

# Tri-State Oversight Committee



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## Three-Year Safety and Security Review of the Washington Metropolitan Area Transit Authority

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### Structures Maintenance

### Elements 14, 15 and 16

**Review Conducted: April/May 2015**

Draft Report: September 18, 2015

**Final Report: November 12, 2015**

## **Introduction**

Representatives from the Maryland Department of Transportation (MDOT), the District of Columbia Department of Transportation (DDOT), and the Virginia Department of Rail and Public Transportation (DRPT) comprise the Tri-State Oversight Committee (TOC), which provides regular oversight of the Washington Metropolitan Area Transit Authority (WMATA) Metrorail system. To comply with State Safety Oversight Final Rule 49 Code of Federal Regulations Part 659 (Part 659), the Federal Transit Administration (FTA) requires states to designate a State Safety Oversight (SSO) agency to administer safety and security programs for rail transit and fixed guideway systems within their jurisdictions. Specifically, 49 CFR Part 659 requires TOC to conduct an on-site safety review of each element of the WMATA System Safety Program Plan (SSPP) at least once every three years. These reviews must assess WMATA's implementation with all 21 elements of its SSPP and seven elements of its Security and Emergency Preparedness Plan (SEPP), along with related plans and procedures. Beginning in 2013, the TOC has split its Three-Year Safety and Security Review topic areas into separately occurring reviews spread out during a three-year period.

The following report documents the observations and findings of the TOC's review of structures maintenance. Generally, this review focused whether WMATA's maintenance program complies with its own written plans as well as industry standards and best practices. The relevant SSPP elements for this review were all or part of:

- Element 14: Facilities and Equipment Inspections
- Element 15: Maintenance Audits and Inspections
- Element 16: Training and Certification

The TOC Program Standard and Procedures defines WMATA requirements for these elements in Section 12 and in Appendix B. Specific requirements are cited further, below.

## **Methodology**

In advance of the review, the TOC requested and reviewed relevant WMATA plans, procedures, checklists, and reports. The on-site portion of the review occurred April 29-May 1, 2015. During the on-site review sessions, the review team interviewed WMATA personnel and reviewed various documents and records on-site to assess compliance with procedures. In attendance from WMATA were primarily personnel from the structures division of the Office of Track and Structures (TRST), with support from Technical Training and Document Control (TTDC). Additional personnel from Quality Assurance and Warranty (QAAW) and Safety and Environmental Management (SAFE) observed; WMATA conducted a simultaneous Internal Safety and Security Audit.

The first day included interviews and discussion regarding: TRST organizational structure and manpower; maintenance plans, manuals, and checklists; MAXIMO and

InspectTech system use; track rights/allocation; quality assurance and control; training; and related topics. The group reviewed real-time open and closed maintenance logs in MAXIMO and conducted other records-related demonstrations. The second and third days involved team inspections of a sample of tunnel, station, and bridge structures. As the review progressed, TOC representatives discussed preliminary findings and addressed questions from WMATA personnel. This report identifies conditions evident during the review period, regardless of the current progress of potential remediation activities.

A Finding may refer to an instance of WMATA operating out of compliance with an applicable internal or external written requirement, plan, policy, rule, standard, or procedure. Findings may also refer to instances whereby WMATA may technically be conducting business in compliance with existing WMATA, TOC, or FTA procedures and requirements; however, there may be no relevant written plan, policy, or procedure in place, or the existing plan, policy, or procedure is not in accordance with industry best practices. Findings may be safety-critical in nature regardless of whether the issue identified is “non-compliant”.

If a Finding is identified, WMATA is required to develop an appropriate Corrective Action Plan (CAP) and take action to achieve compliance with applicable requirements. WMATA is required to formally respond in writing, and is strongly urged to develop an appropriate CAP to update relevant plans, policies, rules, and/or procedures, or to address a particular identified resource or organizational issue. If WMATA determines no CAP is necessary, the agency must complete a hazard analysis in accordance with its hazard management procedure in order to justify taking no action and accept the level of risk associated with the finding.

This review, including all findings presented in this report, intends to assist WMATA with enhancing system safety throughout Metrorail. WMATA received a draft of this report and provided comments, which were considered for integration into this Final Report. **Upon receipt of this Final Report, WMATA has 45 days to submit proposed CAPs in response to each finding using the attached CAP Submission Form.** Each proposed CAP must include the planned action, person responsible, and estimated completion date.

The TOC would like to thank WMATA personnel for their time, cooperation, and forthrightness throughout the review process.

### **Current Conditions**

TRST is housed within the Department of Transit Infrastructure and Engineering Services (TIES). The structures division provides comprehensive inspection, maintenance, repairs, and rehabilitation of all tunnels and structures. Overall, WMATA has a good structural inspection and maintenance program in place. The current inspection program is adequate and should be maintained on the established schedule:

- Tunnels, Vent Shafts and Fan Shafts                      Biennially
- Elevated Structures    Annually
- Stations and Ancillary Structures                          Annually
- Shops and other Service Buildings                         Annually

WMATA’s bridge superstructures are mainly A588 steel box sections and concrete or pre-stressed box sections. Some older superstructures are painted steel girder systems or plate girders with floorbeam systems. Substructures are mainly reinforced concrete. All pier footing and foundations that are in rivers or streams are inspected every three years for erosion and scour.

Structures personnel are responsible for performing detailed structural inspection on a variety of structures including: 91 stations (47 below ground and 44 above ground); 22 aerial structures; 74 WMATA bridges; 22 pedestrian bridges; 6 yard access bridges; 222 escalator support structures; 97 elevator shafts and support structures; 510,988 linear feet (LF) of tunnels; 603,398 LF of ROW security fencing and gates; 52,280 LF of yard security fencing and gates; 16 pedestrian tunnels; 11 bus garages; 175,551 LF of retaining walls; 28 parking garages; and 336 shaft structures.

The structural inspection group processes more than 3,000 inspection reports per year. It is from these reports that maintenance managers develop maintenance and capital programs, and infrastructure renewal project managers develop long range Capital Improvement Programs. Because of the lack of a complete asset list, it cannot be determined whether WMATA’s structures group has sufficient manpower or whether some assets are inspected per required cycles (see Findings below).

The structural field inspectors consist of 16 full-time inspectors; at the time of the review there was one vacancy. The field inspectors report directly to two Supervisors and one Manager, who in turn report to a Superintendent. Their inspection reports are submitted to supervision and one of two departmental support engineers for layers of review.

There is also a maintenance group that performs the respective repairs, headed by a Superintendent as well. There are two Assistance Superintendents who oversee four Maintenance Managers, 15 Supervisors (including two vacancies at the time of the review), and 104 union repairers. In addition, inspections may also be made in response to observations/reports from operations and maintenance personnel who indicate changed or unusual conditions in the system.

WMATA uses a Bridge Inspection Management software package from InspectTech, Inc. to streamline structural inspections and management processes and to improve data documentation. As of 2008, records are maintained electronically through the InspectTech web-based program. Inspectors print out the report template/checklist from InspectTech; guidance manuals and as-built drawings act as procedures and baselines for comparison. However, this software package that is intended for bridge inspections is also used for other structures, and WMATA uses a bridge inspection rating scale that

does not correspond properly with the conditions of other structures (see Finding below).

All of WMATA tunnels and structures are inspected by inspectors with at least NICET I certification and completion of the NHI two-week training course. The reports are also reviewed by a registered engineer.

## **Findings**

Required Actions to be discussed in FTA-TOC working group.

**Finding 1: WMATA's structures division has not been inspecting certain assets as often as required.** For example, WMATA requires each escalator structure to be inspected every two years, but TRST is only inspecting one escalator per set of escalators per year.

Required Actions:

- Conduct and submit an assessment to determine which assets, such as escalator shafts, are not being inspected as often as originally required and intended. Demonstrate regained compliance with the inspection frequency for these structures.

**Finding 2: Information on tunnel leaks is not regularly recorded or acted upon in a timely manner.**

Annual leak inspections have not occurred on time in recent years as a management decision due to manpower constraints, new fatigue management policy requirements, and capital work. WMATA reports that it believes track inspectors should be responsible for noting leaks, as they walk the system daily in comparison to a once per year "snapshot" that may change within weeks as a result of external factors. WMATA should ensure through integration into other regular, documented inspections that leaks are assessed and measured as needed to determine the need for intervention. This is especially pertinent given leak conditions at the site of the Jan. 12 L'Enfant Plaza smoke incident.

Required Actions:

- Revise track inspection procedures, documentation, and reporting processes to ensure that leak measuring and monitoring is a routine aspect of inspections in tunnels.

**Finding 3: Structures Maintenance Managers are not documenting quality control checks as required by the Maintenance Control Policy (MCP).** Although there is in-depth quality assurance, there should be quality control/spot checks of rules and work already conducted, with results and corrective actions documented by structures Maintenance Managers as required by the MCP.

Required Actions:

- Make the existing quality control check procedure more specific for the structures Maintenance Managers to conduct spot checks through field verification and to document results or corrective actions that are completed. Create a related checklist or form. Also complete one month of documented quality control checks as evidence.

**Finding 4: The Maintenance Control Policy (MCP) contains numerous outdated references and procedures.** WMATA requires the MCP be reviewed annually, though the last update was in February 2013. The current MCP mentioned previous inspection record systems and old procedure numbers. However, TRST management reported they were already revising the MCP at the time of this review.

Required Actions:

- Complete the MCP revision with full updates to references and procedures as necessary.

**Finding 5: There is not a complete asset list of structures.** A partial list in the MCP is outdated, and there is one in a Maintenance Plan dated 1979. WMATA personnel stated that their annual schedule is the list of assets and there is not a complete asset list showing the entire sub tasks and workload. An updated asset list can aide WMATA in determining how much workload TRST undertakes annually and whether it corresponds appropriately to personnel levels. Currently, TOC and WMATA are unable to determine whether existing manpower is sufficient without knowledge of how many assets must be inspected and how long it takes to inspect them. In addition, the lack of an asset list with respective inspection frequencies prevents verification that all necessary inspections exist in MAXIMO. The starting point of having a healthy inspection program is to know the complete set of assets in order to program the manpower and time resources required for inspections and corrective maintenance.

Required Actions:

- Create a complete asset list of WMATA structures along with details/characteristics relevant to maintenance.

**Finding 6: There is no work order connection between InspectTech findings and MAXIMO entries.** One cannot determine whether defects in inspection reports have been corrected or work orders have been created for the defects. WMATA should be able to verify whether action has been taken appropriately in response to defects, particularly those rating a level “5” or below. No technicians or managers should need to data mine to learn whether a defect has been corrected

Required Actions:

- Improve use of the InspectTech program to display the work order ticket number created in MAXIMO or note when no work order is needed, for each

deficiency noted in an inspection. Provide evidence of implementation showing clear connection to work orders created or the decision to take no further action.

**Finding 7: Defects listed on inspection reports are very general.** During a field observation of the Pentagon Tunnel, TOC observed that defects were not thoroughly documented in the report. Instead, they note one typical crack and describe it as a general defect throughout the asset. It is difficult to determine which cracks are new or enlarging and thus monitor the deterioration of the structure without detailed documentation of the defects.

Required Actions:

- Enhance written inspection procedures to require documentation of all the defects based on location and quantity (possibly as estimated overall linear footage per area of the asset) as a baseline so that the structure conditions can be compared over time and monitored for any deterioration requiring intervention.

**Finding 8: WMATA does not appear to have completed all required technical training for structural maintenance personnel.**

TTDC supplied a very well-organized spreadsheet depicting which courses are required for certain levels of structural repairers and inspectors. However, transcripts for selected employees show that most of the courses were not identified as completed.

Required Actions:

- Identify whether training is incomplete due to TTDC manpower constraints, the method to track training completion, or other factors; implement a solution to the issue such as additional training staff or use of training reminders in a Learning Management System.

**Finding 9: There is no specialized training for inspecting static structures.** In general, static buildings will have different signs of structural distress and deformation and loading on the structures. The inspectors should be able to identify critical areas for inspection, the allowable imposed loads, and other factors. The International Code Council offers national certification for commercial building inspectors and also provides study guides and webinars for the examination. Such courses include B2 – Commercial Building Inspector, S1 – Structural Steel and Bolting, 47 – Reinforced Concrete Inspector, and 84 – Structural Masonry. The ICC courses may be code-oriented for new construction, but understanding of the codes helps inspectors to differentiate whether defects are structural.

Required Actions:

- Provide training for structural inspectors in static building inspection, and establish a procedure and guidelines for reporting defects and recommending repairable items specific to static structures.

**Finding 10: There are no procedures that define the resources needed per task.** There are no written procedures to define how many hours and personnel are needed per task, type of tools needed, and how to safely access particular assets. TRST reported that it is compiling some of this information as part of a manpower assessment. Current informal estimates are based on experience but not industry standard or analysis of how long work should take.

Required Actions:

- Revise existing maintenance procedures or develop new ones to include information about hours and personnel numbers needed, tools, and access requirements.

**Finding 11: The FHWA 0-9 condition rating system and software package for bridges is also used for other structures.** The general component condition rating guidelines (obtained from the FHWA Coding Guide) are to be used in the evaluation of bridge components. There are no specific definitions or guidelines that correlate to rating the condition for structures other than bridges. In addition, WMATA is using a software package intended for bridge inspection management -- Bridge Inspection Management by InspectTech – for other structures.

Required Actions:

- Establish discrete definitions or guidelines on the rating scale for the condition of structures such as tunnels and passenger stations (all structures other than bridges), and institute software for inspection management that is appropriate for structures other than bridges.

**Persons Interviewed**

- [REDACTED] TRST
- [REDACTED] TTDC
- [REDACTED] TRST
- [REDACTED] TRST
- [REDACTED] TRST

- [REDACTED] TRST
- [REDACTED] TRST

## Documents Reviewed

- WMATA System Safety Program Plan, January 2014
- WMATA Tunnel Structural Inspection Checklist
- WMATA Station Structural Maintenance Inspection Checklist
- WMATA training plans, curricula and related materials for structural inspectors
- MAXIMO corrective maintenance work order for track
- Office of Track and Structures (TRST) Organization Chart
- QAAW maintenance audit reports
- MPLN Monthly Preventive Maintenance Summary, January 2015
- OAP 208-02 Structures Maintenance Management, Maintenance of Way
- WMATA Structural Maintenance Inspection Report (2014 & 2015) for Tunnels, Stations and Bridges
- WMATA Tunnel Leak Inspection Report (2012, 2013 & 2014)
- 2013 & 2014 WMATA TSSM/Rail Structure Inspection Schedule
- WMATA Track & Structures/TSSM Structure Maintenance and Inspection Manual
- WMATA Station Structure Maintenance Report (2014 & 2015) for Pentagon Tunnel, Pentagon City Station, and Stadium Armory (Aerial Structure #8 D&G Junction)
- WMATA Maintenance Plan for Metrorail Structures, March 1979
- 2014-2015 Structure Inspection Compliance Schedule
- WMATA Track & Structures/TSSM Structure Maintenance and Inspection Manual
- Condition Rating Code Guidelines of Inspection Branch – Structures (February 2012)