakes, etc.).
<b>Movement of Rail Vehicle(s) Within, Into, On the Lead, and Out of a Maintenance Facility</b>	
SOP 12.5.1.11	The Vehicle Operator shall secure the rail vehicle with one operational set of handbrakes after positioning the rail vehicle in the maintenance facility. This will occur during an in-house vehicle movement utilizing Stinger and/or bayonet type operation.
SOP	The Vehicle Operator shall initially secure the rail vehicle(s) with one operational

<b>WMATA Standard Operating Procedures For Vehicle Securement</b>	
SOP Number	Standard Operating Procedure
12.5.4.4	set of handbrakes after positioning the rail vehicle(s) in the maintenance facility.
<b>Coupling and Uncoupling Revenue Cars</b>	
SOP 16.5.2.1.4	When coupling to car units with the brakes cut out, make certain handbrakes are applied. Wheel stops and chocks shall be removed. After coupling, the handbrakes shall be released.
SOP 16.5.3.3	Car units that have brakes cut out or other braking problems shall have handbrakes applied before being uncoupled.
<b>WMATA Temporary Order For Vehicle Securement (<i>modifies current SOP 12</i>)</b>	
Order Number	Temporary Order
T-14-21	<p>12.5.1.11 The Vehicle Operator shall secure the rail vehicle with one operational set of handbrakes after positioning the rail vehicle in the maintenance facility. This will occur during an in-house vehicle movement utilizing Stinger and/or bayonet type operation.</p> <p>12.5.4.7 The Vehicle Operator shall initially secure the rail vehicle(s) with one operational set of handbrakes after positioning the rail vehicle(s) in the maintenance facility.</p> <p>12.5.7.10 Class II Vehicle Operator(s) shall initially secure the Class II rail vehicle(s) with one operational set of handbrakes, or the parking brake, after positioning the vehicle(s) in the maintenance shop.</p> <p>12.5.8.9 The Primary Vehicle Flag Person shall ensure the Class II Vehicle Operator secures the Class II Vehicle(s) with one operational set of parking and/or handbrakes after positioning the Class II Vehicle(s) in the maintenance shop.</p> <p>12.5.9.9 Class II Vehicle Operator(s) shall secure the Class II rail vehicle(s) with one operational set of handbrakes, or the parking brake, after positioning the vehicle(s) in the lead or storage tracks.</p> <p>12.5.10.9 The Primary Vehicle Flag Person shall ensure the Class II Vehicle Operator secures the Class II Vehicle(s) with one operational set of handbrakes or the parking brake after positioning the vehicle(s) on the lead or storage tracks.</p>