



U.S. Department  
of Transportation

**Federal Transit  
Administration**

Headquarters

May 17, 2017

1200 New Jersey Avenue, SE  
Washington, DC 20590

Mr. Paul Wiedefeld  
General Manager and Chief Executive Officer  
Washington Metropolitan Area Transit Authority  
600 Fifth Street, NW  
Washington, DC 20001

**Subject: Final Approval of Special Directive 17-1 Corrective Action Plans**

Dear Mr. Wiedefeld:

On December 9, 2016, the Federal Transit Administration (FTA) issued Special Directive 17-1 to require the Washington Metropolitan Area Transit Authority (WMATA) to address findings resulting from FTA's Traction Power Electrification System Investigation Final Report. WMATA submitted its final revision for proposed Corrective Action Plans (CAPs) to implement the FTA's required actions on April 14, 2017.

The FTA reviewed WMATA's 17 proposed CAPs and they adequately address the 22 findings and 47 required actions as described in Special Directive 17-1. FTA approves these CAPs for WMATA's implementation and appreciates your efforts to enhance the safety performance of the Metrorail's traction power electrification system.

Thank you for your commitment to resolving these CAPs and FTA expects WMATA to meet the time commitments established in their CAP plans. Please contact me at (202) 366-5303 or by email at [Angela.Dluger@dot.gov](mailto:Angela.Dluger@dot.gov) with any questions.

Sincerely,

Angela Dluger  
Director, FTA WMATA Safety Oversight

Enclosure: Special Directive 17-1 Corrective Action Plan Table

Mr. Paul Wiedefeld

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cc: Joseph Leader, Chief Operating Officer, WMATA  
Andrew Off, Assistant General Manager for Rail Services, WMATA  
Patrick Lavin, Chief Safety Officer, WMATA  
Angel Peña, Managing Director, Quality Assurance, Internal Compliance &  
Oversight, WMATA  
Sharmila Samarasinghe, Chair, Tri-State Oversight Committee



**Special Directive 17-1 Corrective Action Plan (CAP) Table**  
**Office of FTA Washington Metropolitan Area Transit Authority (WMATA) Safety Oversight (FWSO)**

WMATA CAP ID	FWSO Required Action	Elements of WMATA's CAP	CAP Completion Date
FTA-17-1-1	<p><b>FTA-TPE-17-001-a</b> The WMATA must conduct an assessment to determine if all [Traction Power Electrification (TPE)] system program components should be integrated into a single department with sole responsibility for managing, inspecting, maintaining, repairing, and upgrading the TPE system. At a minimum, this assessment must include those elements of the TPE system inspection, maintenance, and repair currently performed by [the Traction Power Maintenance (TRPM) department]; third rail inspection and maintenance work currently performed by [the Office of Track and Structures (TRST)]; negative return system inspection and maintenance activities performed by [the Automatic Train Control group]; cable replacement activity performed by [the Infrastructure Renewal Construction Management group]; engineering services provided by [the Power Engineering group]; and lock-out/tag-out procedures implemented by the [Rail Operations Control Center (ROCC)] and [Maintenance Operations Center (MOC)].</p> <p><b>FTA-TPE-17-001-b</b> The WMATA must implement the results of the assessment conducted to address FTA-TPE-17-001-a following a schedule reviewed and approved by FTA.</p>	<ol style="list-style-type: none"> <li>1. Assessment of TPE System Responsibility</li> <li>2. Implementation Plan</li> <li>3. Establish Third Rail Inspection and Maintenance Groups</li> <li>4. Quarterly Updates</li> <li>5. Quality Audit Report</li> </ol>	June 28, 2018
FTA-17-1-2	<p><b>FTA-TPE-17-002-a</b> The WMATA must develop and provide TPE system awareness training for ROCC and MOC personnel.</p>	<ol style="list-style-type: none"> <li>1. SOP #6 / SOP #2</li> <li>2. Updated Training Module for ROCC Personnel</li> </ol>	October 31, 2017



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	<p><b>FTA-TPE-17-002-b</b> The WMATA must revisit [Standard Operating Procedure (SOP)] #2: Emergency Removal and Restoration of Third Rail Power Mainline to consider: 1) removal of power during smoke conditions, especially with corresponding third rail power outages caused by unknown conditions, and 2) a requirement to de-energize third rail power at the adjacent power substation or tie breaker, provided the situation does not strand a train that needs to be moved from the smoke condition.</p>	<ol style="list-style-type: none"> <li>3. Training Schedule</li> <li>4. Quality Audit Report</li> </ol>	
<p><b>FTA-17-1-3</b></p>	<p><b>FTA-TPE-17-003-a</b> The WMATA must amend or update the TRPM workload assessment completed by the HNTB Corporation to address the results of FTA-TPE-17- 001-a.</p> <p><b>FTA-TPE-17-003-b</b> The WMATA must develop a 5-year plan for staffing to implement results of the revised workload assessment, reflecting the results of FTA-TPE-17- 001-a.</p> <p><b>FTA-TPE-17-003-c</b> The WMATA must evaluate options for using contractors to complete its TPE system corrective maintenance backlog and outstanding preventive maintenance requirements in the near-term and implement results.</p>	<ol style="list-style-type: none"> <li>1. Workload Assessment and 5-Year Staffing Plan</li> <li>2. Implementation Plan</li> <li>3. Quarterly Reports</li> <li>4. Quality Audit Report</li> </ol>	<p>June 29, 2018</p>
<p><b>FTA-17-1-4</b></p>	<p><b>FTA-TPE-17-006-a</b> The WMATA must establish and implement an inspection, testing, maintenance, and repair program for its floating slab track, running rail insulation, and sacrificial anodes.</p>	<ol style="list-style-type: none"> <li>1. Stray Current Analysis in SMI R-4-30-a</li> <li>2. Stray Current Program</li> <li>3. Stray Current Testing Schedule</li> <li>4. Floating Slab Bonding Inspection Process</li> <li>5. Quality Audit Report</li> </ol>	<p>April 30, 2018</p>



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FTA-17-1-5	<p><b>FTA-TPE-17-022-a</b> The WMATA must establish criteria for its fastener replacement program to improve insulation resistance.</p>	<ol style="list-style-type: none"> <li>1. Fastener Replacement Program Criteria</li> <li>2. Production Report</li> <li>3. Quality Audit Report</li> </ol>	November 30, 2017
FTA-17-1-6	<p><b>FTA-TPE-17-008-a</b> Consistent with WMATA's track fastening plinth replacement requirements, WMATA must develop and implement a third rail grout pad replacement program for supporting insulators.</p>	<ol style="list-style-type: none"> <li>1. Grout Pad Replacement Process</li> <li>2. Completed Grout Pad Replacement</li> <li>3. Quality Audit Report</li> </ol>	August 9, 2017
FTA-17-1-7	<p><b>FTA-TPE-17-007-a</b> The WMATA must establish its new insulator design specifications for composite (fiberglass) and porcelain insulators, including the two-piece insulator discussed with FWSO to facilitate more efficient and economical insulator replacement activities.</p> <p><b>FTA-TPE-17-007-b</b> The WMATA must revise the current insulator replacement work instruction to include proper storage, transportation, and handling of insulators to reduce damage to new insulators before and during installation.</p> <p><b>FTA-TPE-17-007-c</b> Based on the design specifications established in FTA-TPE-17-007-a, WMATA must establish insulator mortality rates and implement cyclical replacement program for each type of insulator used on the Metrorail system.</p> <p><b>FTA-TPE-17-007-d</b> Based on the design specifications established in FTA-TPE-17-003-a, WMATA must develop and implement a formal program for cleaning insulators, including proposed work instructions to ensure the safety of WMATA employees.</p>	<ol style="list-style-type: none"> <li>1. Product Testing and Design Review</li> <li>2. Insulator Design Specifications</li> <li>3. Work Instruction for Insulator Installation</li> <li>4. Work Instruction for Insulator Cleaning</li> <li>5. Receiving Inspection Plan</li> <li>6. Quality Audit Report</li> </ol>	March 2, 2020



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	<p><b>FTA-TPE-17-007-e</b> The WMATA must establish a formal quality testing and inspection program to ensure conformance of the delivered insulators with WMATA's specifications and requirements.</p> <p><b>FTA-TPE-17-007-f</b> Based on the design specifications established in FTA-TPE-17-003-a, WMATA must ensure new insulator anchors are installed to WMATA standards including providing epoxy insulating dielectric material to ensure that the anchor bolts do not provide an electrical path to structural ground. (See WMATA's Track Standards TRST 1000 section 13 - Contact Rail).</p> <p><b>FTA-TPE-17-007-g</b> The WMATA must develop a plan to identify and correct the installation of insulator anchors without appropriate epoxy insulating dielectric material.</p>		
<b>FTA-17-1-8</b>	<p><b>FTA-TPE-17-020-a</b> The WMATA must explain the original intent of Third Rail Composite Replacement Program, define the rationale for stopping the program, and clarify intentions to re-instate this program.</p>	<ol style="list-style-type: none"> <li>1. Written Explanation</li> <li>2. Quality Audit Report</li> </ol>	May 4, 2017
<b>FTA-17-1-9</b>	<p><b>FTA-TPE-17-021-a</b> The WMATA must provide FWSO with its revised schedule for repairing all missing cover boards in the tunnel segments of the WMATA system.</p>	<ol style="list-style-type: none"> <li>1. Third Rail Board Cover Specifications</li> <li>2. Third Rail Maintenance Plan</li> <li>3. Cover Board Replacement Process</li> </ol>	May 30, 2018



WMATA CAP ID	FWSO Required Action	Elements of WMATA's CAP	CAP Completion Date
	<p><b>FTA-TPE-17-021-b</b> The WMATA must evaluate the current protection board design specification and enhance it to meet the [National Fire Protection Association] 130 standards.</p>	<p>4. Quarterly Reports 5. Quality Audit Report</p>	
<p><b>FTA-17-1-10</b></p>	<p><b>FTA-TPE-17-004-a</b> The WMATA must implement its program to secure traction power cables off the ground.</p>	<p>1. Cable Maintenance Program 2. Cable Replacement Program Planning 3. Engineering Modification Instruction (EMI) 220272 Wayside Cable Installation 4. Review of Alternate Power Cable Connections 5. Proof of Concept – EMI for Modifying Existing Traction Power Location 6. Update Standard Drawings 7. Suspension of the Expansion Joint Program 8. Quality Audit Report</p>	<p>October 30, 2019</p>
	<p><b>FTA-TPE-17-009-a</b> The WMATA must conduct an assessment and implement results regarding the identification of additional methods to provide improved dielectric insulation in the area of cable terminations, such as non-tracking heat shrink, utilizing alternative products for cable transitions at duct lines, and providing additional physical barriers where there is close clearance to metallic structures.</p>		
	<p><b>FTA-TPE-17-017-a</b> The WMATA must re-instate its program for cable replacement to support 100 percent 8-car train operations, including the replacement of all primary and secondary TPE system cables, and must provide FTA with a timeline and project plan.</p>		
	<p><b>FTA-TPE-17-018-a</b> The WMATA must revisit its cable upgrade program for 50 percent and 100 percent 8-car operational plan and develop a capital cable replacement program for substation negative return and wayside cross bonding.</p>		
<p><b>FTA-TPE-17-019a</b> The WMATA must provide FWSO with a written explanation regarding the suspension of this program.</p>			



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FTA-17-1-11	<p><b>FTA-TPE-17-011-a</b> The WMATA must develop and submit to FWSO its program for cleaning and drying contaminated cables to improve surface resistivity, including proposed work instructions to ensure the safety of WMATA employees.</p>	<ol style="list-style-type: none"> <li>1. 3<sup>rd</sup> Rail Jumper Cable Replacement Plan</li> <li>2. 3<sup>rd</sup> Rail Jumper Cable Inspection Process</li> <li>3. Cable Meggering Process</li> <li>4. Quality Audit Report</li> </ol>	April 30, 2018
	<p><b>FTA-TPE-17-013-a</b> The WMATA must develop a meggering plan for cross bonded cables, especially in tunnel areas that are prone to water and muck infiltration, to determine their integrity.</p>		
	<p><b>FTA-TPE-17-013-b</b> The WMATA must institute a cable testing program for jumper and transition cables located in the tunnel environment until these cables are upgraded and/or replaced.</p>		
FTA-17-1-12	<p><b>FTA-TPE-17-003-d</b> The WMATA must perform a cost benefit analysis with regards to repairing or replacing the out-of-service vacuum vehicle and implement the results.</p>	<ol style="list-style-type: none"> <li>1. Vacuum Vehicle In-Service Report</li> <li>2. Tunnel Cleaning Program</li> <li>3. Quality Audit Report</li> </ol>	July 19, 2017
FTA-17-1-13	<p><b>FTA-TPE-17-010-a</b> The WMATA must evaluate the traction power direct current feeder breaker settings at substations and tie breakers to determine the optimal settings for various track side conditions, including instantaneous short circuit ratings, time over current settings, and rate of rise settings.</p>	<ol style="list-style-type: none"> <li>1. TPE Relay Program</li> <li>2. Consultant Task Order</li> <li>3. Simulation Study Review</li> <li>4. Relay Settings Verification</li> <li>5. Transfer Trip Analysis</li> <li>6. Quality Audit Report</li> </ol>	July 7, 2020
	<p><b>FTA-TPE-17-010-b</b> The WMATA must provide criteria and test results for circuit breaker relay settings to FWSO for evaluation.</p>		
	<p><b>FTA-TPE-17-010-c</b> The WMATA must develop and submit to FWSO its program plan for installing, testing, and evaluating the effectiveness of the use of multi-protection relays for detecting low level faults.</p>		





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	<p><b>FTA-TPE-17-010-d</b> The WMATA must evaluate the addition of transfer trip circuitry for de-energizing feeds from adjacent power stations during troubled conditions and implement results.</p> <p><b>FTA-TPE-17-15-a</b> The WMATA must re-evaluate previous current draw and load calculations to include field surveys to ensure that the actual condition of the cables and bonds are considered in the requirements analysis for 100 percent 8-car train operation.</p> <p><b>FTA-TPE-17-16-a</b> The WMATA must develop and implement a program for assessing the condition of relays at traction power substations to prioritize upgrade, replacement, and/or repair.</p> <p><b>FTA-TPE-17-20-b</b> The WMATA must review fault detection relay settings and determine if adjustments are required due to the new electrical properties for composite third rail.</p>		
<b>FTA-17-1-14</b>	<p><b>FTA-TPE-17-14-a</b> The WMATA must implement a regular program of stray current and corrosion control testing, which should include, at a minimum, the following: track to earth electrical isolation, track to earth voltage, yard to mainline electrical isolation, shop to yard electrical isolation, mainline segregation, and cathodic protection systems.</p>	<ol style="list-style-type: none"> <li>1. Corrosion Control Program</li> <li>2. Identify Funding</li> <li>3. Field Assessments</li> <li>4. Program to Remedy Future Identified Defects</li> <li>5. Quality Audit Report</li> </ol>	June 28, 2018
<b>FTA-17-1-15</b>	<p><b>FTA-TPE-17-003-e</b> The WMATA must improve the functionality of the thermal imaging car to more accurately pick up cable hot spots.</p>	<ol style="list-style-type: none"> <li>1. Thermal Imaging Car SOP</li> <li>2. Policy for Identification of Hot Spots and Verification Activities</li> </ol>	September 11, 2017



WMATA CAP ID	FWSO Required Action	Elements of WMATA's CAP	CAP Completion Date
	<p><b>FTA-TPE-17-12-a</b> The WMATA must establish grading criteria for TPE system defects, similar to the defect system established for track, and must instruct inspection personnel in how to use them. These grading criteria must also address thermal imaging anomalies and include acceptable thermal variation criteria and action levels.</p> <p><b>FTA-TPE-17-12-b</b> The WMATA must establish a procedure to ensure that thermal imaging data is reviewed with all stakeholders and that automated inspections, which include data collection and analysis of TPE system components, are used collectively to identify trends and target areas for preventive maintenance or monitoring.</p> <p><b>FTA-TPE-17-12-c</b> To enhance usefulness, WMATA must revise its thermal imaging summary report to include comparison reports from past thermal imaging runs.</p> <p><b>FTA-TPE-17-12-d</b> The WMATA must establish a procedure to ensure that TGV third rail data is compared with the reports filed by track inspectors and with previous TGV data to identify trends. Specifically, this procedure must ensure the geometry data from the TGV is reviewed for third rail gauge exceptions, especially in super-elevated track areas and floating slab construction; assess the re-gauging of the third rail per WMATA's Track Standards TRST 1000 section 13 - Contact Rail; and evaluate the need for corrective repairs when the system is out of tolerance.</p>	<ol style="list-style-type: none"> <li>3. OPTRAM Visual Overlay of Historical Hot Spots</li> <li>4. Process for Verifying of Track Geometry Vehicle (TGV) Data Through Physical Inspection</li> <li>5. Quality Audit Report</li> </ol>	



<b>WMATA CAP ID</b>	<b>FWSO Required Action</b>	<b>Elements of WMATA's CAP</b>	<b>CAP Completion Date</b>
<b>FTA-17-1-16</b>	<p><b>FTA-TPE-17-005-e</b> The WMATA must document negative return system defects in the maintenance and repair trouble ticket system (Maximo) and assign responsibility for timely repairs.</p>	<ol style="list-style-type: none"> <li>1. TPE Asset Structure</li> <li>2. Negative Return Defect Monitoring</li> <li>3. Quality Audit Report</li> </ol>	August 8, 2018
<b>FTA-17-1-17</b>	<p><b>FTA-TPE-17-005-a</b> The WMATA must discontinue the practice of using clamped bonds as a permanent installation.</p> <p><b>FTA-TPE-17-005-b</b> The WMATA must locate and replace all clamped bonds with drilled rail web/bolted crimped cable connections, suitable for permanent installations.</p> <p><b>FTA-TPE-17-005-c</b> The WMATA must appropriately train and assign personnel to correctly install and maintain all negative return system components, including drilled rail web running rail bonds.</p> <p><b>FTA-TPE-17-005-d</b> The WMATA must assign maintenance personnel to inspect and repair any running rail bonded joints that are physically compromised, missing, or inadequate to perform their required function.</p>	<ol style="list-style-type: none"> <li>1. Negative Bonding Evaluation</li> <li>2. Negative Bonding Instruction</li> <li>3. Automatic Train Control Maintenance (ATCM) training Module</li> <li>4. Negative Bonding Inspection Process</li> <li>5. Maintenance Procedures</li> <li>6. Maintenance Data Validation</li> <li>7. Data Analysis</li> <li>8. Quality Audit Report</li> </ol>	January 16, 2019