Washington Metropolitan Area Transit Authority

ANNUAL INTERNAL REVIEW 2017

Metrorail Tunnel Ventilation System: Mechanical Subsystem Maintenance

QICO Internal Review

June 9, 2017

Quality Assurance, Internal Compliance & Oversight (QICO)

"Quality Trumps Quantity"

QICO Comprehensive Internal Review

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Internal Review Summary

Why QICO Performed This Review:

- This internal review is intended to provide Metro senior management with an assessment of the state of the Tunnel Ventilation System and promote the actions needed to address any concerns.

- QICO is independent from the functions it oversees, authorized by the General Manager to conduct objective reviews with unrestricted access to all functions, records, assets and employees under its purview.

QICO's Methodology:

- Developed relevant review activities by identifying and assessing risks to quality of work, compliance with standards, records management, and safety.

- Reviewed maintenance documentation, observed maintenance and inspection work in-progress, and interviewed key personnel.

- Review findings and required actions are rated based on severity of risk, which ranges on a scale from "Insignificant" to "High."

Note: An itemized Corrective Action Plan (CAP) is developed for each required action to achieve effective and measureable resolution of identified concerns. To check the status of CAP implementation go to www.wmata.com/initiatives/transparency/.

June 2017

Metrorail Tunnel Ventilation Inspection

QICO's Review Results:

Improved Communication Between Asset Owners and Maintainers Can Produce More Efficient System Results

QICO's internal review identified and noted several **Wins (What Worked Well)** and **Areas for Improvement** requiring corrective actions:

- ✓ Fans and dampers at reviewed sites functioned as intended.
- ✓ Excellent housekeeping at reviewed sites.
- ✓ Preventive maintenance was properly scheduled
- Ineffective use of existing policies and processes to correct design and configuration issues with tunnel ventilation system components.
- Areas adjacent to PLNT workspaces were blocked by equipment and debris.
- Supervisor training should be updated to emphasize quality control responsibilities.
- The governing maintenance documents are not complete/approved.
- Lack of coordination between maintenance and engineering functions in maintenance documentation.
- Modification of maintenance records.
- Concerns with the quality of maintenance documentation.
- Underutilization of technology resources in maintenance documentation.
- Informal Lock Out - Tag Out (LOTO) procedures.

Required Actions:

- **QICO-TVS-17-01:** Establish clear policies for the storage and removal of equipment in work areas, incorporating processes for interdepartmental coordination required to complete maintenance activities. *(Risk Rating: Moderate)*

- **QICO-TVS-17-02:** Establish clear definitions of training requirements for maintenance and supervisory positions, including differences in roles and responsibilities and quality control measures. *(Risk Rating: Elevated)*

- **QICO-TVS-17-03:** Complete, update, and maintain governing maintenance documents to ensure appropriate engineering controls of maintenance activities. *(Risk Rating: High)*

- **QICO-TVS-17-04:** Perform an investigation into the generation of maintenance documentation, to include the items identified by QICO. This investigation must be completed by an appropriate authority not directly responsible for completing the work being investigated. *(Risk Rating: High)*

- **QICO-TVS-17-05:** Establish document control procedures to standardize the capture and storage of maintenance documentation. *(Risk Rating: Elevated)*

1 DEPARTMENT/FUNCTION OVERVIEW

Tunnel Ventilation System and Engineering Support

The Tunnel Ventilation System (TVS) is an important feature of the Metrorail system. The system consists of a network of fan shafts (consisting of multiple fans), vent shafts, and jet fans. It is designed to serve several major functions:

(1) Reduce excessive air movement within stations by provision of vent shafts at each end of each station.
(2) Maintain the temperature of the tunnel, by exhausting heat generated from the operation of trains.
(3) Remove smoke from the tunnels during emergencies, utilizing the combined system of fan shafts, vent shafts, and jet fans.

The removal of smoke from the tunnels during emergencies, (3), was not part of the original design criteria for the tunnel ventilation system. Recently there has been a push to update the system in order to meet the safety regulation standard NFPA 130 due to FTA, NTSB, and other regulatory required actions. NFPA 130 states the requirements for tunnel ventilation systems used in the event of a fire emergency.

There are two offices that work together in order to provide a properly functioning tunnel ventilation system: the Office of Engineering and Architecture (ENGA) and the Office of Plant Maintenance (PLNT). ENGA is responsible for providing the proper procedures and maintenance instructions for ensuring the ventilation system works as designed as well as provide engineering support to PLNT including but not limited to system design, equipment failure analysis, and instructional issues. PLNT is responsible for performing the procedures and maintenance tasks provided by ENGA to ensure the tunnel ventilation system is functioning as designed.

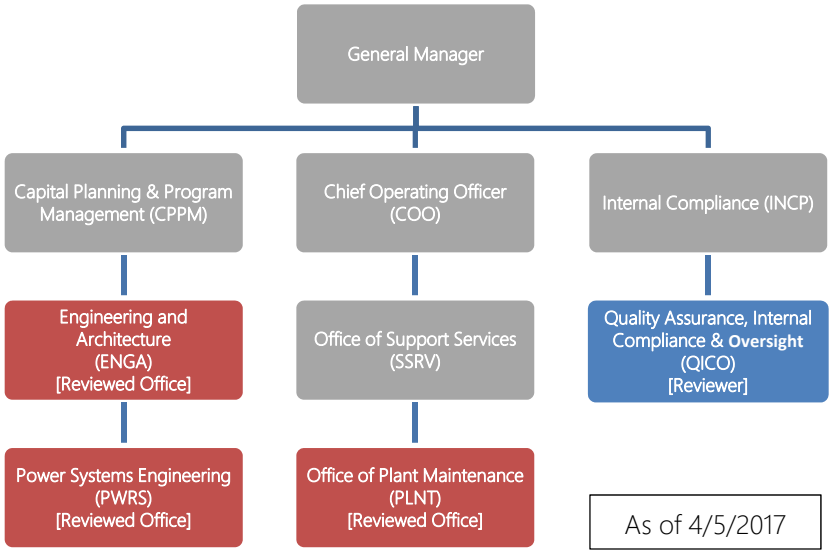
The intention of this internal review is to highlight areas of improvement necessary to ensure all tunnel ventilation systems are in proper working condition and maintenance tasks are conducted according to the appropriate standards and specifications. Additionally, this internal review will highlight areas of concern with regard to the poor communication between the ENGA and PLNT offices.

2 REVIEW METHODOLOGY

Review Stakeholders

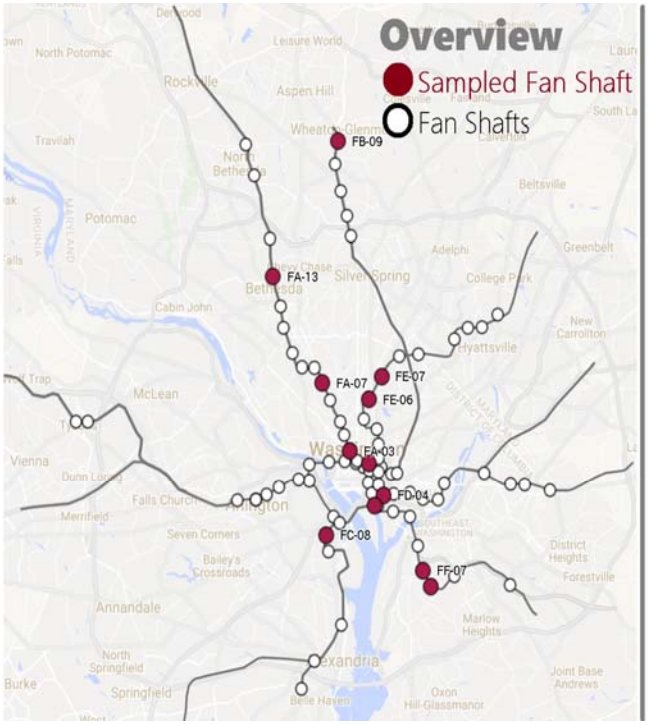
The Infrastructure Assurance branch of the Office of Quality, Internal Compliance and Oversight (QICO) conducted an internal review of the tunnel ventilation system maintenance group, which resides within the Office of Plant Maintenance (PLNT), and the asset owners, Engineering and Architecture (ENGA), responsible for providing engineering support and documentation. As shown in the org chart, QICO is entirely independent of these groups. QICO performed the internal review from February 2 – March 31, 2017.

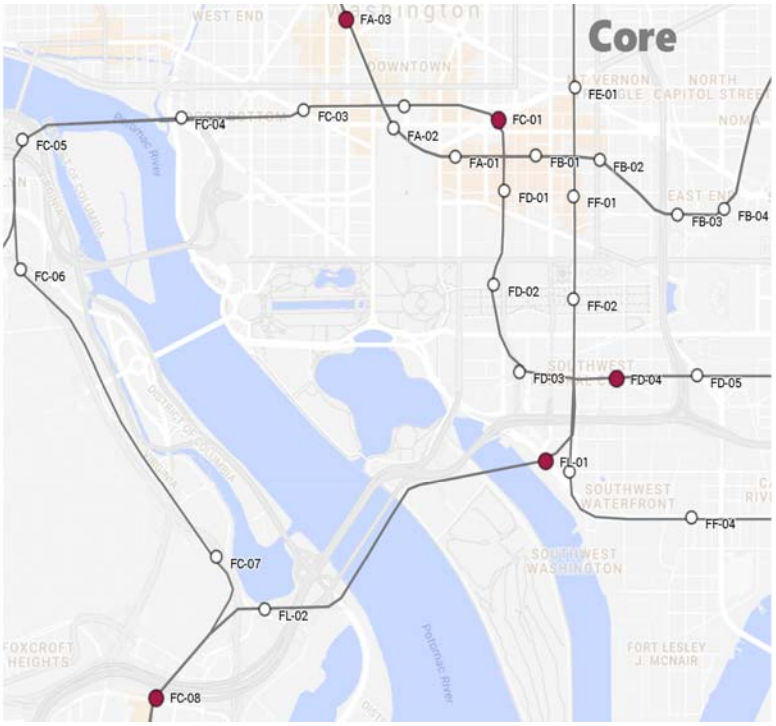
QICO reviewed documentation, interviewed personnel, and shadowed field visits for both PLNT and ENGA, noting both positive and negative findings. QICO's findings are categorized into four groups: **Quality of Work**, **Compliance with Standards**, **Records Management** and **Safety**. For each finding there is an associated **Recommendation** (a suggestion for improving a process based upon QICO's systematic review). Findings are combined into several **Required Actions**, which summarize the steps actions owners must take to address deficiencies.



2.1 REVIEW SCOPE

Category	Description
Review of Existing Documentation	ENGA: - Tunnel Ventilation reports and assessments (air flow, performance, etc.). - PLNT-1000 & PLNT-3000 Documents. - Best Practices and State of Good Repair document (not an official document). - Design Criteria and Specifications for Tunnel Fan Systems. PLNT: - Historical PMs/Checklists for the tunnel fans (6 months past) for all locations. - Tunnel Fan PM/Checklist templates for the various maintenance frequencies (i.e. Monthly, Annual). - O&M Manuals for all Tunnel Fan System components. - February and March schedules for all maintenance and inspection activities. - Tunnel Fan Student Guide for training of WMATA personnel on tunnel ventilation systems.
Interviews of Key Personnel	- Power Infrastructure Engineering (ENGA: PWRS): Engineering Manager [redacted] and Electrical Engineer SCADA [redacted] - Director, Plant Maintenance [redacted] and Superintendent, Plant Equipment Maintenance [redacted].
Shadowing Field Inspections and Business Processes	- Twelve different fan shafts throughout the Metrorail system (both in the core and on the system perimeter): FA3, FA7, FA13, FB9, FC1, FC8, FD4, FE6, FE7, FF7, FF8, and FL1 (as seen below). - PLNT maintenance checklists for the 12 visited sites were reviewed (from January 2014 to December 2016).





2.2 REVIEW CRITERIA

Quality Measures		Definition
Quality of Work	Workmanship	Qualitative or quantitative measurement of material characteristics of work performed.
	Performance of Work	Qualitative or quantitative measurement of actions taken to complete work.
	Housekeeping	Assessment of site conditions; i.e. work zone organization and clenliness.
	Quality Control Measures	Internal management controls that ensure the consistency and reliablilty of work performed.
	Materials and Tooling	Measureable properties of parts and tools used to perform work.
Compliance with Standards	Technical Specifications	Engineering requirements that outline the minimum requirements for material and workmanship standards.
	Business Practices	Formal documented standards governing business practices; i.e. P/I's, departmental policies, etc.
	Procedural Requirements	Formal documented standards that identify specific actions to be taken; i.e. who, what, when, where, how?
	Regulatory Findings	Findings issued by outside regulatory entities (FTA, NTSB, GAO) that generate recommendations or required actions.
	Internal Findings	Findings issued by internal oversight entities (OIG, QICO, SAFE) that generate recommendations or required actions.
Records Management	Work Order Management	Protocols established to control maintenance scheduling, documentation, and tracking.
	Processes	Documented requirements for departmental activites.
	Records Storage and Retention	Documented requirements for the maintenance of records and documentation.
Safety	RWP	Documented requirements for work zone setup and personal protective equipment.
	Applicable Job Safety Requirements	Any documented safety requirements that apply to specific work performed.

2.3 RISK ASSESSMENT SUMMARY

Note: Findings and required actions are rated based on severity of risk. Refer to Appendix A (Risk Assessment) for details.

Definitions

Insignificant	Low	Moderate	Elevated	High
Reasonable assumption that this risk will not occur and unlikely to cause the activity to fail to meet part of its objective	Reasonable assumption that this risk will likely not occur & may cause a failure of the business process to meet part of its objectives	Reasonable assumption that this risk may occur & may cause a failure of the business process to meet a significant part of its objectives	Reasonable assumption that this risk will likely occur & likely to cause a failure of the business process to meet a significant part of its objectives	Reasonable assumption that this will occur & will cause a failure of the business process to meet its objectives or cause objective failure in other activities

3 WHAT WORKED WELL?

Measure	Finding	Description
Safety	Fans and dampers at 12 reviewed sites functioned as intended.	- QICO performed site visits to 12 locations and found no fire and life safety critical items that required immediate action. PLNT maintenance personnel were extremely knowledgeable of tunnel ventilation equipment and understood the processes and procedures to maintain their functionality over long periods of time. QICO observed many occasions where PLNT maintenance personnel would work quickly to repair any damaged or broken equipment, with success each time. *(Source: Information gathered from sampled fan shaft visits.)*
Quality of Work	Housekeeping in PLNT workspaces was excellent at reviewed sites.	- After performing site visits to the 12 fan shaft locations and their associated vent shafts, QICO was impressed at the cleanliness of each site. Only minor trash and debris were observed at a few sites. It is clear that PLNT maintenance crews are vigilant when it comes to keeping their areas of work as spotless as possible. *(Source: Information gathered from sampled fan shaft visits.)*
Records Management	Preventive maintenance was scheduled using WMATA's enterprise asset management system (Maximo).	- QICO observed that preventive maintenance was properly scheduled using Maximo. QICO was able to use the Maximo scheduling to accompany field inspections for 12 fan shafts. *(Source: Information gathered from PLNT maintenance checklists and Maximo review.)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on the associated risk to organization's objectives, provided as *Type of Risk* followed by Risk Severity (Impact rating, Probability rating) Color Coding.
Refer to Appendix A: **Risk Assessment** for further details

Measure	Finding	Description
Quality of Work	F-TVS-17-01: There is an ineffective use of policies and processes already in place to correct design and configuration issues with tunnel ventilation system components. *Governance Risk* Elevated (3,3)	- PLNT maintenance crews perform field inspections each month, populating a checklist with their findings as they relate to mechanical equipment in the tunnel ventilation system. These findings are not passed on to ENGA, as they are often fixed immediately. However, many of these issues are indicative of a greater problem with configuration control. - For specific examples observed by QICO, see Appendix B. Recommended Action: Ensure PLNT personnel understand and follow the policies and processes currently in place to correct design and configuration issues making sure to involve ENGA when making any modifications to the Tunnel Ventilation System. *(Source: Information gathered from sampled fan shaft visits and PLNT maintenance checklists review.)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on the associated risk to organization's objectives, provided as *Type of Risk* followed by Risk Severity (Impact rating, Probability rating) Color Coding.
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Measure	Finding	Description
Quality of Work	F-TVS-17-02: Equipment and debris was observed adjacent to PLNT work areas, impeding access to complete critical ventilation maintenance. *Safety Risk* Moderate (3,3)	- QICO observed many instances where other departments have left work equipment that obstructs PLNT maintenance crew's ability to perform maintenance tasks. Additionally, trash and debris have been left behind by other groups for PLNT to clean up. - For specific examples observed by QICO, see Appendix B. Recommended Action: Establish clear policy and protocols for the storage and removal of equipment in work areas, to include methods for communication in the event stored materials prevent completion of critical maintenance activities. *(Source: Information gathered from sampled fan shaft visits and conversations with PLNT maintenance personnel.)*
Quality of Work	F-TVS-17-04: Supervisors receive the same technical training as maintenance personnel. This training should be updated to emphasize the supervisory role and associated quality control responsibilities. *Operational Risk* Elevated (3,5)	- Currently supervisors and maintenance personnel take the same course when joining PLNT. - QICO found that PLNT SOP 209-07 requires a minimum of two (2) QC inspections per week, selected randomly from all assigned equipment assets (i.e. not just tunnel fans). It is QICO's point of view that all assets should be quality checked on a routine basis to ensure the reliability of all maintained assets. - For more information, see Appendix C. Recommended Action: Establish training requirements and programs for supervisory positions to ensure clear understanding of roles and responsibilities, specifically with regards to quality control. This should include a requirement for minimum number of quality checks for each equipment or system. *(Source: Information gathered from sampled fan shaft visits and interview with PLNT Director and Superintendent of Equipment Maintenance.)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on the associated risk to organization's objectives, provided as *Type of Risk* followed by Risk Severity (Impact rating, Probability rating) Color Coding.
Refer to Appendix A: **Risk Assessment** for further details

Measure	Finding	Description
Compliance with Standards	F-TVS-17-05: The governing maintenance document produced by ENGA for PLNT has not been completed. *Governance Risk* Moderate (3,3)	- The PLNT-3000 document is an important part to the preventive maintenance tasks performed by PLNT personnel. The PLNT-3000 will detail work to be performed that will ensure the longevity of tunnel ventilation systems. QICO reached out to ENGA and was informed that the PLNT-3000 document is currently being written and a draft will be sent out for review by PLNT at the beginning of April 2017. Recommended Action: Complete and maintain all governing maintenance instructions for PLNT (i.e. PLNT-1000, 3000, etc.), distribute to essential stakeholders when approved, and develop implementation plans for updated procedures/processes. *(Source: Information gathered from ENGA document reviews and interview with ENGA engineers, Engineering Manager and Electrical Engineer SCADA.)*
Compliance with Standards	F-TVS-17-06: PLNT is using their preventive maintenance form when conducting an assessment of the PLNT-1000 provided by ENGA. *Governance Risk* Elevated (3,3)	- PLNT personnel were using PLNT Form 209-1571, which is a document created, revised, and used by PLNT. The PLNT Form 209-1571 is the only document taken with PLNT maintenance crews when completing preventive maintenance. QICO questioned ENGA engineers, Engineering Manager and Electrical Engineer SCADA, about this form and was told they were not aware of this approved form. - PLNT personnel must use the checklists created by ENGA (found in the PLNT-1000 and PLNT-3000) when conducting an assessment on preventive maintenance forms for tunnel ventilation. QICO observed in the field that PLNT personnel were using PLNT Form 209-1571 then checking off items in the PLNT-1001 checklist that had been completed. - QICO understands that the PLNT-1001 checklist does not contain enough of the required preventive maintenance instructions to complete a typical monthly inspection; this should be corrected once the PLNT-3000 becomes available. Recommended Action: Establish written requirements for conducting document assessments with regard to preventive maintenance ensuring the document under review is used first in order to spot any deficiencies more effectively. *(Source: Information gathered from the review of PLNT and ENGA documents and interview with ENGA engineers, Engineering Manager and Electrical Engineer SCADA.)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on the associated risk to organization's objectives, provided as *Type of Risk* followed by Risk Severity (Impact rating, Probability rating) Color Coding.
Refer to Appendix A: **Risk Assessment** for further details

Measure	Finding	Description
Records Management	F-TVS-17-07: Accuracy of Forms – QICO identified several instances of maintenance record modification. *Operational Risk* High (4,5)	- QICO reviewed PM checklists for the 12 reviewed sites (going back to 2014) and discovered four reports (work order numbers: 11428620, 11395737, 11395465, & 11451733) that showed the PM was completed before the PM form existed. The PM form creation date is captured in the bottom right corner of the document next to the form name. QICO received all PM form revisions from a technical writer in PLNT confirming that the date on the lower right hand corner was the inception date. Recommended Action: Perform an investigation into the generation of maintenance documentation, to include the items identified by QICO. This investigation must be completed by an appropriate authority not directly responsible for completing the work being investigated. *(Source: Information gathered from the review of PLNT preventive maintenance checklists for the 12 fan shafts sampled.)*
Records Management	F-TVS-17-08: *Documentation Quality Concern #1*: Validity of Forms - Many Preventive Maintenance (PM) forms have no comments or condition assessments for consecutive months. *Operational Risk* Moderate (3,4)	- QICO found multiple PM forms submitted by PLNT maintenance crews that had no comments, or any other indication on the material condition of the equipment. QICO considered this a discrepancy when consecutive months of PM forms reviewed contained no comments. Recommended Action: Provide a means of capturing the condition of assets maintained within PM forms. *(Source: Information gathered from the review of PLNT preventive maintenance checklists for all sites.)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on the associated risk to organization's objectives, provided as *Type of Risk* followed by Risk Severity (Impact rating, Probability rating) Color Coding.
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Measure	Finding	Description
Records Management	F-TVS-17-09: *Documentation Quality Concern #2*: Consistency of Forms – 1. Illegible photocopied PM forms. 2. Inconsistent nomenclature used to fill out PM forms. *Governance Risk* Moderate (3,4)	1. QICO found several cases where it was impossible to read comments that were written down on the PM forms. Information contained in these PM forms that are illegible cannot be used. 2. QICO discovered multiple PM forms with inconsistent vent shaft identification (e.g. VA1 will be written incorrectly as VS1). QICO also found a different vent shaft was checked by maintenance personnel that was not the same vent shaft checked in the months prior and proceeding. Recommended Action: Establish clear practices for the distribution and quality control of PM forms, including requirements for digital vs. physical copies and supervisory checks of completed forms to ensure they are valid, accurate, consistent, relavent, & complete. *(Source: Information gathered from the review of PLNT preventive maintenance checklists for all sites.)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on the associated risk to organization's objectives, provided as *Type of Risk* followed by Risk Severity (Impact rating, Probability rating) Color Coding.
Refer to Appendix A: **Risk Assessment** for further details

Measure	Finding	Description
Records Management	F-TVS-17-10: *Documentation Quality Concern #3*: Completeness of Forms – 1. PM checklists are not complete; tasks have no marks indicating a task was completed and tasks have been marked "N/A" without explanation. 2. PM checklists are missing work order numbers. 3. Annual PM checklists are missing fan amperage information. *Governance Risk* Elevated (4,4)	1. QICO found multiple Preventive Maintenance (PM) forms where tasks were not marked complete and where "N/A" was written. All tasks must be completed during preventive maintenance inspection and testing and any task marked "N/A" must have a comment stating why this task does not apply for that location. Often "N/A" was written for tasks that dealt with pneumatics, tasks 90, 100, & 110 on the PLNT Form 209-1571 (07/01/2016). 2. QICO noted instances where comments were made stating that equipment was inoperable, needed replacement, or "will come back later to fix," but no work order number was listed. Without the work order number it is impossible to track work that needs to be completed. QICO observed cases where the same issue would be written for consecutive months without a work order. 3. During annual preventive maintenance of the tunnel fan amperage readings are required to be checked and recorded from tunnel fan motors, (task 240 on PLNT Form 209-1571) (07/01/2016). QICO discovered several cases where fan amperage readings were missing. Additionally, the form only has a small area where the mechanic can write these readings. Some preventive maintenance forms had a separate readings sheet attached, but this is not an ENGA approved form. Recommended Action: Standardize an amperage reading form for incorporation into PM documentation to ensure maintenance data is captured consistently, and incorporate supervisory checks of completed documentation. *(Source: Information gathered from the review of PLNT preventive maintenance checklists for all sites.)*

4 AREAS FOR IMPROVEMENT

Note: Findings are rated based on the associated risk to organization's objectives, provided as *Type of Risk* followed by Risk Severity (Impact rating, Probability rating) Color Coding.
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Measure	Finding	Description
Records Management	F-TVS-17-11: The enterprise asset management database (Maximo) does not contain preventive maintenance checklists or tasks completed. *Technological Risk* Elevated (4,3)	- QICO found that the Maximo database contained no records of tasks completed nor comments from maintenance crews. Additionally, preventive maintenance checklists provided to QICO were entirely in paper form. Most checklists have not been scanned and stored into a database. The only information provided to QICO via Maximo were dates and labor hours. In talks with both PLNT (Director of PLNT and Superintendent of Equipment Maintenance) and ENGA (Engineering Manager and Electrical Engineer SCADA), QICO was told that this would not be an issue once mobile Maximo was released (this is a submittal for FTA CAP R-6-36-b). PLNT also stated that some of the preventive maintenance checklists are stored electronically in the PLNT department shared drive. Recommended Action: Establish written requirements to capture and store documentation of completed maintenance, exploring the possibility of utilizing the enterprise asset management database (Maximo). *(Source: Information gathered from the review of PLNT preventive maintenance checklists for all sites and sampling of Maximo work orders.)*
Safety	F-TVS-17-12: Lock Out - Tag Out (LOTO) procedures are informal and inconsistently applied when removing electrical power sources for maintenance activities. *Operational Risk* High (4,5)	- QICO observed PLNT maintenance crews performing LOTO procedure inconsistently. Some crews would perform LOTO as understood in training materials (OSHA 1910.147), other crews were observed de-energizing the breaker by pulling the levers to turn the power off at the Motor Control Center (MCC) and fan motor disconnects but attachment of a locking mechanism was not observed. Recommended Action: Establish written requirements for removing electrical power for maintenance activities not associated with traction power systems, to include specific instructions for LOTO of circuit breakers and electrical disconnects. These requirements must conform to OSHA requirements under section 1910.147. *(Source: Information gathered from sampled fan shaft visits.)*

5 OTHER OBSERVATIONS

Measure	Finding	Description
Quality of Work	F-TVS-17-03: Uncontrolled document *Tunnel Fan Student Guide* is being used by PLNT for personnel training.	- QICO reviewed the *Tunnel Fan Student Guide*, which is a training manual used to teach both supervisors and maintenance personnel the following: 1. *Familiarize General Equipment Mechanic (GEM), Industrial Control Technicians (ICT), and other WMATA authorized personnel with WMATA Tunnel Fan Systems and Operations.* 2. *Examine system configuration, areas of responsibility, PPE requirements, and site access procedures.* 3. *Equip the WMATA personnel (GEMs) to complete the Preventive Maintenance Inspection (PMI) of the fan system on a monthly and yearly basis as required.* 4. *WMATA personnel to be able to competently handle basic maintenance issues and repairs of the fan system. They will gain knowledge on the working of the system components and to identify faults if the desired action fails to occur.* - This document is in its fourth revision since inception (12/29/14) and states that it is an uncontrolled document for training purposes only. The understanding is that the course is developed by [redacted] and feedback has been given by PLNT to create the revisions to the training. There is no indication that ENGA had any input on what maintenance personnel are learning in order to maintain the tunnel ventilation systems. Action Taken: Immediate action was taken to correct this finding on the same day reported (4/12/17).

6 SUMMARY OF REQUIRED ACTIONS

Note: Findings are rated based on the associated risk to organization's objectives, provided as *Type of Risk* followed by Risk Severity (Impact rating, Probability rating) Color Coding.
Refer to Appendix A: **Risk Assessment** for further details

Required Action	Finding		Owner
QICO-TVS-17-01: Establish clear policies for the storage and removal of equipment in work areas, incorporating processes for interdepartmental coordination required to complete maintenance activities. Moderate	F-TVS-17-01	There is an ineffective use of policies and processes already in place to correct design and configuration issues with tunnel ventilation system components.	PLNT
	F-TVS-17-02	Equipment and debris was observed adjacent to PLNT work areas, impeding access to complete critical ventilation maintenance.	SSRV
QICO-TVS-17-02: Establish clear definitions of training requirements for maintenance and supervisory positions, including differences in roles and responsibilities and quality control measures. Elevated	F-TVS-17-04	Supervisors receive the same technical training as maintenance personnel. This training should be updated to emphasize the supervisory role and associated quality control responsibilities.	OPMS
QICO-TVS-17-03: Complete, update, and maintain governing maintenance documents to ensure appropriate engineering controls of maintenance activities. High	F-TVS-17-05	The governing maintenance document produced by ENGA for PLNT has not been completed.	ENGA
	F-TVS-17-06	PLNT is using their preventive maintenance form when conducting an assessment of the PLNT-1000 provided by ENGA.	PLNT
	F-TVS-17-12	Lock Out - Tag Out (LOTO) procedures are informal and inconsistently applied when removing electrical power sources for maintenance activities.	ENGA
QICO-TVS-17-04: Perform an investigation into the generation of maintenance documentation, to include the items identified by QICO. This investigation must be completed by an appropriate authority not directly responsible for completing the work being investigated. High	F-TVS-17-07	Accuracy of Forms – QICO identified several instances of maintenance record modification.	COO

6 SUMMARY OF REQUIRED ACTIONS

Note: Findings are rated based on the associated risk to organization's objectives, provided as *Type of Risk* followed by Risk Severity (Impact rating, Probability rating) Color Coding.
Refer to Appendix A: **Risk Assessment** for further details

Required Action	Finding		Owner
QICO-TVS-17-05: Establish document control procedures to standardize the capture and storage of maintenance documentation. Elevated	F-TVS-17-08	*Documentation Quality Concern #1*: Validity of Forms - Many Preventive Maintenance (PM) forms have no comments or condition assessments for consecutive months.	ENGA
	F-TVS-17-09	*Documentation Quality Concern #2*: Consistency of Forms – 1. Illegible photocopied PM forms. 2. Inconsistent nomenclature used to fill out PM forms.	PLNT
	F-TVS-17-10	*Documentation Quality Concern #3*: Completeness of Forms – 1. PM checklists are not complete; tasks have no marks indicating a task was completed and tasks have been marked "N/A" without explanation. 2. PM checklists are missing work order numbers. 3. Annual PM checklists are missing fan amperage information.	ENGA
	F-TVS-17-11	The enterprise asset management database (Maximo) does not contain preventive maintenance checklists or tasks completed.	SSRV

These required actions are composed of corresponding findings and recommendations listed in the previous sections of this document. Response to these items is required within 30 days of this report's publication, including assignment of action owners, proposed actions, and estimated completion dates. QICO will provide any additional guidance and/or clarification necessary through the development of corrective action plans (CAPs).

7 CORRECTIVE ACTION PLANS

INTERNAL REVIEW

Metro's Tunnel Ventilation System: Mechanical Subsystem Maintenance

In response to the internal review report for Metrorail Tunnel Ventilation System: Mechanical Subsystem Maintenance dated April 10, 2017 QICO has coordinated with Operations and Engineering departments to develop five (5) comprehensive CAPs. Each CAP outlines the findings, requirements and recommendations addressed, and a detailed action plan outlining responsible parties and specific actionable items.

EXECUTIVE LEADERSHIP OF RESPONSIBLE PARTIES

Corrective Action Plan (CAP) Commitment

[redacted] 6/7/17

Joseph Leader — *Date*

Chief Operating Officer (COO)

WMATA INTERNAL OVERSIGHT

Corrective Action Plan (CAP) Acknowledgement

[redacted] 06/07/17

Angel Peña — *Date*

Managing Director, Quality Assurance, Internal Compliance & Oversight (QICO)

[redacted] 6/8/17

Eric Christensen — *Date*

Chief, Internal Compliance (INCP)

[redacted] 6/9/17

Paul J. Wiedefeld — *Date*

General Manager & Chief Executive Officer (GM/CEO)

CORRECTIVE ACTION PLAN

Purpose and Scope

On April 10, 2017 QICO issued an internal review report for Metrorail Tunnel Ventilation System: Mechanical Subsystem Maintenance. This Corrective Action Plan (CAP) has been developed to address the following findings and required action per **QICO-TVS-17-01**.

QICO Finding	QICO Recommendation
F-TVS-17-01: There is an ineffective use of policies and processes already in place to correct design and configuration issues with tunnel ventilation system components.	- Ensure PLNT personnel understand the policies and processes currently in place to correct design and configuration issues making sure to involve ENGA when making any modifications to the Tunnel Ventilation System.
F-TVS-17-02: Equipment and debris was observed adjacent to PLNT work areas, impeding access to complete critical ventilation maintenance.	- Establish clear policy and protocols for the storage and removal of equipment in work areas, to include methods for communication in the event stored materials prevent completion of critical maintenance activities.

Required Action

QICO-TVS-17-01: Establish clear policies for the storage and removal of equipment in work areas, incorporating processes for interdepartmental coordination required to complete maintenance activities.

(Risk Rating: Moderate)

Plan Description

F-TVS-17-01: Formal requirements for communicating with ENGA are identified in P/I 4.10/4, "Configuration Control Management" and P/I 4.14.3, "Design Control Board". In addition, PLNT participates in the ENGA-designed Problem Statement process and is a sitting member of the Configuration Control Board.

F-TVS-17-02: For the past several years, PLNT has scheduled a quarterly housekeeping campaign during which employees remove debris/equipment from rail stations, including tunnel areas. In addition, on a routine basis when these obstacles are observed, PLNT employees remove them or contact the responsible office to remove them. PLNT will develop a draft housekeeping bulletin based on MSRPH- section 4 paragraph F for the COO's signature. In addition the new PLNT 3000 will have a section to address housekeeping which focuses on areas of rescue, egress, and general access rooms and addresses methods for communication between departments.

Business Impact – Budget/Cost Estimate

- **Process Improvement** – A current process/procedure needs to be optimized to address the QICO Required Action. This type of initiative does not need additional resources because current manpower will be used to improve the process. No impact to budget.

PLAN SCHEDULE

Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	P/I Updates	P/I 4.10/4, "Configuration Control Management" and P/I 4.14/3, "Design Control Board. Policy governing creation of Problem Statements from PLNT to ENGA	Hiten Patel (ENGA)	05/18/17	08/21/17
2	PLNT Supervisor P/I Acknowledgement	Memorandum notice that P/I 4.10/4 and P/I 4.14/3 are the governing policy for communication between PLNT and ENGA regarding configuration issues.	Paul Kram (PLNT)	05/18/17	08/21/17
3	PLNT 3000	The PLNT 3000 shall be modified to include housekeeping procedures to ensure tunnel fan and vent shafts and fan areas remain clear and free of debris.	Paul Petersen (ENGA)	05/18/17	07/05/17
4	Housekeeping Bulletin	PLNT will develop a draft housekeeping bulletin based on MSRPH – section 4 paragraph F – for the COO's signature and distribution.	Paul Kram (PLNT)	05/18/17	07/13/17
5	QICO CAP Verification Report	QICO will evaluate actionable items submitted to confirm there is reasonable evidence that the findings and this required action have been resolved, taking into account the actionable item descriptions and performance measures.	QICO	08/21/17	10/06/17

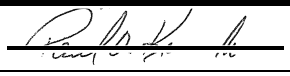
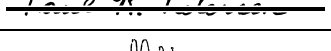
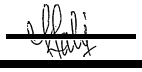
**In the event of personnel or departmental changes, responsibilities for actionable items shall transfer to the new leadership.*

COMPLETION DOCUMENTATION

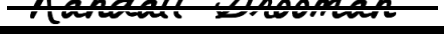
Performance Measures

- 100% of PLNT Supervisors signature acknowledgement of revised P/I 4.10 & 4.14.
- Signature acknowledgement of Housekeeping Bulletin from AGM Rail Services and Managing Director SSRV.

RESPONSIBLE PARTIES

PLNT	Paul Kram	
ENGA	Paul Petersen	
ENGA	Hiten Patel	

SECOND LEVEL RESPONSIBILITY

MD SSRV	Randall Grooman	

CORRECTIVE ACTION PLAN

Purpose and Scope

On April 10, 2017 QICO issued an internal review report for Metrorail Tunnel Ventilation System: Mechanical Subsystem Maintenance. This Corrective Action Plan (CAP) has been developed to address the following finding and required action per **QICO-TVS-17-02**.

QICO Finding	QICO Recommendation
F-TVS-17-04: Supervisors receive the same technical training as maintenance personnel. This training should be updated to emphasize the supervisory role and associated quality control responsibilities.	- Establish training requirements and programs for supervisory positions to ensure clear understanding of roles and responsibilities, specifically with regards to quality control. This should include a requirement for minimum number of quality checks for each equipment or system.

Required Action

QICO-TVS-17-02: Establish clear definitions of training requirements for maintenance and supervisory positions, including differences in roles and responsibilities and quality control measures.

(Risk Rating: Elevated)

Plan Description

F-TVS-17-04: The requirement for PLNT supervisors to perform QC inspections is identified in PLNT SOP 209-07, "Prioritization and Documentation of Maintenance Work," Section 7.5. PLNT will coordinate with OPMS to build upon that curriculum to focus on PLNT specific requirements.

Business Impact – Budget/Cost Estimate

- **Process Improvement** – A current process/procedure needs to be optimized to address the QICO Required Action. This type of initiative does not need additional resources because current manpower will be used to improve the process. No impact to budget.

PLAN SCHEDULE

Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	Revised PLNT SOP 209-07	PLNT SOP 209-07 section 7.5 of this SOP requires supervisors to perform a minimum of 2 QC inspections per week on completed PMs, selected randomly from all mechanical equipment assets.	Paul Kram (PLNT)	05/15/17	06/29/17
2	Training Curriculum	OPMS has developed a 1-day quality control class for supervisors; PLNT will coordinate with OPMS to build upon that curriculum to focus on PLNT specific equipment.	Linda Stoffregen (OPMS)	05/15/17	07/14/17
3	ELM Report	ELM Report: PLNT Supervisors attend updated quality control class.	Linda Stoffregen (OPMS)	07/15/17	08/15/17
4	QICO CAP Verification Report	QICO will evaluate actionable items submitted to confirm there is reasonable evidence that the findings and this required action have been resolved, taking into account the actionable item descriptions and performance measures.	QICO	08/15/17	09/13/17

**In the event of personnel or departmental changes, responsibilities for actionable items shall transfer to the new leadership.*

COMPLETION DOCUMENTATION
Performance Measures
- 95% of PLNT Supervisors complete quality control class.

RESPONSIBLE PARTIES		
PLNT	Paul Kram	
OPMS	Linda Stoffregen	

SECOND LEVEL RESPONSIBILITY		
MD SSRV	Randall Grooman	Randall Grooman

CORRECTIVE ACTION PLAN

Purpose and Scope

On April 10, 2017 QICO issued an internal review report for Metrorail Tunnel Ventilation System: Mechanical Subsystem Maintenance. This Corrective Action Plan (CAP) has been developed to address the following findings and required action per **QICO-TVS-17-03**.

QICO Finding	QICO Recommendation
F-TVS-17-05: The governing maintenance document produced by ENGA for PLNT has not been completed.	- Complete and maintain all governing maintenance instructions for PLNT (i.e. PLNT-1000, 3000, etc.), distribute to essential stakeholders when approved, and develop implementation plans for updated procedures/processes.
F-TVS-17-06: PLNT is using their preventive maintenance form when conducting an assessment of the PLNT-1000 provided by ENGA.	- Establish written requirements for conducting document assessments with regard to preventive maintenance ensuring the document under review is used first in order to spot any deficiencies more effectively.
F-TVS-17-12: Lock Out - Tag Out (LOTO) procedures are informal and inconsistently applied when removing electrical power sources for maintenance activities	- Establish written requirements for removing electrical power for maintenance activities not associated with traction power systems, to include specific instructions for LOTO of circuit breakers and electrical disconnects. These requirements must conform to OSHA requirements under section 1910.147.

Required Action

QICO-TVS-17-03: Complete, update, and maintain governing maintenance documents to ensure appropriate engineering controls of maintenance activities.

(Risk Rating: High)

Plan Description

F-TVS-17-05: ENGA is in the process of completing the PLNT-3000. A draft was completed Friday 04/21/17, then PLNT will be given an opportunity to add their comments and suggestions.

F-TVS-17-06: PLNT personnel will use the PLNT-1000 (and PLNT-3000 when available) checklists as their main preventive maintenance document. PLNT will continue to use Form 209-1571 as a supplemental form until the PLNT-1000 (and PLNT-3000) is updated.

F-TVS-17-12: On April 14, 2017 PLNT Director transmitted to PLNT/EQMT managers and supervisors the requirement to discuss PLNT safety bulletin 2016-01 with their crews on LOTO procedures, and to ensure with their crews were in possession of LOTO devices. PLNT will send all general equipment mechanics to SAFE's LOTO training. PLNT issued a safety bulletin with regard to the LOTO procedures. As per OSHA 1910.147 personnel are required to be retrained when they are observed not performing LOTO in accordance to the standards.

Business Impact – Budget/Cost Estimate

- **Process Improvement** – A current process/procedure needs to be optimized to address the QICO Required Action. This type of initiative does not need additional resources because current manpower will be used to improve the process. No impact to budget.

PLAN SCHEDULE

Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	PLNT-3000 Final	Governing maintenance document required to complete preventive maintenance that has gone through approval process.	Paul Petersen (ENGA)	04/25/17	07/05/17
2	Revised PLNT 209-1571 Checklist	PLNT 209-1571 checklist will be used as the primary preventive maintenance document in order to provide ENGA with proper feedback for updating preventive maintenance forms. This will be done when MOC is set up for testing and both PLNT-1000 & PLNT-3000 checklists are approved.	Paul Kram (PLNT)	07/05/17	08/04/17
3	LOTO Training and Checklist	PLNT will re-train all general equipment mechanics in Lock-Out-Tag-Out (LOTO) requirements and provide a checklist for use in LOTO activities.	Paul Kram (PLNT)	05/24/17	07/24/17
4	QICO CAP Verification Report	QICO will evaluate actionable items submitted to confirm there is reasonable evidence that the findings and this required action have been resolved, taking into account the actionable item descriptions and performance measures.	QICO	08/05/17	10/05/17

**In the event of personnel or departmental changes, responsibilities for actionable items shall transfer to the new leadership.*

COMPLETION DOCUMENTATION

Performance Measures

- 100% compliance with checklist use requirements as identified in QICO field verification activities.
- 95% of PLNT general equipment mechanics complete LOTO training.

RESPONSIBLE PARTIES

PLNT	Paul Kram	
ENGA	Paul Petersen	

SECOND LEVEL RESPONSIBILITY

MD SSRV	Randall Grooman	Randall Grooman

CORRECTIVE ACTION PLAN

Purpose and Scope

On April 10, 2017 QICO issued an internal review report for Metrorail Tunnel Ventilation System: Mechanical Subsystem Maintenance. This Corrective Action Plan (CAP) has been developed to address the following finding and required action per **QICO-TVS-17-04**.

QICO Finding	QICO Recommendation
F-TVS-17-07: Accuracy of Forms – QICO identified several instances of maintenance record modification.	- Perform an investigation into the generation of maintenance documentation, to include the items identified by QICO. This investigation must be completed by an appropriate authority not directly responsible for completing the work being investigated.

Required Action

QICO-TVS-17-04: Perform an investigation into the generation of maintenance documentation, to include the items identified by QICO. This investigation must be completed by an appropriate authority not directly responsible for completing the work being investigated.

(Risk Rating: High)

Plan Description

F-TVS-17-07: Quality Assurance, Internal Compliance & Oversight (QICO) will establish an experienced team to perform the investigation. Following the results of the investigation QICO and PLNT will work with Labor and Human Resource departments to address any disciplinary actions if required.

Business Impact – Budget/Cost Estimate

- **Process Execution** – A current process/procedure exists that meets the QICO Required Action, but needs to be executed. This type of initiative does not need additional resources.

PLAN SCHEDULE

Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	Investigation Report	Investigation into the generation of maintenance documentation, including work order numbers: (11428620, 11395737, 11395465, and 11451733). Investigation report detailing the findings and recommendations for improvement.	QICO	05/15/17	06/27/17
2	Resulting Actions	Implementation plan detailing management actions to be taken in response to the investigation report's findings and recommendations.	Paul Kram (PLNT)	06/27/17	07/27/17
3	QICO CAP Verification Report	QICO will evaluate actionable items submitted to confirm there is reasonable evidence that the findings and this required action have been resolved, taking into account the actionable item descriptions and performance measures.	QICO	07/27/17	10/05/17

**In the event of personnel or departmental changes, responsibilities for actionable items shall transfer to the new leadership.*

COMPLETION DOCUMENTATION

Performance Measures

- Implementation of recommendations from investigation results.

RESPONSIBLE PARTIES		
PLNT	Paul Kram	

SECOND LEVEL RESPONSIBILITY		
MD SSRV	Randall Grooman	Randall Grooman

CORRECTIVE ACTION PLAN

Purpose and Scope

On April 10, 2017 QICO issued an internal review report for Metrorail Tunnel Ventilation System: Mechanical Subsystem Maintenance. This Corrective Action Plan (CAP) has been developed to address the following findings and required action per **QICO-TVS-17-05**.

QICO Finding	QICO Recommendation
F-TVS-17-08: *Documentation Quality Concern #1:* Validity of Forms - Many Preventive Maintenance (PM) forms have no comments or condition assessments for consecutive months.	- Provide a means of capturing the condition of assets maintained within PM forms.
F-TVS-17-09: *Documentation Quality Concern #2:* Consistency of Forms – 1. Illegible photocopied PM forms. 2. Inconsistent nomenclature used to fill out PM forms.	- Establish clear practices for the distribution and quality control of PM forms, including requirements for digital vs. physical copies and supervisory checks of completed forms to ensure they are valid, accurate, consistent, relevant, & complete.
F-TVS-17-10: *Documentation Quality Concern #3:* Completeness of Forms – 1. PM checklists are not complete; tasks have no marks indicating a task was completed and tasks have been marked "N/A" without explanation. 2. PM checklists are missing work order numbers. 3. Annual PM checklists are missing fan amperage information.	- Standardize an amperage reading form for incorporation into PM documentation to ensure maintenance data is captured consistently, and incorporate supervisory checks of completed documentation.
F-TVS-17-11: The enterprise asset management database (MAXIMO) does not contain preventive maintenance checklists or tasks completed.	- Establish written requirements to capture and store documentation of completed maintenance, exploring the possibility of utilizing the enterprise asset management database (MAXIMO).

Required Action

QICO-TVS-17-05: Establish document control procedures to standardize the capture and storage of maintenance documentation.

(Risk Rating: Elevated)

Plan Description

F-TVS-17-08, 09 &10: PLNT will improve the data quality of Preventive Maintenance forms to ensure forms are valid, accurate, consistent, relevant, & complete.

F-TVS-17-11: Currently mobile MAXIMO is being developed and once implemented will address many of the issues with form quality.

Business Impact – Budget/Cost Estimate

- **Process Execution** – A current process/procedure exists that meets the QICO Required Action, but needs to be executed. This type of initiative does not need additional resources.

PLAN SCHEDULE

Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	SOP Revision	PLNT will modify SOP 209-07 to include data quality and provide training to personnel.	Paul Kram (PLNT)	05/23/17	06/29/17
2	Receipt of Mobile Devices	Confirmation of procurement of mobile devices for the mobile Maximo pilot program.	Paul Petersen (ENGA)	03/27/17	05/30/17
3	Curriculum and Training Roster	Provide training to PLNT personnel in the use of mobile devices, documenting attendance.	Linda Stoffregen (OPMS)	06/26/17	12/27/17
4	QICO CAP Verification Report	QICO will evaluate actionable items submitted to confirm there is reasonable evidence that the findings and this required action have been resolved, taking into account the actionable item descriptions and performance measures.	QICO	12/27/17	01/25/18

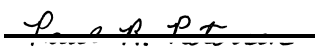
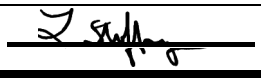
**In the event of personnel or departmental changes, responsibilities for actionable items shall transfer to the new leadership.*

COMPLETION DOCUMENTATION

Performance Measures

- 95% of PLNT Supervisors trained in use of mobile devices.
- 95% of PLNT Supervisor and Mechanic personnel trained in updated SOP for data quality.

RESPONSIBLE PARTIES

PLNT	Paul Kram	
ENGA	Paul Petersen	
OPMS	Linda Stoffregen	

SECOND LEVEL RESPONSIBILITY

MD SSRV	Randall Grooman	

8 SUPPLEMENTAL MATERIALS

8.1 APPENDIX A: Risk Assessment

Risk Matrix and Structure

What is Risk?

Risk is defined as an uncertain event or condition that, if it occurs, has a positive or negative effect on the organization's objectives and operations (both threats and opportunities). It is assessed on the combination of the probability of occurrence of risk and the severity of the risk.

Risk management is an attempt to answer the following questions:

- What can go wrong? – The Risk
- How bad are the consequences? – The Impact
- How often does/will it happen? – The Probability of Occurrence
- Is the risk acceptable? – The Risk Treatment,

Remediation Categories of Risk

- *Safety* – Risk associated with harm to customers and employees and
  critical equipment or asset safety
- *Governance* – Risks associated with internal controls and compliance
- *Operational* – Risk related to inefficient and ineffective business processes, disruption to normal business operations, non- compliance, negative public relations, breach to physical security, etc.
- *External* – Risks related to changing regulations, unfavorable economic conditions, industry or customer needs change, litigation and damage/loss to company assets
- *Financial* – Risks associated with uncollectable receivables, incorrect financial models or analysis, fluctuation in capital levels and adverse movement of interest rates
- *Technological* – Risk associated with unauthorized access to information, unavailable or unreliable information, technology not meeting business needs and compromised information security

Risk Assessment

The following risk matrix (Figure 1) was used to assess risks within the universe of review areas. The universe (see Table 1) is comprised of the potential range of all review activities and review business units (or departments) that fall within QICO's scope and oversight authority. These business units consist of programs, processes, assets and people which together contribute to the fulfilment of the departments' strategic goals (Goal 1 - Build Safety Culture; Goal 2 - Deliver Quality Service; Goal 3 - Improve Regional Mobility; and Goal 4 - Ensure Fiscal Stability).

Risks are assessed based on the probability of occurrence (see vertical axis in Figure 1) and the significance of their impact (see horizontal axis in Figure 1). The probability ratings are rated on a scale of 1 (minimum) to 5 (maximum) and are driven by the metrics shown on the next page. The impacts ratings are also rated on a scale of 1 (minimum) to 5 (maximum) and are driven by the category of risks, which are then aligned on the metrics shown on the next page.

Each finding is given a severity rating of Insignificant, Low, Moderate, Elevated or High. All areas with Elevated / High ratings are considered to be high risk to the organization's objectives; and need to be mitigated/ reduced in severity at the earliest. The risk ratings to the findings are provided as "Type of Risk" followed by "Severity Rating (Impact, Probability)" (e.g. a finding with *"Elevated (4 , 3)"* would mean a 'significant (4)' impact along with a 'possible (3)' probability of occurrence)

Figure 1: Risk Assessment Matrix

Probability \ Impact	Negligible (1)	Minor (2)	Moderate (3)	Significant (4)	Major (5)
Almost Certain (5)	Low	Moderate	Elevated	High	High
Likely (4)	Low	Low	Moderate	Elevated	High
Possible (3)	Low	Low	Moderate	Elevated	Elevated
Unlikely (2)	Insignificant	Low	Low	Moderate	Moderate
Rare (1)	Insignificant	Insignificant	Low	Moderate	Moderate

Possibility of Occurring ↑

Potential Impact of Risk →

8.1 APPENDIX A: Risk Assessment

Risk Assessment

Probability of Occurrence of Risk Events Defined

Rare | 1 – Reasonable assumption that this risk will not occur

Unlikely | 2 – Reasonable assumption that this risk will likely not occur

Possible | 3 – Reasonable assumption that this risk may occur

Likely | 4 – Reasonable assumption that this risk will likely occur

Almost Certain | 5 – Reasonable assumption that this will occur

Potential Impact of Risk Events Defined

Negligible | 1 – Unlikely to cause the activity to fail to meet part of its objectives.

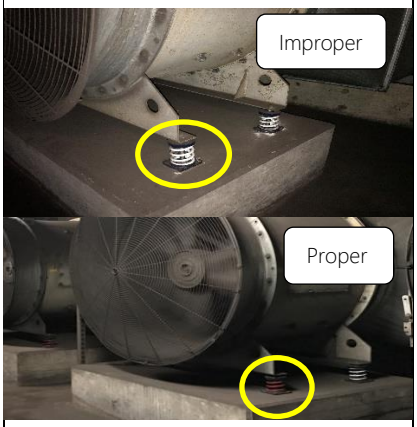
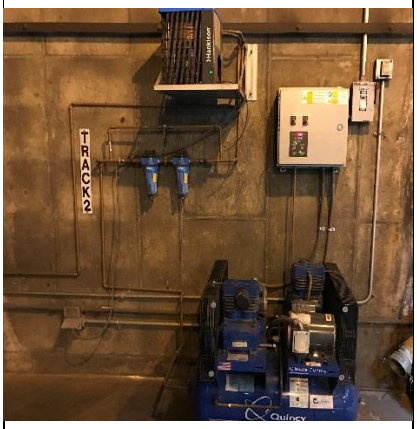
Minor | 2 – May cause a failure of the business process to meet part of its objectives, which may expose Metro to minor financial losses, less-effective or efficient operations, some non- compliance with laws and regulations, waste of resources, etc.

Moderate | 3 – May cause a failure of the business process to meet a significant part of its objectives, or negatively impact the objectives of other activities, which may expose Metro to significant financial losses, reductions to or ineffectiveness of operations, non- compliance with laws and regulations, sizable waste of resources, etc.

Significant | 4 – Likely to cause a failure of the business process to meet a significant part of its objectives, or negatively impact the objectives of other activities, which may expose Metro to significant financial losses, reductions to or ineffectiveness of operations, non- compliance with laws and regulations, sizable waste of resources, etc.

Major | 5 – Will cause a failure of the business process to meet its objectives, or cause objective failure in other activities, which may cause or expose Metro to major financial losses, interruptions in operations, failure to comply with laws and regulations, major waste of resources, failure to achieve stated goals, etc.

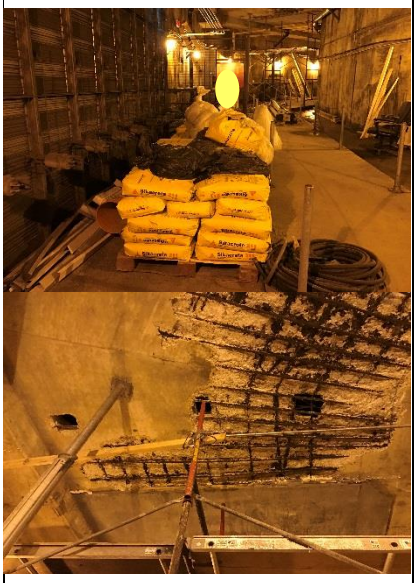
8.2 APPENDIX B: QICO Tunnel Ventilation Finding Details

Picture	Description	Recommended Action
	Installation of improper isolators for 2 fans at FF8. Color coded isolators showed that 2 fans (TV1 & TV2) had 4 white isolators installed. These 2 fans are now more susceptable to increased vibration. Field mechanics were questioned about the incorrect isolators installed and their response was that they ran out of funding for the red colored isolators so they used the less expensive white colored isolators instead.	Proper isolators shall be bought and installed for these fans.
	PLNT personnel have been replacing actuators and their supports due to supports failing at the bolt location. Replacing in kind is only a temporary fix to the larger issue of improper support of the actuators.	PLNT shall reach out to ENGA in order to arrive at a solution to support the actuators for the fan damper bank.
	Installation of an air compressor for fan and damper controls at FL1. PLNT installed air compressor due to consistent air leakage from main air compressor. ENGA was not notified. According to ENGA, this air compressor would not have been approved due to location and power issues. The location is an issue due to obstruction of the emergency egress and the power issue is that the air compressor is drawing power from the fan shaft's fire and life safety power distribution despite not being a fire and life safety asset.	PLNT shall remove or relocate this equipment per ENGA's request. Any future design modifications made to fan or vent shaft locations must go through ENGA.
	QICO observed a broken all thread rod supporting the fan motor of fan #1 at FL1. Maintenance personnel told QICO that they would have it rewelded. Picture was sent to PLNT for resolution. It is unclear to QICO whether this is an issue that should be brought to ENGA's attention for root cause analysis and solutioning.	PLNT should make ENGA aware of any issues relating to design integrity of fire and life safety equipment.

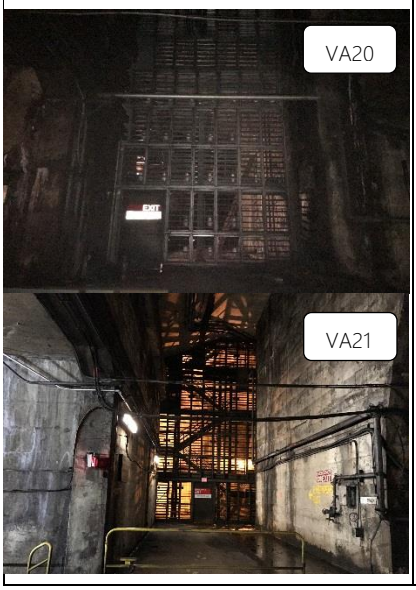
8.2 APPENDIX B: QICO Tunnel Ventilation Finding Details

Picture	Description	Recommended Action
	Construction groups around FL1 left scaffolding which blocked off an emergency egress passageway. Had there been no preventive maintenance inspection performed this equipment would have remained for an indeterminate amount of time.	Emergency egress locations shall remain accessible at all times. Scaffolding was removed by Clark Construction contractors.
	Water intrusion has caused severe corrosion of the staircase at FA3.	PLNT shall reach out to the appropriate department to repair or replace the staircase.
	QICO observed multiple drains at various fan shaft locations in similar condition to the pictured drain found at FA3.	The plumbing branch shall unclog all drains and replace all drain covers so that large debris do not enter and re-clog these drains.
	Concrete spalling was observed at FA3 along with scaffolding staged at bottom of fan shaft. QICO questioned PLNT about this issue and was told that the scaffolding had been there for years but no structural work was observed. At this location the spalling is a minor. However, at other locations this is not the case.	TRST should complete all work started so that minor spalling does not become a major structural failure.

8.2 APPENDIX B: QICO Tunnel Ventilation Finding Details

Picture	Description	Recommended Action
	Major concrete work being done at vent shaft VA4, a vent shaft associated with fan shaft FA3. Structural concrete is blocking access to vent shaft damper actuators and equipment is blocking the path of an emergency egress walkway (emergency egress stairs are toward the back, see top picture). When PLNT personnel were questioned they informed QICO that this work setup had been configured this way for a few months. It is uncertain to QICO if PLNT has had any communication with TRST with regard to estimated date of completion or removal of equipment from emergency egress walkway and damper openings.	PLNT shall reach out to the TRST to request immediate removal of equipment and supplies from vent shaft openings and emergency egress walkway.
	PLNT requested the sheet metal group to block off a deteriorated section of damper blades located at the bottom row of the dampers at ven shaft VA5, (associated with FA3), due to a water intrusion issue. PLNT wanted a more air tight seal as the solution, but it does not appear that the sheetmetal group received the message.	PLNT shall reach out to sheetmetal group and resolve this issue. PLNT Maintenance shall be clear when requesting work be done and be present while the work is being completed. This will ensure that the final product will have the intended results.
	Major deterioration of the concrete staircase observed by QICO at VA5. Rebar is completely exposed in multiple areas of the staircase, corrosion of the rebar is visible, and grating at multiple landings has rust. It appears to QICO that what PLNT maintenance crews see on a monthly basis with regards to structural components is not being communicated effectively to the Structures Maintenance group of Track and Structures (TRST).	TRST shall assess this staircase and repair as necessary. PLNT or ENGA shall add a structural component to their housekeeping task that will include structural elements such as staircases, grating walkways, fan and vent shaft structures. Any structural issues seen by PLNT personnel shall be assessed by TRST.

8.2 APPENDIX B: QICO Tunnel Ventilation Finding Details

Picture	Description	Recommended Action
	QICO observed vent dampers not opening at vent shaft VC12, a vent shaft associated with fan shaft FC8. Additionally, after observing multiple dampers not open PLNT personnel did not try to fix these dampers. Although the failsafe mode for vent shaft dampers is the closed position, all dampers should be operational at all times.	All dampers should be fixed such that they open and close as intended. PLNT personnel shall perform preventive maintenance on vent shaft dampers as outlined in PLNT-1001 Tasks 70 & 180.
	QICO observed various equipment and debris left from a previously completed SafeTrack Surge. There is an emergency egress staircase that leads from the center platform area to the fan shaft area, FA13. PLNT personnel have noted many instances where other departments have left equipment and trash in tunnel fan areas which end up having to be cleaned up by PLNT personnel.	PLNT shall reach out to the various asset owners that have equipment or debris left in tunnel ventilation areas and asset owners shall reply within 10 business days of their plan to remove their equipment and debris in a timely manner.
	QICO visually inspected the 2 vent shafts, VA20 & VA21, associated with fan shaft FA13. QICO observed that PLNT did not perform any preventive maintenance tasks at these vent shaft locations during the visit on 2/27/17. It is unclear what preventive maintenance instructions are used at these vent shafts and other vent shafts of this type and location.	ENGA shall ensure vent shafts of this variety and location are properly addressed in the PLNT-1000 and PLNT-3000. PLNT shall perform preventive maintenance in accordance with the PLNT-1000 and PLNT-3000.

8.2 APPENDIX B: QICO Tunnel Ventilation Finding Details

Picture	Description	Recommended Action
	Access to bypass dampers at fan shaft FF7 involves entering an area that is part of the Roadway (but not on the track). According to the Roadway Worker Protection Manual: *What is the Roadway?* *In tunnel areas, it is all areas between tunnel walls to include all safety walk areas and open shafts and ancillary areas.* *Vent shafts and emergency egress shafts, with hand rails or protective railings, are NOT considered part of the roadway.*	PLNT shall reach out to the appropriate group to install hand rails in areas where access to fan, damper, vent shaft equipment currently requires entering the Roadway.
	QICO discovered a pressure relief shaft was installed between fan shaft FF7 and vent shaft VF14. This is unusual to the typical design of the ventilation system.	QICO and PLNT brought this to ENGA's attention and ENGA is in the process of assessing whether the pressure relief should remain or be modified.

8.3 APPENDIX C: Document Review

Note: *Supervisor position was vacant between June 26 and October 30, 2016.

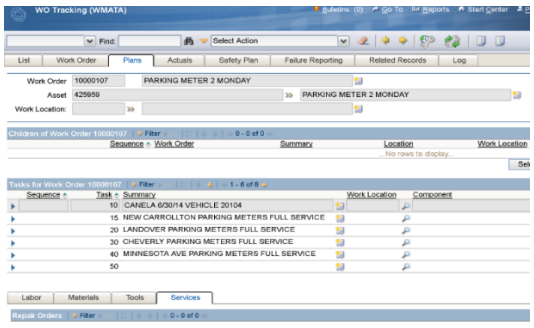
Preventive Maintenance Checklist Review (Years 2015 & 2016)

Location ID	Forms With QC Checkbox Marked		Forms Without Supervisor's Signature*	
	Report Date	Work Order Number	Report Date	Work Order Number
FA3	1. 12/01/15 2. 02/03/16 3. 02/18/16 4. 03/14/16 5. 07/19/16	1. 12189716 2. 12335265 3. 12407395 4. 12506042 5. 12803589	1. 03/27/15	1. 11540112
FA7	1. 06/22/15	1. 11755240	None Found	None Found
FA13	1. 10/29/15 2. 11/20/15	1. 12133051 2. 12211160	None Found	None Found
FB9	1. 07/10/15 2. 06/16/16 3. 10/14/16	1. 11783609 2. 12705728 3. 12964616	None Found	None Found
FC1	1. 04/29/15 2. 06/22/16 3. 08/16/16 4. 12/27/16	1. 11602537 2. 12743922 3. 12868617 4. 13126114	None Found	None Found
FC8	1. 05/07/15 2. 08/26/15	1. 11662687 2. 11951146	None Found	None Found
FD4	None Found	None Found	1. 04/30/15 2. 08/04/16 3. 09/01/16 4. 10/03/16	1. 11602434 2. 12803469 3. 12868487 4. 12937192
FE6	1. 03/31/15 2. 04/03/15 3. 07/31/15 4. 08/21/15 5. 08/23/16	1. 11501868 2. 11566929 3. 11783532 4. 11892401 5. 12830383	1. 06/03/16	1. 12705685
FE7	1. 03/12/15 2. 04/23/15 3. 05/06/15 4. 04/06/16	1. 11502198 2. 11567302 3. 11626863 4. 12547560	None Found	None Found
FF7	None Found	None Found	1. 03/05/15 2. 07/22/16 3. 08/11/16 4. 09/02/16 5. 10/17/16	1. 11495183 2. 12816540 3. 12883334 4. 12951131 5. 13015541
FF8	None Found	None Found	1. 03/05/15 2. 04/23/15 3. 07/19/16 4. 08/10/16 5. 09/22/16 6. 10/28/16	1. 11495182 2. 11615459 3. 12816539 4. 12883333 5. 12951130 6. 13015540
FL1	1. 08/18/15	1. 11973350	1. 08/24/16 2. 09/29/16	1. 12886381 2. 12952509
Total Sites: 12	Total with QC Box Marked: 27		Total with No Supervisor Signature: 19	

8.4 APPENDIX D: Definitions

Definitions	Photos
Damper A series of plates that are pneumatically or electrically operated to control the direction of air flow in the underground portion of the Metrorail system. Dampers are located in vent and fan shafts and operate automatically when an emergency tunnel fan is exercised, based on a predetermined sequence of operation. Dampers associated with the Tunnel Ventilation System are located as follows: Vent Shaft damper, Fan Shaft By-Pass damper, and Fan damper. As a separate feature not associated with emergency tunnel fan operation, vent shaft dampers and fan by-pass dampers operate automatically to open when tunnel temperatures exceed 50 degrees F and there is no command to operate the Tunnel Ventilation System.	
Fan (Tunnel) Fans are reversible and are capable of being controlled from the ROCC or locally in the fan shaft. Fans in their static state are off and are designed to be operated in an emergency to move air to/from a station or tunnel segment.	
Fan Shaft Fan shafts are located throughout the underground portion of the Metrorail system and are typically located either between stations or between a station and portal. The fan shaft houses the fan gallery, fan controls, and fan by-pass dampers. These shafts open to the surface level located in a sidewalk or field but never a street. Certain fan shafts are also designated as an emergency egress.	
Jet Fan Jet fans are wall-mounted within tunnel recesses. They are reversible fans and thus have the capability of moving smoke away from passengers during an emergency if configured properly (with local and remote control).	

8.4 APPENDIX D: Definitions

Definitions	Photos
Maximo Maximo is WMATA's enterprise asset management (EAM) system used for work order, incident, and track defect tracking. Maximo Work Orders (WO) specifies a particular task and the labor, materials, services, and tools required to complete the task.	
Lock Out - Tag Out (LOTO) LOTO is a safety procedure used to remove power from equipment that is being temporarily taken off line for maintenance. OSHA 1910.147 governs the proper procedure when performing LOTO.	
Vent Shaft Vent shafts are located throughout the underground portion of the Metrorail system and are located at both ends of a station. They open to the surface level located in a sidewalk, road median, or field. Certain fan shafts are also designated as an emergency egress. When the Tunnel Ventilation System is commanded on, vent shaft dampers closed to seal the shaft, allowing air to be moved either in exhaust or supply from the station.	

8.5 APPENDIX E: Application of Regulatory CAPs

Measure	Finding	QICO Review During Review
Regulatory Findings - NTSB	NTSB R-15-9: *Develop and implement detailed written tunnel ventilation procedures for Operations Control Center (OCC) staff that take into account the probable source location of smoke and fire, the location of the train, the best evacuation route, and unique infrastructure features; these procedures should be based on the most effective strategy for fan direction and activation to limit passengers' exposure to smoke.* **Status:** Open/Past Due	WMATA is behind schedule on this CAP. The new proposed completion dates are the following: - Play Book from AECOM (4/14/17) - Findings and recommendations (5/12/17) - Action Plan from AECOM findings (6/30/17)
	NTSB R-16-10: *WMATA is required to improve the capacity of the tunnel fans to conform to NFPA 130.* **Status:** Open	- WMATA's response is due 9/20/21. QICO has reviewed documentation on various studies completed to assess the fire and smoke handling capabilities of the current tunnel ventilation system.
	NTSB R-16-11: *WMATA must develop location specific emergency ventilation configurations.* **Status:** Open	- WMATA's response is due 7/18/17. ENGA has been creating a fan playbook for the various tunnel ventilation configurations thoughout the Metrorail system with the help of AECOM.
Regulatory Findings - FTA	FTA CAP R-5-34-a: *WMATA must complete its "Fire/Life Safety 1000" maintenance procedure, to clarify roles and responsibilities, and outline expectations regarding how departments should work together to coordinate inspection, maintenance and repair of these system components.* **Status:** Rejected	- FTA requests that WMATA resubmit the PLNT-1000 Fire/Life Safety Mannual and include a quality audit process to ensure compliance with the requireements of the new manual.
	FTA CAP R-6-36-a: *WMATA is required to establish a ventilation system testing quality audit process to ensure compliance with the established maintenance and testing practices.* **Status:** Rejected	- FTA requests that WMATA resubmit the PLNT-1000 Fire/Life Safety Manual and include a quality audit process to ensure compliance with the requirements of the new manual.

8.5 APPENDIX E: Application of Regulatory CAPs

Measure	Finding	QICO Review During Review
Regulatory Findings - FTA	FTA CAP R-6-36-b: *WMATA must automate inspection and maintenance record keeping for tunnel ventilation systems, drainage pumping stations, and other critical systems managed by the Office of Plant Maintenance (PLNT).* **Status:** Open/Past Due	- Mobile Maximo is in the process of being completed. Mobile devices are expected to be delivered during the first week of April 2017. WMATA has requested for a CAP closure date of 07/26/17.
	FTA CAP R-6-37-a: *WMATA must complete the replacement of pneumatic control boxes for tunnel ventilation fans with Programmable Logic Control (PLC) Systems within the next five years.* **Status:** Under FTA Review	Resubmitted for closure on 2/24/17. - WMATA is required to complete the replacement of pneumatic control boxes for tunnel ventilation fans with Programmable Logic Control (PLC) Systems by 2020. As of March 2017, 2 of 72 panels have been delivered, tested, and passed the testing protocol.
	FTA CAP R-6-38-a: *WMATA must conduct an engineering assessment to identify ways in which to improve the performance and capacity of the tunnel ventilation system.* **Status:** Open/Past Due	WMATA is behind schedule on this CAP. The new proposed completion dates are the following: - Playbook from AECOM (4/14/17) - Findings and recommendations (5/12/17) - Action Plan from AECOM findings (6/30/17)

8.6 APPENDIX F

Interview Notes with PLNT and ENGA

Quality Assurance, Internal Compliance & Oversight
Interview Notes

QICO PROGRAM	Tunnel Ventilation Audit				
LOCATION	CTF	DATE:	3/20/17	TIME:	11:00am-01:00pm

Background Information	
Name(s): [redacted]	

Interview Notes		
Quality Measure	Question	Response
Quality of Work	What does the PLNT 1000 Pilot Project entail? Where is the PLNT 3000? What is being done annually for preventive maintenance (as the PLNT-1001 is only monthly)?	- PLNT is trying to implement the PLNT-1000. Guesses CENI looked at what they had and implemented a new checklist. - Haven't gotten to the PLNT-3000 yet. - Trying to work out all the bugs for the PLNT-1001. They are using the old forms and the new checklist. The old checklists are being used as "insurance". - Have you given any feedback to CENI about the PLNT-1001? Getting the forms back form the maintenance crews/ their supervisors. Last month was the first month of doing the new checklists. Meeting will take place and feedback will be given.
	Do supervisors direct the maintenance personnel on how to interpret the tasks on the PM checklist?	- The old checklists were created by PLNT not by CENI. Says CENI was given the old checklists. There is training, week long training with refresher when there are changes. Maintenance crews given a tool allowance, provided with test equipment, meters. Toolbox talk every morning, don't check what tools they have every day, up to supervisor to check.
	How are vent shafts chosen when performing a fan shaft PM?	- Typically fan shafts are tied to 2 vent shafts. Chosen based on location. 1 or 2 locations where it's not exactly like that. Location with only 1 vent shaft is rare.
	Are there any training classes for maintenance personnel who have never worked on tunnel fans before?	- Answered above. Training department develops this week long training, feedback is given based on what they want their guys to be trained on.
	What is the procedure for dealing with pneumatic issues (air leaks, compressor not on site/broken/turned off)?	- Create a service ticket or fix it if they can find the air leak. Ideally they would fix it right away if is an easy fix. ROW air leaks need more time to fix.
	When structural issues are seen, how do maintenance personnel report these issues? Are they trained to detect and report these issues?	- Not meant to be looking for these issues, but a ticket will be called in to fix these issues. MOC

Compliance with Standards	What was PLNT's involvement in completing the PLNT-1001 checklist?	- No dates set on feedback. FTA deliverables for the PLNT-1001. Silver Line and Jet fans are operated with codes (Modes). For the most part feedback is for the Silver Line and Jet Fans. - No comments about the PLNT-1001 checklists.
	Does CENI Engineering get involved or called on to help solution problems found in the field?	- Yes, lift/control problems. CENI found to be helpful. PLNT testing the PLC controls in conjunction with CENI.
	Who is responsible for signing off completed checklists? What are they checking for? Why is the QC check box / line never filled out?	- Supervisor reviews the checklists. Supervisors should go out once and a while to check. 1-2 a week. Supervisors checking for comments things went wrong. QC check box should be marked when the supervisor actually goes out there. - Other groups may call in tickets, which is another set of eyes on each Fan Shaft.
Records Management	Why were there very few annual checklists in the documents handed to QICO?	- Monthlys were pulled for review no annual. Monthly and annual are stored together. Some are scanned into the X: drive (PLNT drive).
	What happens when the maintenance crews come back from the field? What paperwork is completed? How do new WOs get generated? Why are there so few computers for the maintenance personnel to use?	- *Interpretations of the same document is a concern. PLNT is looking for feedback from QICO to see if there are different interpretations. All 14 mechanics were brought in together for the same class. - Call POWER desk for any POWER issues because PLNT can't open a WO for another department, except Fire Technicians at the Fire Shop they have super user rights to open tickets to anyone. - Tablets in a procurement stage.
	Who is responsible for completing newly created WOs? Who is responsible for assuring WOs get closed out and the work is truly completed? Is there a process where WOs get escalated after they have been idle for a period of time?	- WO done by trade. - *No need to add these to MAXIMO due to mobile MAXIMO being rolled out because of the FTA. - Auto escalation for FLS only. If a ticket is closed then it falls off the list. Problem with cross departmental WO creation. Email notifications are sent when a ticket is opened and when it's closed. Problem comes when a mechanic opens the ticket since they aren't checking emails regularly.
	What is done with the data stored in MAXIMO? Can the PM checklists be uploaded into MAXIMO? If so, why is this not done? Does anyone go back into MAXIMO to use the data for future planning of work or inspection?	- [redacted] are looking at back logs of the supervisors and assistant superintendents. Weekly reports are made for [redacted] to see what his crews are working on (action items). - Create a ticket when they do work. Supervisor level for items that keep breaking month to month. Establish a work history to generate a work statement. They don't change form, fit, or function. Problem statements are generated when failures are seen 3 or more times.
	How long are the PM checklists held onto? What policy states this duration of time?	- Document Retention Policy, corporate wide, 2 years.

Safety	Where applicable, are job safety briefings completed before going into the field?	- *There are training classes available. Yes, but they are individual training courses. They are required courses (eventually). HR requires them. Not a 2 week supervisor training class.
	Are there written procedures for using the cones/barriers/hatch support?	- MSRPH has all of this information. - *cross silo work flow, even if it was a read only.

Quality Assurance, Internal Compliance & Oversight
Interview Notes

QICO PROGRAM	Tunnel Ventilation Audit				
LOCATION	CTF	DATE:	3/20/17	TIME:	11:00am-01:00pm

Background Information	
Name(s): [redacted] Position: Superintendent of Equipment maintenance Time at WMATA: [redacted] Previous Experience: [redacted]	Responsibility: oversee operations and maintenance of support equipment within the authority for example, in the buildings air handling units, door air compressors, lifts, sewage ejectors; fan coil; no HVAC, 2 asst. superintendents, and special projects manager, and then 9 supervisors who report to them Responsible Area:
Name: [redacted] Position: Director of Plant Maintenance Time at WMATA: [redacted] Previous Experience: [redacted]	Responsible for all things PLNT

Interview Notes		
Quality Measure	Question	Response
Quality of Work	What does the PLNT 1000 Pilot Project entail? Where is the PLNT 3000? What is being done annually for preventive maintenance (as the PLNT-1001 is only monthly)?	- Just started, CENI did the engineering, but they are just beginning to implement it. Attempting to phase in the new PLNT 1000s into use - There's a bit going on with the restructuring for ROCC and MOC - Currently Mechanics call into OCC to get access to do testing, but struggling to get access from controllers (they're busy) - PLNT 3000: heard nothing about the 3000, still dealing with implementing the - Mechanics use both form old form and new PLNT 1000 form - The supervisors who are overseeing the transition are gathering information for PLNT feedback to CENI; Charlie expects something written, but will have a meeting
	Do supervisors direct the maintenance personnel on how to interpret the tasks on the PM checklist?	- The old checklist was developed by PLNT, no involvement with CENI - Involvement of CENI only began 3-4 years ago - There's a tool list provided to every mechanic and a tool allowance, there is a tool box meeting with a check, but it's up to the supervisors discretion - Mechanics meet with their supervisors every morning to discuss safety and a Toolbox meeting

	How are vent shafts chosen when performing a fan shaft PM?	- Typically a fan shaft is tied to 2 vent shafts, but occasionally other configurations exists - Vent shaft is typically tied to a fan shaft, so the location determines
	Are there any training classes for maintenance personnel who have never worked on tunnel fans before?	- When they mechanics are hired, there's a week long training. With a refresher whenever there's a change. - Training is run through the Training Department, PLNT does give input, the Special Project Manager handles the logistics and the content - PLNT had all 14 mechanics in the same class hearing the same instructions at the same time, to work towards consistency - Paul looking for feedback to confirm/address consistency of work given that there are different individuals performing the work.
	What is the procedure for dealing with pneumatic issues (air leaks, compressor not on site/broken/turned off)?	- Ideally, mechanics try to find air leaks - Some leaks are along the right of way and require additional planning effort to address - System is set in failsafe mode, ie if there's no air it still works
	When structural issues are seen, how do maintenance personnel report these issues? Are they trained to detect and report these issues?	- If they see something while they're doing an inspection, they report it (call a ticket in to MOC who generates the service ticket) - However, mechanics are not going to fix things while they are on
Compliance with Standards	What was PLNT's involvement in completing the PLNT-1001 checklist?	- There isn't a date defined for feedback to be due, the new standards went into effect in Feb 2017 - Development driven from FTA Deliverables, actually to develop the emergency operation sequence in addition to maintenance sequence - There is an implementation schedule worked from CAPs developed, but delayed due to the inauguration check for SGR - Prior to that, Jet fans and controlled by Maintenance operations sequence and an emergency operations sequence. - Primarily giving feedback on the Jet Fans, no tools on the existing fans - 3000 address the annual checks - Waiting to gather information from supervisors to provide feedback to CENI; mechanics are providing feedback to TSMT (Training department) and they're communicating that with Paul prior to making changes - New document they're getting more feedback and addressing changes faster
	Does CENI Engineering get involved or called on to help solution problems found in the field?	- Yes, for example there is an issue with lifts or control problems and CENI is working with PLNT to address this problem - Find CENI Engineering to be helpful - Robust program to replace controllers on Tunnel Fans and some Drain Pumping System
	Who is responsible for signing off completed checklists? What are they checking for?	- Mechanic does his job filling out the checklist, and the supervisor reviews comments from Mechanics and signs it, but doesn't check the QC box; Mechanic is also supposed to create a follow up work order for issues that are found in the inspections, supervisor is reviewing sheet to confirm Maximo work order is created and correct.

	Why is the QC check box / line never filled out?	- The supervisor is supposed to go out and review periodically; once or twice a week supervisors are expected to do this and check the box - If a checklist has no comments, its assumed to be fine - Also get calls from other groups noticing issues that are covered by PLNT
Records Management	Why were there very few annual checklists in the documents handed to QICO?	- Pulled mostly monthly sheets, but one of those sheets is an Annual checklist. - Monthly and annual inspections are stored together - Storing Fire Life Safety docs, under platform exhaust fan (UPE), DPS, tunnel fan
	What happens when the maintenance crews come back from the field? What paperwork is completed? How do new WOs get generated? Why are there so few computers for the maintenance personnel to use?	- If it's a non-PLNT issues, it's called in. Fire shop does have the ability to open tickets in other departments, the techs aren't fixing things, they are going out to do inspections and opening. - Mis-assigned tickets can happen from MOC can happen, the only way to deal with them
	Who is responsible for completing newly created WOs? Who is responsible for assuring WOs get closed out and the work is truly completed? Is there a process where WOs get escalated after they have been idle for a period of time?	- PNLT WO response goes by trade, so if a general equipment sees something will either call in a ticket or call the supervisor for required trade. That supervisor should create a ticket and send out a work crew. - [redacted] provide a visio flow chart of FLS - WO escalation: Auto-escalation – Fire/Life Safety, there's a weekly report that comes out (Responsible supervisor, OEM, Fire Marshall), but if they get closed they fall off the list, when tickets are closed, the person who requests the ticket

	What is done with the data stored in MAXIMO?
	
	Can the PM checklists be uploaded into MAXIMO?
	If so, why is this not done?
	
	Does anyone go back into MAXIMO to use the data for future planning of work or inspection?
		- In Maximo, you don't' see the work performed, only the time.
		- Did not put effort into getting checklists updated, since mobile Maximo component is coming down
		- Looking at ticket workloads by supervisor and Asst. Superintendents, also aging ticket information, being handled at a Superintendent Level
		- Also perform a failure trend analysis on their assets
		- How are defects followed?
		  o Mechanics are now required to create a CM or Child work order to capture additional work outside of inspection (ie replacement, repair)
		  o Looking at alarms, and failure of components
		  o At the supervisor level, may lead to having mechanics
		  o Establish a Design flaw and document the repeated failure and a little analysis in a Problem Statement
		- The Problem statement process is new, but is still a work in progress
		- [redacted] submits problem statement, and it's similar to the SSWP system in GOTRS
		- Tracking is an issue

	How long are the PM checklists held onto? What policy states this duration of time?	- There is a policy (WMATA-wide). It's 2 years at min.
Safety	Where applicable, are job safety briefings completed before going into the field?	- There is a weeklong supervisor training class, taught by SAFE, but trained by - General training is provided, effective workplace behavior, ADA compliance, generally want to get the supervisors to complete classes through the year
	Are there written procedures for using the cones/barriers/hatch support?	- Covered in MSRPH

Quality Assurance, Internal Compliance & Oversight
Interview Notes

QICO PROGRAM	Tunnel Ventilation Audit				
LOCATION	JGB 5th Floor Room 505	DATE:	3/17/17	TIME:	01:00 - 02:00pm

Background Information	
Name(s): [redacted]	

Interview Notes

Quality Measure	Question	Response
Quality of Work	Have you received any feedback on the new checklists? Why are there no tasks for vent shafts in the new checklist? Air compressors? Why is there no location/line for vent shaft IDs?	- No feedback from PLNT about PLNT 1000 checklist. PLNT has provided comments for previous revisions of the new checklists. Engineering has used perform visual inspection to make it more clear on what they should do. - Engineering has never seen the PLNT checklists, even when creating the PLNT 1000. - PLNT 1000 checklist from CENI is to make sure fan can run. - PLNT 1001 checklists was purposefully made to be monthly with no reason for annual tasks due to reason for PLNT 1001.
	Why are there no annual preventive maintenance tasks in the PLNT 1000?	- Answered in other questions.
	What is the current state of the PLNT 3000?	- Being developed, in the works. [redacted] will have rough draft Thursday next week. End of this month have more finalized draft which will go to PLNT for review.
Compliance with Standards	Why do the checklists have short description and not the long description?	- FTA requirement for tablet version which is reason for short hand version. PLNT 1001 short hand was created to fulfill the FTA requirement. - Long version is instruction manual: crews should be trained on this. Training has never once come to Engineering, never seen the curriculum.
	Does PLNT ask CENI for help when they run into problems found in the field? Are you aware of some of the pneumatic issues PLNT is experiencing out in the field? Are there any steps being taken to correct any of these issues?	- Yes, 1/3 of [redacted] week goes to helping them. EMI interpretation or modifications. Training could help with some of these issues. - Have discussed air leak problems. Doesn't result in solution often. - FL01 has air compressor put in, Engineering is getting it removed (PLNT did not go through engineering). Site has power issues and the air compressor is not fire and life safety critical item among many other issues.
	Are there any current outstanding CAPs for tunnel ventilation systems?	- Tunnel ventilation playbook with AECOM, NTSB - FTA, controls retrofit, PLNT 3000, MAXIMO tablet

	Does PLNT have any involvement with any CAPs or other regulatory findings/recommendations?	
Records Management	What is the reasoning for not having a comment section in the new checklist?	- Tablet. -
	What level of involvement do CENI and PLNT have together on a daily basis? What involvement did PLNT have during the creation of the PLNT-1001? Would it be beneficial to have periodic meetings with PLNT in order to facilitate a better relationship and stay on the same page?	- Very unofficial, limited. PLNT only calls CENI when there are issues over the phone. No meetings or anything setup. - Talking more officially for testing and installation for the new control panels. Sign offs by PLNT and CENI for control panel integrity. 70+ page checklists sent back and forth. - CENI should meet with PLNT. That should be the response of CENI when PLNT tests these control panels. More meetings with the higher-ups in PLNT. PLNT circumvents CENI to talk to [redacted] (IRPG-CPDO). - PLNT meets monthly with CPDO ([redacted]).

8.7 APPENDIX G

Job Descriptions

Code No. 5620

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

JOB DESCRIPTION

Assistant Superintendent
Plant and Equipment Maintenance, TS-07

JOB DEFINITION:

This is technical management, supervisory and administrative building and support equipment maintenance work. Employee in this job is responsible for assisting in the planning, scheduling, inspecting, managing, coordinating and establishing work priorities for major Plant Maintenance activities. Employee has authority, accountability and responsibility for assisting in the management of major activities associated with system-wide support maintenance involving inspections, preventative maintenance, complex repairs, alteration, renovation, construction and replacement projects within WMATA facilities, facility components and support systems. Employee in this class works in close coordination with staff level rail, bus and construction managers and other technical staff throughout WMATA. Employee is also required to work in close coordination with jurisdictional authorities governing work permits, licenses and operational maintenance support. Employee has considerable latitude for independent judgement and action within established guidelines and is expected to assist in the initiation and implementation of appropriate policies and procedures. The employee's performance will be measured on the efficient and effective management of the resources assigned, the ability to comply with assigned schedules and respond to emergency service situations, and the adherence to established policies and regulations and accomplishment of Authority objectives. Employee reports to the Superintendent, Plant and Equipment Maintenance Branch.

EXAMPLES OF DUTIES:

Individual will be responsible for the management, supervision and coordinatin of plans, work schedules, inspections and special project work involving outside contractors and in house forces. The work involved shall include but not be limited to renovation of WMATA buildings and paved surfaces and the maintenance, repair and or overhaul of physical plant equipment.

The craft disciplines shall include plumbing, welding, sheet metal, masonary, tile, carpentry, heating, air conditioning, pneumatic controls and other special areas relating to building construction and plant maintenance.

Direct guidance and follow up will be provided to first line supervisors who oversee the various craft disciplines in the field. Employee will be accountable for the progress of jobs and maintenance of equipment assigned to his function. In the case of boiler and chiller equipment he will also be responsible for the annual operation of this equipment.

Management responsibilities shall include the management, supervision and coordination of special projects assigned for the improvement, renovation, enhancement, etc. of the WMATA system properties, equipment or systems to include major and minor efforts involving complex project management efforts related to schedules, reports, plans and execution of work utilizing force account and contract resources such as labor, materials, equipment, space allocation, coordination with outside agencies and other WMATA groups, etc.

Administrative duties include coordination, management and resource allocation involving Authority Capitol Improvement Projects and other major renovation efforts that require intensive management control efforts including the development and management of plans, schedules, periodic reports, presentations, justifications, acquisitions and other procurement activities involved with the effective and efficient execution of assigned projects.

Evaluates the efficiency and effectiveness of assigned staff and employees, assessing such items adherence to phased work plans and allowable costs, how well performance and work quality objectives are achieved and the incidence of follow up actions. Initiates improvements in work methods and techniques to correct operations and maintenance deficiencies.

Manages and supervises the assignment of tasks or projects to be performed by crews in accordance with established priorities; manages the performance of major multi-phase/multi-craft projects to ensure continuity of efforts and compliance with standards, specifications, applicable codes, etc.

Directs and manages the initiation of application for permits and licenses required by the jurisdictions to effect repair, replacement, construction or renovation of facilities, systems or sub-systems and the occupancy and/or operation of facilities and equipment or systems.

Oversees the technical evaluation of new equipment and maintenance methods to ensure that systems and procedures meet internal, WMATA and applicable regulatory agency standards.

Discusses complaints and grievances with employees or their representatives and attempts to resolve them in accordance with sound employee relations practices and operating requirements. Evaluates the performance of assigned personnel and counsels or disciplines employees as appropriate.

Makes recommendations regarding the establishment of policies and procedures for programs affecting the provision of service and operations within major areas of assigned responsibility.

Conducts periodic staff meetings to ensure enhanced communications and effectiveness among subordinate employees.

Performs related duties as required.

KNOWLEDGE, SKILLS AND ABILITIES:

Comprehensive knowledge of the methods and procedures required to manage complex maintenance, construction and renovation projects involving building structures, systems and facilities including: paving systems; masonry, concrete, wood and steel structures; roofing systems; lighting and electrical distribution systems; plumbing, drainage and fire suppression systems; interior and exterior finishes and appliances; and other specialized equipment and systems within the assigned area of responsibility.

Thorough knowledge of building codes, fire and safety codes, OSHA regulations, etc. having applicability to the maintenance of WMATA structures and support equipment and systems assigned.

Knowledge of, or the ability to acquire a knowledge of WMATA and RAIL rules and regulations that affect operating and maintenance procedures, collective bargaining agreements and their proper implementation, and requirements for effective and efficient operation.

Ability to establish and maintain effective working relationships with those individuals and organizations with whom interface is required.

Ability to communicate effectively orally and in writing.

Demonstrated ability to diagnose complex maintenance problems and direct corrective actions in a timely and effective manner.

Ability to supervise, train, and evaluate subordinate staff in compliance with applicable Authority personnel and labor relations policies, procedures, regulations, and agreements.

MINIMUM QUALIFICATIONS AND EXPERIENCE:

Graduation from an accredited college or university with a Bachelor's Degree in Electrical, Mechanical, Civil, or related engineering field supplemented by extensive technical work experience in the relevant applied engineering area which demonstrates a high degree of proficiency in managing and supervising preventive and corrective building, plant or support equipment and systems maintenance.

Or, an equivalent combination of education and experience.

LICENSE:

Possession of a valid District of Columbia, Maryland or Virginia motor vehicle operator's license issued from the jurisdiction of residence.

Approvals:

DEPT/OFFICE: [redacted] DATE: 4/29/92

PERS/COMP: [redacted] DATE: 4/29/92

LABR: _____ DATE: _____

Job Established:

Code No.: 5322

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

JOB DESCRIPTION

POSITION: Superintendent, Plant and Equipment Maintenance, LS-12

DATE: 01-08-03

DEPT/OFFICE: OPER/PLNT

REVIEWED:
OPER :
HRMP:

REPORTS TO: Assistant Director, PLNT

POSITION SUMMARY:

This is senior level maintenance program management, administrative, and supervisory work involving the effective and efficient overall program management of plant and equipment preventive and corrective and contract maintenance. Employee is responsible for the direction, staff supervision and coordination, oversight and technical direction of multiple complex projects involving work performed by resources within the Equipment Maintenance Branch.

Employee works in close coordination with rail general superintendents, regional bus directors, senior engineering staff, other senior administrative and technical staff throughout WMATA. Employee also works to closely coordinate with various public and governmental activities interfacing with WMATA. Employee has extensive latitude for independent judgement and action and is expected to initiate and implement appropriate policies and procedures. Employee reports to the Director, Plant Maintenance (PLNT), through reviews of completed work assignments and effectiveness in meeting objectives.

DUTIES:

Manages, directs, supervises, and evaluates the activities, policies, procedures, and employees. Provides technical direction to assigned staff in support of in-house and contract maintenance activities for the effective maintenance of WMATA stations, tunnels, garages, shops, and related support equipment.

Formulates and implements detailed program plans and budget requirements for the execution of each program component ensuring conformance to overall program plans and Authority policies and objectives.

Oversees the establishment and implementation of an effective inspection, preventive maintenance, and repair program for assigned facilities, related systems and equipment to ensure their continuous availability, safe and efficient use.

Ensures that contingency plans are provided for in the event of an emergency and that properly trained personnel and appropriate equipment are available on a timely basis to ensure the effective restoration of the system to normal operations.

Supervises subordinate staff to include recommending applicant selection, disciplinary actions, resolution of grievances, assigning duties, directing work, approving leave requests and time sheets, and ensuring appropriate subordinate training is provided.

Establishes work plans for subordinates against which they will be measured and conducts performance evaluations of subordinates based on these work plans.

Discusses and resolves complaints and grievances with employees or their representatives in accordance with sound employee relations practices and operating requirements.

Provides procedures for selection and location of work, vacations and assignments of operations and maintenance personnel.

Prepares and delivers concise, authoritative written or oral reports or briefings regarding work performance, goals, trends and budget adherence.

Performs related management duties as required or assigned.

KNOWLEDGE, SKILLS, AND ABILITIES:

Extensive knowledge of the principles, practices, and techniques of project/program management, to coordinate, review and provide expert technical management direction.

Ability to acquire and maintain current knowledge of state-of-the-art trends, methods and practices that effect physical plant operation and maintenance as necessary to enhance the effectiveness in implementing, evaluating and analyzing major program activities within assigned area.

Comprehensive knowledge of, and progressively responsible experience in the maintenance, repair and replacement of facility systems and shop equipment, i.e., air compressors, drainage pumps, sewage ejectors, etc., and HVAC equipment and systems.

Ability to establish and maintain effective working relationships with those individuals and organizations with whom interface is required.

Ability to communicate effectively.

Ability to manage, within established budget limitations, all facility operations and maintenance functions, including the direction of all facets of operations within the assigned area of maintenance program responsibility.

Ability to effectively oversee total scope of budgetary, fiscal and program management, administrative and human relations functions is also required.

MINIMUM QUALIFICATIONS AND EXPERIENCE:

Graduation from an accredited college or university with a Bachelor's Degree in civil, mechanical, industrial engineering or a related field; and seven (7) years extensively responsible senior line management and operations experience in an organization responsible for the operations, maintenance and repair of a public mass transportation system and related physical plant. Demonstrated progressively responsible management experience in the areas of maintenance of major complex facility components, systems, equipment, industrial environments, collective bargaining, and related facets of public transportation.

Or, an equivalent combination of post high school education and more than nine (9) years extensively responsible senior line management and operations experience in an organization responsible for the operations, maintenance and repair of a public mass transportation system and related physical plant. Demonstrated progressively responsible management experience in the areas of maintenance of major complex facility components, systems, equipment, industrial environments, collective bargaining, and related facets of public transportation.

LICENSE:

Possession of, or ability to rapidly acquire, a valid District of Columbia, Maryland or Virginia motor vehicle operator's permit issued from jurisdiction of residence.

MEDICAL GROUP:

Ability to satisfactorily complete the medical examination for this class. Must be able to perform the essential functions of this job either with or without reasonable accommodation(s).

FLSA EXEMPT

CODE NO: 5316

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

POSITION DESCRIPTION

SUPERVISOR, CRAFT CREW, LS-08
DEPT/OFFICE: TIES/PLNT

DATE: 3/20/12

FLSA: NON-EXEMPT
ROLE: 03

REVIEWED:
TIES:
HRSD:
LABR:

REPORTS TO: Assistant Superintendent or Manager

SUMMARY:

This position is responsible for inspection, installation, repair, replacement of mechanical equipment systems or inspection, repair and renovation/construction of facilities throughout the Metro system. The incumbent supervises one or more crafts, including: carpentry, masonry, plumbing, surface finishing, welding, sheet metal, machining, graphics, heating and air conditioning, fire protection, or mechanical equipment and industrial controls maintenance. This is technical nature of work in one or more trades involving equipment maintenance, facilities maintenance, construction or heavy equipment operations.

MAJOR DUTIES:

Supervises employees, in one or more crafts, that are responsible for maintaining mechanical equipment systems or performing construction services and heavy equipment operations. Affected crafts include: carpentry, masonry, plumbing, surface finishing, welding, sheet metal, machining, graphics, heating and air conditioning, fire protection or mechanical equipment and industrial controls maintenance.

Supervises and develops schedules for inspection, preventive/corrective/overhaul maintenance and replacement of mechanical equipment systems or facilities.

Conducts daily tool box meetings, develops job specific safety plans, performs safety audits and safety conversations, participates on a Local Safety Committee and contributes to accident/incident investigations. Reviews maintenance

processes and procedures from a safety perspective and recommends improvements.

Performs on-site inspections to monitor work performed by contractors and internal staff; ensures compliance with established standards. Acts as site supervisor/ coordinator to interface with and support other maintenance and operations functions. Analyzes work volume and staffing requirements and recommends measures to enhance performance and productivity.

Accesses automated maintenance management system to input work performance data, monitors work orders and backlog, assesses equipment performance trends and predict future maintenance requirements.

Instructs/trains employees using applicable technical data, tools, precision measuring/special equipment, tests instrumentation and corrective maintenance programs and procedures.

Provides instruction on safety and environmental requirements to include methods for minimizing at-risk behaviors to avoid injuries and property damage and techniques for identifying and correcting safety hazards. Enforces compliance with requirements for personal protective equipment and the roadway worker protection program.

Supervises subordinate staff to include recommending applicant selection, disciplinary actions, and grievance resolution. Assigns duties, directs work and approves leave requests and time sheets.

Prepares and completes oral, written and electronic reports and documentation; ensures easy retrieval of information for statistical and management purposes.

Purchases materials, parts and tools and ensures their proper use, care and security. Complies with established procurement policies and procedures.

The above duties are not intended to limit specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Demonstrated knowledge of, abilities to and/or hands-on experience in:

Functions and principles involved in installing, inspecting, troubleshooting and performing preventive/corrective maintenance on mechanical equipment systems or facilities.

Stay abreast of and apply current technologies. Diagnose maintenance problems and render problem-solving assistance as it relates to sophisticated electronic and computer-based control equipment.

Read, comprehend and use schematics, wiring diagrams, operational manuals, maintenance instructions and construction blueprints.

Federal, state and local building and regulatory codes, including OSHA, BOCA, NFPA, WSSC, EPA, etc.

Use of personal computer, MS Office products and computerized maintenance management systems.

Organize, plan and execute assigned projects or functions with minimal guidance and within established budget.

Understand and ensure compliance with safety, roadway worker protection and environmental rules and procedures and collective bargaining agreements.

Work various locations, hours and days.

Communicate effectively at all levels of the organization.

MINIMUM QUALIFICATIONS:

Graduation from high school or possession of a high school equivalent certificate (GED) with vocational training in the specified facilities maintenance or related field. Minimum four (4) years of progressively responsible related technical experience in the construction, equipment maintenance or facilities maintenance fields.

LICENSE/CERTIFICATE:

Possession of a valid District of Columbia, Maryland or Virginia motor vehicle operator's permit issued from the jurisdiction of residence.

Plumbing Supervisor: Possession of a Master Plumber's License, a Journeyman Gasfitter's License and a Cross Connection Certification Certificate from the Washington Suburban Sanitary Commission.

Boiler/Chiller Supervisor: Possession of a Third Class Steam Operating Engineers License issued from the District of Columbia.

HVAC Supervisor: Possession of a Journeyman's Refrigeration/Air Conditioning License from a local jurisdiction.

Equipment Operations Supervisor: Class A CDL from Maryland, Virginia or the District of Columbia and a Class 7 Operating Engineers License from the District of Columbia.

MEDICAL GROUP:

Ability to satisfactorily complete the medical examination for this job. The employee must be able to perform the essential functions of this job either with or without reasonable accommodation(s).

2335T

Code No. - 5394 (D)
Code No. - 5393 (C)
Code No. - 5392 (B)
Code No. - 5391 (A)
Code No. - 5390 (AA)

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

JOB DESCRIPTION

POSITION: General Equipment Mechanic

DATE: 9-11-92

DEPT/OFFICE: RAIL/PLNT

REPORTS TO: Supervisor, Craft Crew

APPROVALS:
RAIL
PERS
LABR

POSITION SUMMARY:

This is diverse technical industrial mechanical equipment operation and maintenance work. An employee in this class is responsible for operating and maintaining a variety of mechanical equipment and systems located in Authority owned facilities throughout the bus and rail system. Employee has considerable latitude for independent judgement and action within established guidelines. The work requires an understanding of maintenance procedures and practices; basic knowledge of electrical, electronic, hydraulic, mechanical, pneumatic and refrigeration theories and principles; the materials, parts, tools, test equipment and operating systems associated with WMATA's physical plant.

General Equipment Mechanic D - # 5394

Employees are assigned elementary general equipment operation and maintenance work in WMATA facilities. Employees are expected to gain familiarity with and to develop skills in the operation, maintenance and repair of physical plant equipment and systems. Employees receive instruction and close supervision on new assignments, while regular assignments are performed independently. Work is reviewed and verified upon completion to check progress and conformance to established policies and requirements by a Supervisor, Craft Crew.

General Equipment Mechanic C - # 5393

Employees are assigned routine general equipment operation and maintenance work in WMATA facilities. Employees are expected to utilize established procedures for operation, installation, inspection, maintenance and repair of physical plant equipment and systems. Routine assignments are performed independently. Employees make some work decisions independently but refer technical policy or procedural matters to a supervisor for decision or clarification. Work is reviewed periodically to check progress and conformance to established policies and requirements by a Supervisor, Craft Crew.

Code No. - 5394 (D)
Code No. - 5393 (C)
Code No. - 5392 (B)
Code No. - 5391 (A)
Code No. - 5390 (AA)

General Equipment Mechanic B - # 5392

Employees are assigned moderately difficult general equipment operation and maintenance work in WMATA facilities. Employees are expected to handle all normal aspects of the job independently. Employees make most work decisions independently but refer technical policy or procedural questions to a supervisor for decision or clarification. Work is reviewed occasionally to check progress and conformance to established policies and requirements by a Supervisor, Craft Crew.

General Equipment Mechanic A - # 5391

Employees are assigned difficult general equipment operation and maintenance work in WMATA facilities. Employees are expected to carry assignments through completion independently. Existing rules, regulations and procedures govern the work but employees use considerable judgement in interpreting and applying them to unusual or non-standard situations. Employees occasionally develop and refine their own work routines. Work is reviewed in general terms through spot checks and occasional checking of results by a Supervisor, Craft Crew.

General Equipment Mechanic AA - # 5390

Employees are assigned complex general equipment maintenance operation and maintenance work in WMATA facilities. Employees are expected to carry assignments through completion independently. Existing rules, regulations and procedures govern the work but employees use considerable judgement in interpreting and applying them to unusual or non-standard situations. Employees frequently refine and develop their own work routines. Work is reviewed in general terms through spot checks and occasional checking of results by a Supervisor, Craft Crew.

EXAMPLES OF DUTIES:

ALL LEVELS

Observes physical plant general equipment and systems in operation to detect potential failures or locate causes of malfunctions. Observes meters, gauges, fluid levels and charts to determine optimum operation efficiency and completes required documentation. Inspects used parts and equipment for changes in calibration, dimensional requirements and manufacturer's specifications. Tests and calibrates system controls and equipment to ensure proper system operations using test equipment or precision measuring instruments.

Performs repairs, inspections, required adjustments, testing, troubleshooting, cleaning, lubrication, and scheduled maintenance on assigned physical plant equipment in accordance with schematics, wiring and flow diagrams, standard operating procedures, operation manuals, manufacturer's specifications, maintenance instructions, local and federal standards.

Code No. - 5394 (D)
Code No. - 5393 (C)
Code No. - 5392 (B)
Code No. - 5391 (A)
Code No. - 5390 (AA)

Performs preventive, scheduled, unscheduled or corrective maintenance, troubleshoots and tests physical plant equipment systems, subsystems and components using precision measuring equipment such as multimeters and amprobes to test defective electrical control circuits; transits, flow meters, pressure gauges, leak detectors, vacuum pumps, pneumatic control testers, thermometers, pilot gages and air velocity indicators to inspect, test and repair mechanical components and systems; and other instruments and tools as required. Operates special shop equipment (drills, grinders, fork trucks, hoists, cranes, presses, de-greasers, lathes) and uses various tools.

Maintains physical plant systems by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; lubricating and cleaning or recharging equipment; installing and replacing filters, metering devices, and solenoids; high pressure cleaning; adjusting belts and drives, sanding and spot painting, and adjusting or calibrating equipment to manufacturer's specifications using approved procedures and test equipment.

Maintains physical plant service controls (temperature, pressure, electric, solid state and pneumatic) by performing scheduled maintenance inspections and tests, removing, replacing or repairing defective or worn parts and adjusting or calibrating to manufacturer's specifications using approved procedures and test equipment.

Maintains physical plant equipment electrical components (circuits, wiring, starters, relays and motors) and mechanical components (compressors, train lifts, vehicle lifts, overhead doors, cranes and hoists, sewage ejectors, ventilation and air handling systems, valves, pumps, portable lifts, etc.) by performing scheduled maintenance inspections and tests; removing, replacing and repairing defective or worn parts; cleaning and lubricating components as needed.

Implements directed engineering modifications to physical plant equipment and system. Performs new plant and component acceptance testing.

Completes required documentation and reports for the operation and maintenance of physical plant equipment and related components by using the proper forms, tags or entering data into computer records; prepares parts requisitions for the supervisor's approval.

Attends on-the-job and formal training classes; assists technicians in higher classifications in their assignments or provides job specific training to technicians in lower classifications.

Responds to and provides assistance in emergencies such as securing or safeguarding physical plant equipment, fire/life/safety, snow emergencies. etc.

Performs all tasks and assignments within the established safety practices and maintenance guidelines.

May operate Authority vehicles between work locations.

Works variable shifts, days and hours as required and as provided for under existing Union contract.

Performs all other related duties as required.

KNOWLEDGE, SKILLS AND ABILITIES:

ALL LEVELS

Knowledge of and demonstrated ability to perform all duties at current level.

Knowledge of assigned Plant Maintenance section's functions, procedures and guidelines and the maintenance requirements of the Authority operation supported.

Knowledge of and demonstrated ability to identify and apply basic facts and principles of the Authority's operating, maintenance and safety rules, regulations and procedures.

Ability to communicate effectively orally and in writing.

Ability to accept supervision and complete duties and work assignments in a timely and accurate manner.

Ability to deal courteously and effectively with supervisors and co-workers.

General Equipment Mechanic D

Ability to identify basic relationships, terms, general principles, laws and theories relating to, electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and how they relate to industrial and commercial physical plants.

Ability to identify and correct routine physical plant problems. Employee expected to perform simple parts of the procedure with assistance or demonstration from supervisor or mechanics in higher classifications. Employee demonstrates increasing proficiency for speed and accuracy.

Ability to recognize electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to operate and maintain related general physical plant equipment and components.

Ability to select and use correct parts, tools and test equipment to perform scheduled and unscheduled maintenance required to maintain general physical plant systems and support equipment.

Code No. - 5394 (D)
Code No. - 5393 (C)
Code No. - 5392 (B)
Code No. - 5391 (A)
Code No. - 5390 (AA)

General Equipment Mechanic C

Ability to explain basic relationships, general principles, laws and theories relating to electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and how they relate to industrial and commercial physical plants.

Ability to identify and correct routine physical plant problems. Employee expected to perform most tasks independently requiring assistance or demonstration on more difficult tasks from a supervisor or mechanics in higher classifications. Employee demonstrates increasing proficiency for speed and accuracy.

Ability to recognize electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to operate and maintain related general physical plant equipment and components.

Ability to select correct parts, use tools and test equipment in accordance with step-by-step procedures ; to perform scheduled and unscheduled maintenance required to maintain general physical plant systems and support equipment.

Ability to provide leadership to instruct and review work of lower level mechanics.

Ability to proficiently repair at a minimum the following equipment and systems: ACU, AHU, air curtain, air dryer, air purification, anti-freeze system, battery room fan, circulating fan, cyclone cleaner, dome fan, dust collector, E.T.E.C.'s, exhaust fan, garage exhaust fan, lube system for oil, grease and ATF, parts washer, submersible sewage pump, and sump pumps.

General Equipment Mechanic B

Ability to analyze facts and principles based on intermediate knowledge of general principles, laws and theories relating to electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and draw conclusions in their application to industrial and commercial physical plants.

Ability to identify and correct moderately difficult physical plant general equipment problems. Employee expected to perform most tasks independently with occasional spot checks of completed tasks. Employee may require assistance or demonstration on more difficult tasks from a supervisor or mechanic in higher classification. Employee demonstrates competency for speed and accuracy.

Ability to interpret electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to isolate, diagnose, repair and install related equipment and components.

Ability to select and use correct parts, tools and test equipment; analyze, evaluate and interpret test results to perform scheduled and unscheduled maintenance required to maintain general physical plant systems and equipment.

Ability to provide leadership to instruct and review work of lower level mechanics.

Ability to proficiently repair at a minimum the following equipment and systems: Bilco hatch door, brake tester, brake lathe, brake lathe dust collector, bus wash system, control air compressor, DPS, fuel systems - gas and diesel, industrial air compressor, jib crane, sewage ejector, tire machine and wheel alignment machines.

General Equipment Mechanic A

Ability to evaluate conditions, make independent decisions based on advanced knowledge of general principles, laws and theories relating to electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and draw conclusions in their application to industrial and commercial physical plants.

Ability to identify and correct difficult to complex physical plant general equipment problems. Employee expected to perform most tasks independently with occasional spot checks of completed tasks. Employee is proficient and able to explain or demonstrate proper procedures to subordinates.

Ability to interpret electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to isolate, diagnose, repair and install related equipment and components.

Ability to select and use correct parts, tools and test equipment; analyze, evaluate and interpret test results to perform scheduled and unscheduled maintenance required to maintain general physical plant systems and equipment.

Ability to provide leadership to instruct and review work of lower level mechanics.

Ability to proficiently repair at a minimum the following equipment and systems: bus lifts (hydraulic), car wash system, fire support system, overhead door, tunnel vent fan and under platform fans.

General Equipment Mechanic AA

Ability to evaluate conditions, make independent decisions based on advanced knowledge of advanced knowledge of general principles, laws and theories relating to electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and draw conclusions in their application to industrial and commercial physical plants.

Code No. - 5394 (D)
Code No. - 5393 (C)
Code No. - 5392 (B)
Code No. - 5391 (A)
Code No. - 5390 (AA)

Ability to identify and correct difficult to complex physical plant general equipment problems. Employee expected to perform and complete tasks independently, quickly and accurately. Employee is proficient and able to explain or demonstrate proper procedures to subordinates.

Ability to interpret electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to isolate, diagnose, repair and install related equipment and components.

Ability to select and use correct parts, tools and test equipment; analyze, evaluate and interpret test results to perform scheduled and unscheduled maintenance required to maintain general physical plant systems and equipment.

Ability to provide leadership to instruct and review work of lower level mechanics.

Maintains understanding of current trends, policies, technologies and techniques of general equipment maintenance specifically relating to the section of Plant Maintenance assigned.

Ability to proficiently repair at a minimum the following equipment and systems: Mobile lifts, train lifts, overhead crane and truck drop elevators.

May serve as Lead General Equipment Mechanic.

MINIMUM QUALIFICATIONS AND EXPERIENCE:

ALL LEVELS

Graduation from high school or possession of a high school equivalency certificate, and satisfactory completion of an acceptable vocational school and/or training program in a mechanical or a related field is required.

General Equipment Mechanic D

Considerable knowledge of and have performed satisfactorily the duties of a General Equipment Mechanic or related field for a period of not less than two (2) years.

General Equipment Mechanic C

Considerable knowledge of and have performed satisfactorily the duties of a General Equipment Mechanic or related field for a period of not less than three (3) years.

Code No. - 5394 (D)
Code No. - 5393 (C)
Code No. - 5392 (B)
Code No. - 5391 (A)
Code No. - 5390 (AA)

General Equipment Mechanic B

Considerable knowledge of and have performed satisfactorily the duties of a General Equipment Mechanic or related field for a period of not less than four (4) years.

General Equipment Mechanic A

Considerable knowledge of and have performed satisfactorily the duties of a General Equipment Mechanic or related field for a period of not less than five (5) years.

General Equipment Mechanic AA

Considerable knowledge of and have performed satisfactorily the duties of a General Equipment Mechanic or related field for a period of not less than six (6) years.

Or, an equivalent combination of education and experience.

LICENSE:

ALL LEVELS

Possession of a valid District of Columbia, Maryland or Virginia motor vehicle operator's license issued from jurisdiction of residence. Safe driving record with no more than four (4) points accumulated over the past three (3) years.

MEDICAL GROUP:

ALL LEVELS

Ability to complete satisfactorily the medical examination for this class.

Ability to perform strenuous physical tasks including frequent lifting of objects weighing up to 50 pounds and occasionally to 75 pounds.

Ability to distinguish basic colors for component, wiring and safety identification.

Job Established: 09-02-921

Local 689, ATU Represented
Maintenance and Construction District
In-class Progression Only

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Refer to the current Union Contract for the current Progression Rates for these positions.

SUBJECT: Completed Job Evaluation DATE: April 5, 2006

FROM: HRMP - [redacted]

TO: OPER - [redacted]

The position(s) listed below have been evaluated as follow:

JOB CODE	TITLE	GRADE
5706	Industrial Control Technician AA Lead	L689
5701	Industrial Control Technician AA	L689
5702	Industrial Control Technician A	L689
5703	Industrial Control Technician B	L689
5704	Industrial Control Technician C	L689
5705	Industrial Control Technician D	L689

Please contact me at x1379 if you have any questions.

cc: LABR - [redacted]
SAFE-
HRMS -
ODEV -

jobevaldpf

CODE NO: 5706

WASHINGTON METROPOLITAN TRANSIT AUTHORITY
POSITION DESCRIPTION
INDUSTRIAL CONTROL TECHNICIAN AA Lead L689
DEPT/OFFICE: OPER/PLNT

DATE: 02-23-06 FLSA: NON-EXEMPT

REVIEWED:
OPER :
COBN :
LABR :

REPORTS TO: Appropriate Supervisor

SUMMARY:

Performs technical, industrial, electrical, mechanical, equipment operation and maintenance work. Responsible for the installation, operation, repair, calibration, troubleshooting, and maintenance of electric, pneumatic, electro-mechanical, programmable logic controller (PLC) controlled industrial machinery, fans, vehicle lifts, pump stations, etc. Serves as lead and aids other Industrial Control Technicians.

MAJOR DUTIES:

Observes and operates physical plant general equipment and systems in operation to analyze operation of malfunctioning electrical or electronic equipment. Observe meters, gauges, fluid levels and charts to determine optimum operation and efficiency.

Perform repairs, inspections, required adjustments, testing, troubleshooting, cleaning, lubrication, and scheduled maintenance on assigned physical plant equipment.

Inspects used parts and equipment for changes in calibration, dimensional requirements and manufacturer's specifications. Tests and calibrates system controls and equipment to ensure proper system function. Execute operations using test equipment or precision measuring instruments.

Analyzes technical data, designs, or preliminary specifications such as blueprints, schematics, technical drawings, work orders, instructions, formulas, etc. Confers with engineering, technical or manufacturing personnel. Work is performed in accordance with schematics, wiring and flow diagrams, standard operating procedures, operation manuals, manufacturer's specifications, maintenance instructions, and local and federal standards.

Operates precision measuring equipment such as multi meters, amprobe, and other instruments and tools as required to test defective control circuits. Test and maintains; flow meters, pressure gauges, leak detectors, vacuum pumps, pneumatic controls, thermometers, pilot gages and air velocity indicators. Operates special

shop equipment (drills, grinders, fork trucks, hoists, cranes, presses, de-greasers, lathes) and uses various tools.

Maintains physical plant systems by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; lubricating and cleaning or recharging equipment; installing and replacing filters, metering devices, and solenoids; high pressure cleaning; adjusting belts and drives, sanding and spot painting, and adjusting or calibrating equipment to manufacturer's specifications using approved procedures and test equipment.

Maintains physical plant service controls (temperature, pressure, electric, solid state and pneumatic) Fabricates, assembles, or disassembles manufactured products by hand. Installs electrical fixtures or components, electronic equipment, or systems, electronic power, communication, control, or security equipment. Connects electrical equipment to power circuits. Instructs customers in product installation, use, or repair.

Maintains physical plant equipment electrical components (circuits, wiring, starters, relays and motors) and mechanical components (compressors, train lifts, vehicle lifts, overhead doors, cranes and hoists, sewage ejectors, ventilation and air handling systems, valves, pumps, portable lifts, etc.) by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; cleaning and lubricating components as needed.

Implements directed engineering modifications to physical plant equipment and system. Performs new plant and component acceptance testing.

Employee is assigned complex general equipment operation and maintenance work in WMATA facilities. Employee is expected to carry assignments through completion independently.

Existing rules, regulations and procedures govern the work but employees use considerable judgement in interpreting and applying them to unusual or non-standard situations.

Serves as Lead Industrial Control Technician.

The above duties and responsibilities are not intended to limit specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Knowledge of assigned Plant Maintenance section's functions, procedures and guidelines and the maintenance requirements of the Authority operation supported.

Knowledge of and demonstrated ability to identify and apply basic facts and principles of the Authority's operating, maintenance and safety rules, regulations and procedures.

Knowledge and skills in electrical circuits, digital and analog electronics, micro controllers, PLCs, microcomputer hardware and systems software.

Knowledge of the theories, principles, and materials used in association with: hydraulic, mechanical, pneumatic and refrigeration systems associated with WMATA's physical plant.

Ability to evaluate conditions, make independent decisions based on advanced knowledge of general principles, laws and theories relating to electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and draw conclusions in their application to industrial and commercial physical plants.

Ability to identify and correct difficult to complex physical plant general equipment problems. Employee is expected to perform and complete tasks independently, quickly and accurately. Employee is proficient and able to explain or demonstrate proper procedures to subordinates.

Ability to interpret electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to isolate, diagnose, repair and install related equipment and components.

Ability to select and use correct parts, tools and test equipment; analyze, evaluate and interpret test results to perform scheduled and unscheduled maintenance required to maintain general physical plant systems and equipment.

Ability to proficiently repair at a minimum the following equipment and systems: Mobile lifts, train lifts, PLC controls, overhead crane and truck drop elevators.

Ability to provide leadership to instruct and review work of lower level mechanics.

MINIMUM QUALIFICATIONS:

Graduation from high school or possession of a high school equivalency certificate, satisfactory completion of an acceptable vocational school and/or training program in electro-mechanical or a related field and six(6) years experience as a Industrial Control Technician.

Or, an equivalent combination of education and seven (7) years experience as a Industrial Control Technician.

LICENSE:

Possession of a valid District of Columbia, Maryland or Virginia motor vehicle operator's license issued from jurisdiction of residence. Safe driving record with no more than four (4) points accumulated over the past three (3) years.

MEDICAL GROUP:

Satisfactorily complete the medical examination for this position, if required. The incumbent must be able to perform the essential functions of this position either with or without reasonable accommodations.

Ability to perform strenuous physical tasks including frequent lifting of objects weighing up to 50 pounds and occasionally to 75 pounds.

Ability to distinguish basic colors for component, wiring and safety identification.

CODE NO: 5701

WASHINGTON METROPOLITAN TRANSIT AUTHORITY
POSITION DESCRIPTION

INDUSTRIAL CONTROL TECHNICIAN AA L689
DEPT/OFFICE: OPER/PLNT

DATE: 02-23-06 FLSA: NON-EXEMPT

REVIEWED:
OPER :
COBN :
LABR :

REPORTS TO: Appropriate Supervisor

SUMMARY:

Performs technical, industrial, electrical, mechanical, equipment operation and maintenance work. Responsible for the installation, operation, repair, calibration, troubleshooting, and maintenance of electric, pneumatic, electro-mechanical, programmable logic controller (PLC) controlled industrial machinery, fans, vehicle lifts, pump stations, etc. The equipment and systems are located in Authority owned facilities throughout the bus and rail system.

MAJOR DUTIES:

Observes and operates physical plant general equipment and systems in operation to analyze operation of malfunctioning electrical or electronic equipment. Observe meters, gauges, fluid levels and charts to determine optimum operation and efficiency.

Perform repairs, inspections, required adjustments, testing, troubleshooting, cleaning, lubrication, and scheduled maintenance on assigned physical plant equipment.

Inspects used parts and equipment for changes in calibration, dimensional requirements and manufacturer's specifications. Tests and calibrates system controls and equipment to ensure proper system function. Execute operations using test equipment or precision measuring instruments.

Analyzes technical data, designs, or preliminary specifications such as blueprints, schematics, technical drawings, work orders, instructions, formulas, etc. Confers with engineering, technical or manufacturing personnel. Work is performed in accordance with schematics, wiring and flow diagrams, standard operating procedures, operation manuals, manufacturer's specifications, maintenance instructions, and local and federal standards.

Operates precision measuring equipment such as multi meters, amprobe, and other instruments and tools as required to test defective control circuits. Test and maintains; flow meters, pressure gauges, leak detectors, vacuum pumps, pneumatic controls, thermometers, pilot gages and air velocity indicators. Operates special shop equipment (drills, grinders, fork trucks, hoists, cranes, presses, de-greasers, lathes) and uses various tools.

Maintains physical plant systems by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; lubricating and cleaning or recharging equipment; installing and replacing filters, metering devices, and solenoids; high pressure cleaning; adjusting belts and drives, sanding and spot painting, and adjusting or calibrating equipment to manufacturer's specifications using approved procedures and test equipment.

Maintains physical plant service controls (temperature, pressure, electric, solid state and pneumatic) Fabricates, assembles, or disassembles manufactured products by hand. Installs electrical fixtures or components, electronic equipment, or systems, electronic power, communication, control, or security equipment. Connects electrical equipment to power circuits. Instructs customers in product installation, use, or repair.

Maintains physical plant equipment electrical components (circuits, wiring, starters, relays and motors) and mechanical components (compressors, train lifts, vehicle lifts, overhead doors, cranes and hoists, sewage ejectors, ventilation and air handling systems, valves, pumps, portable lifts, etc.) by performing scheduled maintenance inspections and tests.

Implements directed engineering modifications to physical plant equipment and system. Performs new plant and component acceptance testing.

The above duties and responsibilities are not intended to limit specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Knowledge of assigned Plant Maintenance section's functions, procedures and guidelines and the maintenance requirements of the Authority operation supported.

Knowledge of and demonstrated ability to identify and apply basic facts and principles of the Authority's operating, maintenance and safety rules, regulations and procedures.

Knowledge and skills in electrical circuits, digital and analog electronics, micro controllers, PLCs, microcomputer hardware and systems software.

Knowledge of the theories, principles, and materials used in association with: hydraulic, mechanical, pneumatic and refrigeration systems associated with WMATA's physical plant.

Ability to evaluate conditions, make independent decisions based on advanced knowledge of general principles, laws and theories relating to electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and draw conclusions in their application to industrial and commercial physical plants.

Ability to identify and correct difficult to complex physical plant general equipment problems. Employee is expected to perform most tasks independently with occasional spot checks of completed tasks. Employee is proficient and able to explain or demonstrate proper procedures to subordinates.

Ability to interpret electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to isolate, diagnose, repair and install related equipment and components.

Ability to provide leadership to instruct and review work of lower level mechanics.

MINIMUM QUALIFICATIONS:

Graduation from high school or possession of a high school equivalency certificate, satisfactory completion of an acceptable vocational school and/or training program in electro-mechanical or a related field and six (6)years experience as a Industrial Control Technician.

Or, an equivalent combination of education and seven (7) years experience as a Industrial Control Technician.

LICENSE:

Possession of a valid District of Columbia, Maryland or Virginia motor vehicle operator's license issued from jurisdiction of residence. Safe driving record with no more than four (4) points accumulated over the past three (3) years.

MEDICAL GROUP:

Satisfactorily complete the medical examination for this position, if required. The incumbent must be able to perform the essential functions of this position either with or without reasonable accommodations.

Ability to perform strenuous physical tasks including frequent lifting of objects weighing up to 50 pounds and occasionally to 75 pounds.

Ability to distinguish basic colors for component, wiring and safety identification.

CODE NO: 5702

WASHINGTON METROPOLITAN TRANSIT AUTHORITY
POSITION DESCRIPTION
INDUSTRIAL CONTROL TECHNICIAN A L689
DEPT/OFFICE: OPER/PLNT

DATE: 02-23-06 FLSA: NON-EXEMPT

REVIEWED:
OPER : [redacted]
COBN : [redacted]
LABR : [redacted]

REPORTS TO: Appropriate Supervisor

SUMMARY:

Performs technical, industrial, electrical, mechanical, equipment operation and maintenance work. Responsible for the installation, operation, repair, calibration, troubleshooting, and maintenance of electric, pneumatic, electro-mechanical, programmable logic controller (PLC) controlled industrial machinery, fans, vehicle lifts, pump stations, etc. The equipment and systems are located in Authority owned facilities throughout the bus and rail system.

MAJOR DUTIES:

Observes and operates physical plant general equipment and systems in operation to analyze operation of malfunctioning electrical or electronic equipment. Observe meters, gauges, fluid levels and charts to determine optimum operation and efficiency.

Performs repairs, inspections, required adjustments, testing, troubleshooting, cleaning, lubrication, and scheduled maintenance on assigned physical plant equipment.

Inspects used parts and equipment for changes in calibration, dimensional requirements and manufacturer's specifications. Tests and calibrates system controls and equipment to ensure proper system function. Execute operations using test equipment or precision measuring instruments.

Analyzes technical data, designs, or preliminary specifications such as blueprints, schematics, technical drawings, work orders, instructions, formulas, etc. Confers with engineering, technical or manufacturing personnel. Work is performed in accordance with schematics, wiring and flow diagrams, standard operating procedures, operation manuals, manufacturer's specifications, maintenance instructions, and local and federal standards.

Operates precision measuring equipment such as multi meters, amprobe, and other

instruments and tools as required to test defective control circuits. Test and maintains; flow meters, pressure gauges, leak detectors, vacuum pumps, pneumatic controls, thermometers, pilot gages and air velocity indicators. Operates special shop equipment (drills, grinders, fork trucks, hoists, cranes, presses, de-greasers, lathes) and uses various tools.

Maintains physical plant systems by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; lubricating and cleaning or recharging equipment; installing and replacing filters, metering devices, and solenoids; high pressure cleaning; adjusting belts and drives, sanding and spot painting, and adjusting or calibrating equipment to manufacturer's specifications using approved procedures and test equipment.

Maintains physical plant service controls (temperature, pressure, electric, solid state and pneumatic) Fabricates, assembles, or disassembles manufactured products by hand. Installs electrical fixtures or components, electronic equipment, or systems, electronic power, communication, control, or security equipment. Connects electrical equipment to power circuits. Instructs customers in product installation, use, or repair.

Maintains physical plant equipment electrical components (circuits, wiring, starters, relays and motors) and mechanical components (compressors, train lifts, vehicle lifts, overhead doors, cranes and hoists, sewage ejectors, ventilation and air handling systems, valves, pumps, portable lifts, etc.) by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; cleaning and lubricating components as needed.

Implements directed engineering modifications to physical plant equipment and system. Performs new plant and component acceptance testing.

The above duties and responsibilities are not intended to limit specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Knowledge of assigned Plant Maintenance section's functions, procedures and guidelines and the maintenance requirements of the Authority operation supported.

Knowledge of and demonstrated ability to identify and apply basic facts and principles of the Authority's operating, maintenance and safety rules, regulations and procedures.

Knowledge and skills in electrical circuits, digital and analog electronics, micro controllers, PLCs, microcomputer hardware and systems software.

Knowledge of the theories, principles, and materials used in association with: hydraulic, mechanical, pneumatic and refrigeration systems associated with WMATA's physical plant.

Ability to evaluate conditions, make independent decisions based on advanced knowledge of general principles, laws and theories relating to electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and draw conclusions in their application to industrial and commercial physical plants.

Ability to identify and correct difficult to complex physical plant general equipment problems. Employee expected to perform most tasks independently with occasional spot checks of completed tasks. Employee is proficient and able to explain or demonstrate proper procedures to subordinates.

Ability to interpret electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to isolate, diagnose, repair and install related equipment and components.

Ability to select and use correct parts, tools and test equipment; analyze, evaluate and interpret test results to perform scheduled and unscheduled maintenance required to maintain general physical plant systems and equipment.

Ability to proficiently repair at a minimum the following equipment and systems: bus lifts (hydraulic & electro-mechanical), car wash system, fire support system, overhead door, tunnel vent fan and under platform fans.

Ability to provide leadership to instruct and review work of lower level mechanics.

MINIMUM QUALIFICATIONS:

Graduation from high school or possession of a high school equivalency certificate, satisfactory completion of an acceptable vocational school and/or training program in electro-mechanical or a related field and five (5) years experience as a Industrial Control Technician.

Or, an equivalent combination of education and seven six (6) years experience as a Industrial Control Technician.

LICENSE:

Possession of a valid District of Columbia, Maryland or Virginia motor vehicle operator's license issued from jurisdiction of residence. Safe driving record with no more than four (4) points accumulated over the past three (3) years.

MEDICAL GROUP:

Satisfactorily complete the medical examination for this position, if required. The incumbent must be able to perform the essential functions of this position either with or without reasonable accommodations.

Ability to perform strenuous physical tasks including frequent lifting of objects weighing up to 50 pounds and occasionally to 75 pounds.

Ability to distinguish basic colors for component, wiring and safety identification.

WASHINGTON METROPOLITAN TRANSIT AUTHORITY
POSITION DESCRIPTION
INDUSTRIAL CONTROL TECHNICIAN B L689
DEPT/OFFICE: OPER/PLNT

DATE: 02-23-06 FLSA: NON-EXEMPT

REVIEWED:
OPER :
COBN :
LABR :

REPORTS TO: Appropriate Supervisor

SUMMARY:

Performs technical, industrial, electrical, mechanical, equipment operation and maintenance work. Responsible for the installation, operation, repair, calibration, troubleshooting, and maintenance of electric, pneumatic, electro-mechanical, programmable logic controller (PLC) controlled industrial machinery, fans, vehicle lifts, pump stations, etc.

MAJOR DUTIES:

Observes and operates physical plant general equipment and systems in operation to analyze operation of malfunctioning electrical or electronic equipment. Observe meters, gauges, fluid levels and charts to determine optimum operation and efficiency.

Perform repairs, inspections, required adjustments, testing, troubleshooting, cleaning, lubrication, and scheduled maintenance on assigned physical plant equipment.

Inspects used parts and equipment for changes in calibration, dimensional requirements and manufacturer's specifications. Tests and calibrates system controls and equipment to ensure proper system function. Execute operation using test equipment or precision measuring instruments.

Analyzes technical data, designs, or preliminary specifications such as blueprints, schematics, technical drawings, work orders, instructions, formulas, etc. Confers with engineering, technical or manufacturing personnel. Work is performed in accordance with schematics, wiring and flow diagrams, standard operating procedures, operation manuals, manufacturer's specifications, maintenance instructions, and local and federal standards.

Operates precision measuring equipment such as multi meters, amprobe, and other

instruments and tools as required to test defective control circuits. Test and maintains; flow meters, pressure gauges, leak detectors, vacuum pumps, pneumatic controls, thermometers, pilot gages and air velocity indicators. Operates special shop equipment (drills, grinders, fork trucks, hoists, cranes, presses, de-greasers, lathes) and uses various tools.

Maintains physical plant systems by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; lubricating and cleaning or recharging equipment; installing and replacing filters, metering devices, and solenoids; high pressure cleaning; adjusting belts and drives, sanding and spot painting, and adjusting or calibrating equipment to manufacturer's specifications using approved procedures and test equipment.

Maintains physical plant service controls (temperature, pressure, electric, solid state and pneumatic) Fabricates, assembles, or disassembles manufactured products by hand. Installs electrical fixtures or components, electronic equipment, or systems, electronic power, communication, control, or security equipment. Connects electrical equipment to power circuits. Instructs customers in product installation, use, or repair.

Maintains physical plant equipment electrical components (circuits, wiring, starters, relays and motors) and mechanical components (compressors, train lifts, vehicle lifts, overhead doors, cranes and hoists, sewage ejectors, ventilation and air handling systems, valves, pumps, portable lifts, etc.) by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; cleaning and lubricating components as needed.

Implements directed engineering modifications to physical plant equipment and system. Performs new plant and component acceptance testing.

The above duties and responsibilities are not intended to limit specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Knowledge of assigned Plant Maintenance section's functions, procedures and guidelines and the maintenance requirements of the Authority operation supported.

Knowledge of and demonstrated ability to identify and apply basic facts and principles of the Authority's operating, maintenance and safety rules, regulations and procedures.

Knowledge and skills in electrical circuits, digital and analog electronics, micro controllers, PLCs, microcomputer hardware and systems software.

Knowledge of the theories, principles, and materials used in association with: hydraulic, mechanical, pneumatic and refrigeration systems associated with WMATA's physical plant.

Ability to analyze facts and principles based on intermediate knowledge of general principles, laws and theories relating to electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and draw conclusions in their application to industrial and commercial physical plants.

Ability to identify and correct moderately difficult physical plant general equipment problems. Employee is expected to perform most tasks independently with occasional spot checks of completed tasks. Employee may require assistance or demonstration on more difficult tasks from a supervisor or mechanic in higher classification. Employee demonstrates competency for speed and accuracy.

Ability to interpret electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to isolate, diagnose, repair and install related equipment and components.

Ability to select correct parts, use tools and test equipment in accordance with step-by-step procedures; to perform scheduled and unscheduled maintenance required to maintain general physical plant systems and support equipment.

Ability to proficiently repair at a minimum the following equipment and systems: Bilco hatch door, brake tester, brake lathe, brake lathe dust collector, bus wash system, control air compressor, DPS, fuel systems - gas and diesel, industrial air compressor, jib crane, sewage ejector, tire machine and wheel alignment machines.

MINIMUM QUALIFICATIONS:

Graduation from high school or possession of a high school equivalency certificate, satisfactory completion of an acceptable vocational school and/or training program in electro-mechanical or a related field and four(4) years experience as a Industrial Control Technician.

Or, an equivalent combination of education and five (5) years experience as a Industrial Control Technician.

LICENSE:

Possession of a valid District of Columbia, Maryland or Virginia motor vehicle operator's license issued from jurisdiction of residence. Safe driving record with no more than four (4) points accumulated over the past three (3) years.

MEDICAL GROUP:

Satisfactorily complete the medical examination for this position, if required. The incumbent must be able to perform the essential functions of this position either with or without reasonable accommodations.

Ability to perform strenuous physical tasks including frequent lifting of objects weighing up to 50 pounds and occasionally to 75 pounds.

Ability to distinguish basic colors for component, wiring and safety identification.

WASHINGTON METROPOLITAN TRANSIT AUTHORITY
POSITION DESCRIPTION
INDUSTRIAL CONTROL TECHNICIAN C L689
DEPT/OFFICE: OPER/PLNT

DATE: 02-23-06 FLSA: NON- EXEMPT

REVIEWED:
OPER :
COBN :
LABR :

REPORTS TO: Appropriate Supervisor

SUMMARY:

Performs technical, industrial, electrical, mechanical, equipment operation and maintenance work. Responsible for the installation, operation, repair, calibration, troubleshooting, and maintenance of electric, pneumatic, electro-mechanical, programmable logic controller (PLC) controlled industrial machinery, fans, vehicle lifts, pump stations, etc.

MAJOR DUTIES:

Observes and operates physical plant general equipment and systems in operation to analyze operation of malfunctioning electrical or electronic equipment. Observe meters, gauges, fluid levels and charts to determine optimum operation and efficiency.

Perform repairs, inspections, required adjustments, testing, troubleshooting, cleaning, lubrication, and scheduled maintenance on assigned physical plant equipment.

Inspects used parts and equipment for changes in calibration, dimensional requirements and manufacturer's specifications. Tests and calibrates system controls and equipment to ensure proper system function. Execute operation using test equipment or precision measuring instruments.

Analyzes technical data, designs, or preliminary specifications such as blueprints, schematics, technical drawings, work orders, instructions, formulas, etc. Confers with engineering, technical or manufacturing personnel. Work is performed in accordance with schematics, wiring and flow diagrams, standard operating procedures, operation manuals, manufacturer's specifications, maintenance instructions, and local and federal standards.

Operates precision measuring equipment such as multi meters, amprobe, and other instruments and tools as required to test defective control circuits. Test and maintains; flow meters, pressure gauges, leak detectors, vacuum pumps, pneumatic controls, thermometers, pilot gages and air velocity indicators. Operates special shop equipment (drills, grinders, fork trucks, hoists, cranes, presses, de-greasers, lathes) and uses various tools.

Maintains physical plant systems by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; lubricating and cleaning or recharging equipment; installing and replacing filters, metering devices, and solenoids; high pressure cleaning; adjusting belts and drives, sanding and spot painting, and adjusting or calibrating equipment to manufacturer's specifications using approved procedures and test equipment.

Maintains physical plant service controls (temperature, pressure, electric, solid state and pneumatic) Fabricates, assembles, or disassembles manufactured products by hand. Installs electrical fixtures or components, electronic equipment, or systems, electronic power, communication, control, or security equipment. Connects electrical equipment to power circuits. Instructs customers in product installation, use, or repair.

Maintains physical plant equipment electrical components (circuits, wiring, starters, relays and motors) and mechanical components (compressors, train lifts, vehicle lifts, overhead doors, cranes and hoists, sewage ejectors, ventilation and air handling systems, valves, pumps, portable lifts, etc.) by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; cleaning and lubricating components as needed.

Implements directed engineering modifications to physical plant equipment and system. Performs new plant and component acceptance testing.

The above duties and responsibilities are not intended to limit specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Knowledge of assigned Plant Maintenance section's functions, procedures and guidelines and the maintenance requirements of the Authority operation supported.

Knowledge of and demonstrated ability to identify and apply basic facts and principles of the Authority's operating, maintenance and safety rules, regulations and procedures.

Ability to obtain basic knowledge and skills in electrical circuits, digital and analog electronics, micro controllers, PLCs, microcomputer hardware and systems software.

Knowledge of the theories, principles, and materials used in association with: hydraulic, mechanical, pneumatic and refrigeration systems associated with WMATA's physical plant.

Ability to recognize electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to operate and maintain related general physical plant equipment and components.

Ability to explain basic relationships, general principles, laws and theories relating to electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and how they relate to industrial and commercial physical plants.

Ability to select correct parts, uses tools and test equipment in accordance with step-by-step procedures; to perform scheduled and unscheduled maintenance required to maintain general physical plant systems and support equipment.

Ability to proficiently repair at a minimum the following equipment nd systems: ACU, AHU, air curtain, air dryer, air purification, anti-freeze system, battery room fan, circulating fan, cyclone cleaner, dome fan, dust collector, E.T.E.C.'s, exhaust fan, garage exhaust fan, lube system for oil, grease and ATF, parts washer, submersible sewage pump, and sump pumps.

MINIMUM QUALIFICATIONS:

Graduation from high school or possession of a high school equivalency certificate, satisfactory completion of an acceptable vocational school and/or training program in electro-mechanical or a related field and three (3) years experience as a Industrial Control Technician.

Or, an equivalent combination of education and seven four (4) years experience as a Industrial Control Technician.

LICENSE:

Possession of a valid District of Columbia, Maryland or Virginia motor vehicle operator's license issued from jurisdiction of residence. Safe driving record with no more than four (4) points accumulated over the past three (3) years.

MEDICAL GROUP:

Satisfactorily complete the medical examination for this position, if required. The incumbent must be able to perform the essential functions of this position either with or without reasonable accommodations.

Ability to perform strenuous physical tasks including frequent lifting of objects weighing up to 50 pounds and occasionally to 75 pounds.

Ability to distinguish basic colors for component, wiring and safety identification.

CODE NO: 5705

WASHINGTON METROPOLITAN TRANSIT AUTHORITY
POSITION DESCRIPTION
INDUSTRIAL CONTROL TECHNICIAN D L689
DEPT/OFFICE: OPER/PLNT

DATE: 02-23-06 FLSA: NON-EXEMPT

REVIEWED:
OPER :
COBN :
LABR :

REPORTS TO: Appropriate Supervisor

SUMMARY:
Performs technical, industrial, electrical, mechanical, equipment operation and maintenance work. Responsible for the installation, operation, repair, calibration, troubleshooting, and maintenance of electric, pneumatic, electro-mechanical, programmable logic controller (PLC) controlled industrial machinery, fans, vehicle lifts, pump stations, etc.

MAJOR DUTIES:

Observes and operates physical plant general equipment and systems in operation to analyze operation of malfunctioning electrical or electronic equipment. Observe meters, gauges, fluid levels and charts to determine optimum operation and efficiency.

Perform repairs, inspections, required adjustments, testing, troubleshooting, cleaning, lubrication, and scheduled maintenance on assigned physical plant equipment.

Inspects used parts and equipment for changes in calibration, dimensional requirements and manufacturer's specifications. Tests and calibrates system controls and equipment to ensure proper system function. Execute operation using test equipment or precision measuring instruments.

Analyzes technical data, designs, or preliminary specifications such as blueprints, schematics, technical drawings, work orders, instructions, formulas, etc. Confers with engineering, technical or manufacturing personnel. Work is performed in accordance with schematics, wiring and flow diagrams, standard operating procedures, operation manuals, manufacturer's specifications, maintenance instructions, and local and federal standards.

Operates precision measuring equipment such as multi meters, amprobe, and other instruments and tools as required to test defective control circuits. Test and maintains; flow meters, pressure gauges, leak detectors, vacuum pumps, pneumatic controls, thermometers, pilot gages and air velocity indicators. Operates

special shop equipment (drills, grinders, fork trucks, hoists, cranes, presses, de-greasers, lathes) and uses various tools.

Maintains physical plant systems by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; lubricating and cleaning or recharging equipment; installing and replacing filters, metering devices, and solenoids; high pressure cleaning; adjusting belts and drives, sanding and spot painting, and adjusting or calibrating equipment to manufacturer's specifications using approved procedures and test equipment.

Maintains physical plant service controls (temperature, pressure, electric, solid state and pneumatic) Fabricates, assembles, or disassembles manufactured products by hand. Installs electrical fixtures or components, electronic equipment, or systems, electronic power, communication, control, or security equipment. Connects electrical equipment to power circuits. Instructs customers in product installation, use, or repair.

Maintains physical plant equipment electrical components (circuits, wiring, starters, relays and motors) and mechanical components (compressors, train lifts, vehicle lifts, overhead doors, cranes and hoists, sewage ejectors, ventilation and air handling systems, valves, pumps, portable lifts, etc.) by performing scheduled maintenance inspections and tests; removing, replacing or repairing defective or worn parts; cleaning and lubricating components as needed.

Implements directed engineering modifications to physical plant equipment and system. Performs new plant and component acceptance testing.

The above duties and responsibilities are not intended to limit specific duties and responsibilities of any particular position. It is not intended to limit in any way the right of supervisors to assign, direct and control the work of employees under their supervision.

KNOWLEDGE, SKILLS AND ABILITIES:

Knowledge of assigned Plant Maintenance section's functions, procedures and guidelines and the maintenance requirements of the Authority operation supported.

Knowledge of and demonstrated ability to identify and apply basic facts and principles of the Authority's operating, maintenance and safety rules, regulations and procedures.

Knowledge and skills in electrical circuits, digital and analog electronics, micro controllers, PLCs, microcomputer hardware and systems software.

Knowledge of the theories, principles, and materials used in association with: hydraulic, mechanical, pneumatic and refrigeration systems associated with WMATA's physical plant.

Ability to analyze facts and principles based on intermediate knowledge of general principles, laws and theories relating to electrical, electronic, hydraulic, mechanical, pneumatic equipment and systems and draw conclusions in their application to industrial and commercial physical plants.

Ability to identify and correct moderately difficult physical plant general equipment problems. Employee is expected to perform most tasks independently with occasional spot checks of completed tasks. Employee may require assistance or demonstration on more difficult tasks from a supervisor or mechanic in higher classification. Employee demonstrates competency for speed and accuracy.

Ability to interpret electrical, electronic, hydraulic, mechanical and pneumatic, symbols; read and use schematic and wiring diagrams, mechanical drawings, flow diagrams, operational manuals, and manufacturer's maintenance instructions to isolate, diagnose, repair and install related equipment and components.

Ability to select correct parts, use tools and test equipment in accordance with step-by-step procedures; to perform scheduled and unscheduled maintenance required to maintain general physical plant systems and support equipment.

Ability to proficiently repair at a minimum the following equipment and systems: Bilco hatch door, brake tester, brake lathe, brake lathe dust collector, bus wash system, control air compressor, DPS, fuel systems - gas and diesel, industrial air compressor, jib crane, sewage ejector, tire machine and wheel alignment machines.

MINIMUM QUALIFICATIONS:

Graduation from high school or possession of a high school equivalency certificate, satisfactory completion of an acceptable vocational school and/or training program in electro-mechanical or a related field and two (2) years experience as a Industrial Control Technician.

Or, an equivalent combination of education and tree (3) years experience as a Industrial Control Technician.

LICENSE:

Possession of a valid District of Columbia, Maryland or Virginia motor vehicle operator's license issued from jurisdiction of residence. Safe driving record with no more than four (4) points accumulated over the past three (3) years.

MEDICAL GROUP:

Satisfactorily complete the medical examination for this position, if required. The incumbent must be able to perform the essential functions of this position either with or without reasonable accommodations.

Ability to perform strenuous physical tasks including frequent lifting of objects weighing up to 50 pounds and occasionally to 75 pounds.

Ability to distinguish basic colors for component, wiring and safety identification.

9 REFERENCE DOCUMENTS

9.1 Reference 1

Tunnel Fan Student Guide

Tunnel Fan Student Guide

Document Revision Log

Course No.	Release Date	Technical Instructor	Reason/Description	Curriculum Developer
OPTTTV	Alpha Pilot 12-29-14	[redacted]	New Course Launch	[redacted]
OPTTTV	Beta Pilot 01-26-15		Incorporation of Content Changes	
OPTTTV	01-27-2015		Incorporate Changes from Beta Session	
OPTTTV	03-19-2015		Incorporate Changes from PLNT	

This document is designed as a reference guide for all classes developed and revised by and for Technical Skills and Maintenance Training (TSMT.) All content conforms to Operations Administrative Procedure (OAP) 203-3 and established processes.

9.2 Reference 2

PLNT Form 209-1571

Preventive Maintenance
With Inspection and Testing

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID FS: _____ **VS:** _____ **VS:** _____

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from Metrorail tunnels. The fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) during emergencies. The fans can also be operated independently at the fan shaft. The fans and dampers work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled through the fan shaft and ejected outside.

Always refer to the manufacturer's manual for equipment-specific maintenance procedures.

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10		**Notify Operation Control Center (OCC) the PM work location where fans will be temporarily out of service. Alarms may be generated during the PM.**	
20		Perform visual inspection (PVI) of the discharge grating at street level for trash/debris or overgrowth which might prevent or restrict airflow.	
30		PVI the fire extinguisher and sign tag if it passes inspection.	
40		Operate the fans locally in both manual "Exhaust" and "Supply" modes. PVI the general operation of fans for vibration and listen/check for any noise that may indicate abnormal conditions. Verify vent dampers and bypass dampers close while the fans operate in emergency modes (Supply and Exhaust).	
50		PVI the fans for loose bolts or fasteners.	
60		PVI the fan mounts and verify each fan is secure and the vibration isolators (springs/rubber) are intact.	
70		**Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).**	
80		PVI the fan housing, silencers, flexible ductwork connections for major tears or openings that would result in significant air leakage.	
90		PVI of the controls located within the control panel(s) to verify there are no air leaks or disconnected air lines. For pneumatic controls, verify the regulated air pressure to the controls is between 20 and 25 PSI.	
100		PVI the drain water separator in the pneumatic control cabinet and drain any accumulated water.	
110		Verify the temperature gauge in the control cabinet reads approximately the same as the tunnel temperature.	
120		PVI all fan and vent dampers and damper frames for damage or deformation. Look for missing mounting hardware/fasteners. Verify all damper blades are in place and aligned correctly.	

Task	Y	Task Description	Comments, Follow-Up WO#
130		**Remove LOTO** and restore power to the fan. Ensure fan HOA switch is in "Remote" mode.	
140		PVI Motor Control Center (MCC) for rust and water damage.	
150		Verify fan shaft telephone operates by calling ROCC. Record the name of the ROCC operator.	**Name of ROCC Operator:**
160		Request ROCC to remotely operate the fans. The sequence commands should be as follows: **EMERGENCY ON EXHAUST** *(Verify the fans operate in exhaust and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify the fans stop.)* **EMERGENCY ON SUPPLY** *(Verify the fans operate in supply and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify fans stop.)* **RESTORE TO AUTO EXHAUST**	**Open COMM FLS Work Orders, if needed.**
170		Perform routine housekeeping tasks as needed. Clean shaft and remove debris/trash.	

NOTES: 1. Open Fire/Life Safety (FLS) work orders for any safety deficiency that was observed during the testing and inspection of the tunnel fans. (Includes deficiencies in graphics, Emergency Exit lights, handrails, overgrowth around hatch/grating at street level.)
2. Open a regular work order for any minor deficiency observed. (Includes clogged drains, deficiencies in lighting, doors, paint surfaces, etc.)

Date Completed: _____

Mechanic's Name: _____ Mechanic's Signature: _____

Mechanic's Name: _____ Mechanic's Signature: _____

Supervisor's Signature: _____ ☐ QC Performed WO #: _____

PLNT Form 209-1571 (07/01/2016)

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard PPE including approved shoes and WMATA-issued safety vest, safety glasses, flashlight, gloves, hearing protection and radio.		
Standard tools for general equipment mechanics.		

9.3 Reference 3

PLNT-1001 Checklist

Inspection and Testing PLNT 1001

PLNT-1001 Testing and Inspections Checklist

Equipment: Tunnel Fans

Chain Marker: All Fan Shafts

Station: N/A

Location: N/A

DESCRIPTION: This Checklist provides the steps required to carry out the testing and inspections of the Tunnel Fan Systems. Tunnel Fans are used to provide airflow along the tunnel section. The location of a smoke or fire incident and the direction of customer evacuation determines how the fans are activated. The goal is to blow fresh air towards the customers as they exit the tunnel.

MONTHLY TASKS:

Task	☐	Testing and Inspection Task Description
10		Inspect street level discharge grating.
20		Verify telephone operation by contacting ROCC & inform ROCC of testing
30		Inspect for loose fasteners
40		Inspect fan mounts and vibration isolators.
50		Operate fans check for abnormal noise/vibration.
60		Remove power to each fan, LOTO.
70		Inspect dampers and frames.
80		Inspect housing, attenuator, ductwork.
90		Inspect fan grilles.
100		Inspect Control Cabinet and temperature gauge.
110		Inspect Water seperator.
120		Restore power to fans, place selector switch in "Remote Control"
130		Contact ROCC and request fan to operate in "Emergency Exhaust", record ROCC operator name.
140		Verify "Emergency Exhaust" operation.
150		Verify "Emergency Off" operation.
160		Contact ROCC and request fan to operate in "Emergency Supply".

Inspection and Testing PLNT 1001

170		Verify "Emergency Supply" operation.
180		Verify damper operation for all modes.
190		Verify "Emergency Off" operation.
200		Request ROCC command fans to "Auto Exhaust".
210		Advice ROCC that testing and inspection is complete.
220		Inspect fire extinguisher.

Requirements for performing the Testing and Inspections:
Standard hand tools.
Minimum PPE to include hearing protection, safety glasses or goggles, safety vest, flashlight, gloves, radio, and safety shoes.

Date Completed: _____

Mechanic's #1 Name: _____

Supervisor's Sign: _____

Mechanic's #1 Sign: _____

Mechanic's #2 Name: _____

Mechanic's #2 Sign: _____

QC Performed: _____

WO#: _____

9.4 Reference 4

Modification of Preventive Maintenance Forms

Wo# 11428620

Preventive Maintenance

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers **LOCATION ID FS:** FC01 **VS:** VC1 **VS:** VC2

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from the tunnels if there is a fire. These fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) (they can also be operated independently at the fan shaft) during emergencies. The fans and dampers can work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled to the fan shaft and ejected outside. **Always refer to the manufacturer's manual for equipment-specific procedures.**

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	✓	Notify OCC of work location and the fans will be temporarily out of service.	
20	✓	Operate fan locally. Inspect the general operation of fans for vibration or abnormal conditions.	
30	✓	Inspect fan for loose bolts or fasteners.	
40	✓	Verify fan is mounted securely and vibration isolators are intact, if applicable.	
50	✓	Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).	
60	✓	Inspect fan housing, silencers, flexible connection ductwork for tears.	
70	✓	Inspect and clean pilot tubes (air flow switches); remove any blockage.	
80	✓	Inspect pneumatic controls for air leaks and condensation.	
90	✓	Verify regulated air pressure is 20-25 PSI to controls.	
100	✓	Verify temperature gauge in pneumatic cabinet reads close to the tunnel temperature.	
110	✓	Lubricate damper blades in fan and vent shaft(s), if needed.	
120	✓	Inspect Motor Control Center (MCC) for rust and water damage. Inspect telephone for proper operation.	
130	✓	Inspect and clean equipment surfaces and cabinet interiors.	
140	✓	Remove LOTO and restore power to the fan. Perform operation test with OCC.	

PLNT Form 209-1571 (07/01/2015)

Task	Y	Task Description	Comments, Follow-Up WO#
150	✓	Request OCC to remotely operate the fans. The sequence should be as follows: **EMERGENCY ON EXHAUST** OK **EMERGENCY ON SUPPLY** OK **AUTO EXHAUST** OK Ensure that no abnormal indications or alarms were generated; make adjustments as needed and re-test if abnormal conditions or alarms occur.	**Name of OCC Operator:** [redacted] **Open COMM Work Order, if needed. WO#:**
160	✓	Verify operation of vent shaft dampers.	
170	✓	Restore to "Auto Exhaust."	
180	✓	Sweep and clean room as needed, spot re-lamp as required.	
190	✓	Inspect and clean drain grating for both fan and vent shaft(s).	
200	✓	Inspect fan/vent door(s), locks, closers, paint and graphics.	
210	✓	Inspect fire extinguisher and sign tag.	
220	✓	Check fan/vent shaft, Emergency Exit lights.	
230	✓	Visually inspect stairs, ladders and railings for rust and damage.	
240	✓	Verify no excessive overgrowth around hatch/grating at street level.	

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard Tools and PPE including hearing protection and safety glasses.		
Clean Cloth	R59-70-0123	
Thermometer		

Date Completed: 8/15/15

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Supervisor's Signature: [redacted] ☐ QC Performed

WO #: 11428620

PLNT Form 209-1571 (07/01/2015)

WO# 11895737

Preventive Maintenance

X

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID FS: 5007 VS: VE12 VS: VE13

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from the tunnels if there is a fire. These fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) (they can also be operated independently at the fan shaft) during emergencies. The fans and dampers can work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled to the fan shaft and ejected outside. **Always refer to the manufacturer's manual for equipment-specific procedures.**

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	✓	Notify OCC of work location and the fans will be temporarily out of service.	
20	✓	Operate fan locally. Inspect the general operation of fans for vibration or abnormal conditions.	
30	✓	Inspect fan for loose bolts or fasteners.	
40	✓	Verify fan is mounted securely and vibration isolators are intact, if applicable.	
50	✓	Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).	
60	✓	Inspect fan housing, silencers, flexible connection ductwork for tears.	
70	✓	Inspect and clean pilot tubes (air flow switches); remove any blockage.	
80	✓	Inspect pneumatic controls for air leaks and condensation.	
90	✓	Verify regulated air pressure is 20-25 PSI to controls.	
100	✓	Verify temperature gauge in pneumatic cabinet reads close to the tunnel temperature.	
110	✓	Lubricate damper blades in fan and vent shaft(s), if needed.	
120	✓	Inspect Motor Control Center (MCC) for rust and water damage. Inspect telephone for proper operation.	
130	✓	Inspect and clean equipment surfaces and cabinet interiors.	
140	✓	Remove LOTO and restore power to the fan. Perform operation test with OCC.	

PLNT Form 209-1571 (07/01/2015)

Task	Y	Task Description	Comments, Follow-Up WO#
150	✓	Request OCC to remotely operate the fans. The sequence should be as follows: **EMERGENCY ON EXHAUST** OK **EMERGENCY ON SUPPLY** OK **AUTO EXHAUST** OK Ensure that no abnormal indications or alarms were generated; make adjustments as needed and re-test if abnormal conditions or alarms occur.	**Name of OCC Operator:** [redacted] **Open COMM Work Order, if needed. WO#:**
160	✓	Verify operation of vent shaft dampers.	
170	✓	Restore to "Auto Exhaust."	
180	✓	Sweep and clean room as needed, spot re-lamp as required.	
190	✓	Inspect and clean drain grating for both fan and vent shaft(s).	
200	✓	Inspect fan/vent door(s), locks, closers, paint and graphics.	
210	✓	Inspect fire extinguisher and sign tag.	
220	✓	Check fan/vent shaft, Emergency Exit lights.	
230	✓	Visually inspect stairs, ladders and railings for rust and damage.	
240	✓	Verify no excessive overgrowth around hatch/grating at street level.	

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard Tools and PPE including hearing protection and safety glasses.		
Clean Cloth	R59-70-0123	
Thermometer		

Date Completed: 01/20/15

Mechanic's Name: [redacted]

Mechanic's Signature: [redacted]

Supervisor's Signature: [redacted]

☐ QC Performed

WO #: 11395787

PLNT Form 209-1571 (07/01/2015)

WO# 113954 65

Preventive Maintenance

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID **FS:** FE06 **VS:** VE10 **VS:** VE11

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from the tunnels if there is a fire. These fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) (they can also be operated independently at the fan shaft) during emergencies. The fans and dampers can work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled to the fan shaft and ejected outside. **Always refer to the manufacturer's manual for equipment-specific procedures.**

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	✓	Notify OCC of work location and the fans will be temporarily out of service.	
20	✓	Operate fan locally. Inspect the general operation of fans for vibration or abnormal conditions.	
30	✓	Inspect fan for loose bolts or fasteners.	
40	✓	Verify fan is mounted securely and vibration isolators are intact, if applicable.	
50	✓	Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).	
60	✓	Inspect fan housing, silencers, flexible connection ductwork for tears.	
70	✓	Inspect and clean pilot tubes (air flow switches); remove any blockage.	
80	✓	Inspect pneumatic controls for air leaks and condensation.	
90	✓	Verify regulated air pressure is 20-25 PSI to controls.	
100	✓	Verify temperature gauge in pneumatic cabinet reads close to the tunnel temperature.	
110	✓	Lubricate damper blades in fan and vent shaft(s), if needed.	
120	✓	Inspect Motor Control Center (MCC) for rust and water damage. Inspect telephone for proper operation.	
130	✓	Inspect and clean equipment surfaces and cabinet interiors.	
140	✓	Remove LOTO and restore power to the fan. Perform operation test with OCC.	

PLNT Form 209-1571 (07/01/2015)

Task	Y	Task Description	Comments, Follow-Up WO#
150	✓	Request OCC to remotely operate the fans. The sequence should be as follows: **EMERGENCY ON EXHAUST** OK **EMERGENCY ON SUPPLY** OK **AUTO EXHAUST** OK Ensure that no abnormal indications or alarms were generated; make adjustments as needed and re-test if abnormal conditions or alarms occur.	**Name of OCC Operator:** [redacted] **Open COMM Work Order, if needed. WO#:**
160	✓	Verify operation of vent shaft dampers.	
170	✓	Restore to "Auto Exhaust."	
180	✓	Sweep and clean room as needed, spot re-lamp as required.	
190	✓	Inspect and clean drain grating for both fan and vent shaft(s).	
200	✓	Inspect fan/vent door(s), locks, closers, paint and graphics.	
210	✓	Inspect fire extinguisher and sign tag.	
220	✓	Check fan/vent shaft, Emergency Exit lights.	
230	✓	Visually inspect stairs, ladders and railings for rust and damage.	
240	✓	Verify no excessive overgrowth around hatch/grating at street level.	

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard Tools and PPE including hearing protection and safety glasses.		
Clean Cloth	R59-70-0123	
Thermometer		

Date Completed: 01/22/15

Mechanic's Name: [redacted]

Mechanic's Signature: [redacted]

Supervisor's Signature: [redacted]

☐ QC Performed

WO #: 11395465

PLNT Form 209-1571 (07/01/2015)

Preventive Maintenance

EQUIPMENT: Tunnel Fans and Jet Fan/Vent Shaft Dampers **LOCATION ID FS:** FE07 **VS:** V12 **VS:** V13

DESCRIPTION: Tunnel Fans and Fan Shafts (FS)/Vent Shafts (VS) are used to remove smoke from the tunnels if there is a fire. These fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) (can also be operated independently at the fan shaft) during emergencies. The fans and dampers work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled to the fan shaft and ejected outside. **Always refer to the manufacturer's manual for equipment-specific procedures.**

MONTHLY TASKS:

Task	Y	Task Description	Comments, Follow-Up WO# 11C+51733
		Monthly PM Tasks	
10	✓	Inspect and clean pilot tubes (air flow switches); remove any blockage.	
20	✓	Inspect general operation of fans for vibration or abnormal conditions.	
30	✓	Inspect for loose bolts or fasteners.	
40	✓	Verify fan is mounted securely and vibration isolators are intact, if applicable.	
50	✓	Inspect fan housing, silencers, flexible connection ductwork for tears.	tighten loose stabilizing bar in ductwork
60	✓	Inspect pneumatic controls for air leaks and condensation.	
70	✓	Verify regulated air pressure is 20-25 PSI to controls.	
80	✓	Verify temperature gauge in pneumatic cabinet reads close to tunnel temp.	N/A PLC
90	✓	Lubricate damper blades in fan and vent shaft(s), if needed.	
100	✓	Inspect fan/vent door(s), locks, closers, paint and graphics.	
110	✓	Inspect and clean equipment surfaces, interior of cabinets, phone.	
120	✓	Inspect Motor Control Center (MCC) and telephone for proper operation.	Relamp indicator lights
130	✓	Test transfer switch (test button only).	
140	✓	Inspect fire extinguisher and sign tag.	
150	✓	Check fan/vent shaft, Emergency Exit lights.	
160	✓	Visually inspect stairs, ladders, and railings.	
170	✓	Ensure the hatch and grating are secured and do not create a tripping hazard.	

PLNT Form 209-1571 (02/15/2015)

Task	Y	Task Description	Comments, Follow-Up WO#
180		Request OCC to remotely operate the fans. The sequence should be as follows: **EMERGENCY ON EXHAUST** OK **EMERGENCY ON SUPPLY** OK **AUTO EXHAUST** OK Ensure that no abnormal indications or alarms were generated; make adjustments as needed and re-test if abnormal conditions or alarms occur.	**Name of OCC Operator:** [redacted]
190	✓	Verify operation of vent shaft dampers.	
200	✓	Restore to "Auto Exhaust."	
210	✓	Sweep and clean room as needed, spot re-lamp as required.	
220	✓	Inspect and clean drain grating for both fan and vent shaft(s).	
230	✓	Verify no excessive overgrowth around hatch/grating at street level.	

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard Tools and PPE including hearing protection and safety glasses.		
Clean Cloth	R59-70-0123	
Thermometer		

Date Completed: 02/12/15

Mechanic's Name: [redacted]

Mechanic's Signature: [redacted]

Supervisor's Signature: [redacted]

☐ QC Performed

[redacted] O #: 11451733

PLNT Form 209-1571 (02/15/2015)

9.5 Reference 5

Preventive Maintenance Forms Missing Comments

X

Preventive Maintenance
With Inspection and Testing

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers **LOCATION ID FS:** F29 FE13 **VS:** VE15 **VS:** ________

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from Metrorail tunnels. The fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) during emergencies. The fans can also be operated independently at the fan shaft. The fans and dampers work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled through the fan shaft and ejected outside.

Always refer to the manufacturer's manual for equipment-specific maintenance procedures.

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	✓	Notify Operation Control Center (OCC) the PM work location where fans will be temporarily out of service. Alarms may be generated during the PM.	
20	✓	Perform visual inspection (PVI) of the discharge grating at street level for trash/debris or overgrowth which might prevent or restrict airflow.	
30	✓	PVI the fire extinguisher and sign tag if it passes inspection.	
40	✓	Operate the fans locally in both manual "Exhaust" and "Supply" modes. PVI the general operation of fans for vibration and listen/check for any noise that may indicate abnormal conditions. Verify vent dampers and bypass dampers close while the fans operate in emergency modes (Supply and Exhaust).	
50	✓	PVI the fans for loose bolts or fasteners.	
60	✓	PVI the fan mounts and verify each fan is secure and the vibration isolators (springs/rubber) are intact.	
70	✓	Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).	
80	✓	PVI the fan housing, silencers, flexible ductwork connections for major tears or openings that would result in significant air leakage.	
90	N/A	PVI of the controls located within the control panel(s) to verify there are no air leaks or disconnected air lines. For pneumatic controls, verify the regulated air pressure to the controls is between 20 and 25 PSI.	
100	N/A	PVI the drain water separator in the pneumatic control cabinet and drain any accumulated water.	
110	N/A	Verify the temperature gauge in the control cabinet reads approximately the same as the tunnel temperature.	
120	✓	PVI all fan and vent dampers and damper frames for damage or deformation. Look for missing mounting hardware/fasteners. Verify all damper blades are in place and aligned correctly.	

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Task	Y	Task Description	Comments, Follow-Up WO#
130	✓	Remove LOTO and restore power to the fan. Ensure fan HOA switch is in "Remote" mode.	
140	✓	PVI Motor Control Center (MCC) for rust and water damage.	
150	✓	Verify fan shaft telephone operates by calling ROCC. Record the name of the ROCC operator.	**Name of ROCC Operator:** [redacted]
160	✓ ✓ ✓ ✓ ✓ ✓	Request ROCC to remotely operate the fans. The sequence commands should be as follows: **EMERGENCY ON EXHAUST** *(Verify the fans operate in exhaust and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify the fans stop.)* **EMERGENCY ON SUPPLY** *(Verify the fans operate in supply and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify fans stop.)* **RESTORE TO AUTO EXHAUST**	**Open COMM FLS Work Orders, if needed.**
170		Perform routine housekeeping tasks as needed. Clean shaft and remove debris/trash.	

NOTES: 1. Open Fire/Life Safety (FLS) work orders for any safety deficiency that was observed during the testing and inspection of the tunnel fans. (Includes deficiencies in graphics, Emergency Exit lights, handrails, overgrowth around hatch/grating at street level.)
2. Open a regular work order for any minor deficiency observed. (Includes clogged drains, deficiencies in lighting, doors, paint surfaces, etc.)

Date Completed: 07-13-16

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Mechanic's Name: [redacted] Mechanic's Signature:

Supervisor's Signature: [redacted] ☐ QC Performed

WO #: 12803639

PLNT Form 209-1571 (07/01/2016)

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard PPE including approved shoes and WMATA-issued safety vest, safety glasses, flashlight, gloves, hearing protection and radio.		
Standard tools for general equipment mechanics.		

Preventive Maintenance
With Inspection and Testing

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID FS: BU FB09 **VS:** VB15 **VS:** N/A

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from Metrorail tunnels. The fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) during emergencies. The fans can also be operated independently at the fan shaft. The fans and dampers work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled through the fan shaft and ejected outside.

Always refer to the manufacturer's manual for equipment-specific maintenance procedures.

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	✓	**Notify Operation Control Center (OCC) the PM work location where fans will be temporarily out of service. Alarms may be generated during the PM.**	
20	✓	Perform visual inspection (PVI) of the discharge grating at street level for trash/debris or overgrowth which might prevent or restrict airflow.	
30	✓	PVI the fire extinguisher and sign tag if it passes inspection.	
40	✓	Operate the fans locally in both manual "Exhaust" and "Supply" modes. PVI the general operation of fans for vibration and listen/check for any noise that may indicate abnormal conditions. Verify vent dampers and bypass dampers close while the fans operate in emergency modes (Supply and Exhaust).	FAN IN OFF POSITION
50	✓	PVI the fans for loose bolts or fasteners.	
60	✓	PVI the fan mounts and verify each fan is secure and the vibration isolators (springs/rubber) are intact.	
70	✓	**Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).**	
80	✓	PVI the fan housing, silencers, flexible ductwork connections for major tears or openings that would result in significant air leakage.	
90	✓	PVI of the controls located within the control panel(s) to verify there are no air leaks or disconnected air lines. For pneumatic controls, verify the regulated air pressure to the controls is between 20 and 25 PSI.	
100	✓	PVI the drain water separator in the pneumatic control cabinet and drain any accumulated water.	
110	✓	Verify the temperature gauge in the control cabinet reads approximately the same as the tunnel temperature.	
120	✓	PVI all fan and vent dampers and damper frames for damage or deformation. Look for missing mounting hardware/fasteners. Verify all damper blades are in place and aligned correctly.	

Task	Y	Task Description	Comments, Follow-Up WO#
130	✓	Remove LOTO and restore power to the fan. Ensure fan HOA switch is in "Remote" mode.	
140	✓	PVI Motor Control Center (MCC) for rust and water damage.	
150	✓	Verify fan shaft telephone operates by calling ROCC. Record the name of the ROCC operator.	**Name of ROCC Operator:** [redacted]
160	✓ ✓ ✓ ✓ ✓ ✓	Request ROCC to remotely operate the fans. The sequence commands should be as follows: **EMERGENCY ON EXHAUST** *(Verify the fans operate in exhaust and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify the fans stop.)* **EMERGENCY ON SUPPLY** *(Verify the fans operate in supply and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify fans stop.)* **RESTORE TO AUTO EXHAUST**	**Open COMM FLS Work Orders, if needed.**
170		Perform routine housekeeping tasks as needed. Clean shaft and remove debris/trash.	

NOTES: 1. Open Fire/Life Safety (FLS) work orders for any safety deficiency that was observed during the testing and inspection of the tunnel fans. (Includes deficiencies in graphics, Emergency Exit lights, handrails, overgrowth around hatch/grating at street level.)
2. Open a regular work order for any minor deficiency observed. (Includes clogged drains, deficiencies in lighting, doors, paint surfaces, etc.)

Date Completed: 09-30-16

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Supervisor's Signature: [redacted] ☐ QC Performed

WO #: 12530430

PLNT Form 209-1571 (07/01/2016)

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard PPE including approved shoes and WMATA-issued safety vest, safety glasses, flashlight, gloves, hearing protection and radio.		
Standard tools for general equipment mechanics.		

Preventive Maintenance
With Inspection and Testing

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID FS: BAFB09 VS: VB15 VS: N/A

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from Metrorail tunnels. The fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) during emergencies. The fans can also be operated independently at the fan shaft. The fans and dampers work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled through the fan shaft and ejected outside.

Always refer to the manufacturer's manual for equipment-specific maintenance procedures.

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	✓	Notify Operation Control Center (OCC) the PM work location where fans will be temporarily out of service. Alarms may be generated during the PM.	
20	✓	Perform visual inspection (PVI) of the discharge grating at street level for trash/debris or overgrowth which might prevent or restrict airflow.	
30	✓	PVI the fire extinguisher and sign tag if it passes inspection.	
40	✓	Operate the fans locally in both manual "Exhaust" and "Supply" modes. PVI the general operation of fans for vibration and listen/check for any noise that may indicate abnormal conditions. Verify vent dampers and bypass dampers close while the fans operate in emergency modes (Supply and Exhaust).	
50	✓	PVI the fans for loose bolts or fasteners.	
60	✓	PVI the fan mounts and verify each fan is secure and the vibration isolators (springs/rubber) are intact.	
70	✓	Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).	
80	✓	PVI the fan housing, silencers, flexible ductwork connections for major tears or openings that would result in significant air leakage.	
90	✓	PVI of the controls located within the control panel(s) to verify there are no air leaks or disconnected air lines. For pneumatic controls, verify the regulated air pressure to the controls is between 20 and 25 PSI.	
100	✓	PVI the drain water separator in the pneumatic control cabinet and drain any accumulated water.	
110	✓	Verify the temperature gauge in the control cabinet reads approximately the same as the tunnel temperature.	
120	✓	PVI all fan and vent dampers and damper frames for damage or deformation. Look for missing mounting hardware/fasteners. Verify all damper blades are in place and aligned correctly.	

Task	Y	Task Description	Comments, Follow-Up WO#
130	✓	Remove LOTO and restore power to the fan. Ensure fan HOA switch is in "Remote" mode.	
140	✓	PVI Motor Control Center (MCC) for rust and water damage.	
150	✓	Verify fan shaft telephone operates by calling ROCC. Record the name of the ROCC operator.	**Name of ROCC Operator:** [redacted]
160	✓ ✓ ✓ ✓ ✓	Request ROCC to remotely operate the fans. The sequence commands should be as follows: **EMERGENCY ON EXHAUST** *(Verify the fans operate in exhaust and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify the fans stop.)* **EMERGENCY ON SUPPLY** *(Verify the fans operate in supply and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify fans stop.)* **RESTORE TO AUTO EXHAUST**	**Open COMM FLS Work Orders, if needed.**
170		Perform routine housekeeping tasks as needed. Clean shaft and remove debris/trash.	

NOTES: 1. Open Fire/Life Safety (FLS) work orders for any safety deficiency that was observed during the testing and inspection of the tunnel fans. (Includes deficiencies in graphics, Emergency Exit lights, handrails, overgrowth around hatch/grating at street level.)
2. Open a regular work order for any minor deficiency observed. (Includes clogged drains, deficiencies in lighting, doors, paint surfaces, etc.)

Date Completed: 09-30-16

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Supervisor's Signature: [redacted] ☐ QC Performed

WO #: 12898246

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard PPE including approved shoes and WMATA-issued safety vest, safety glasses, flashlight, gloves, hearing protection and radio.		
Standard tools for general equipment mechanics.		

Preventive Maintenance
With Inspection and Testing

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID **FS:** B11FB09 **VS:** B11 **VS:** N/A

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from Metrorail tunnels. The fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) during emergencies. The fans can also be operated independently at the fan shaft. The fans and dampers work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled through the fan shaft and ejected outside.

Always refer to the manufacturer's manual for equipment-specific maintenance procedures.

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	✓	**Notify Operation Control Center (OCC) the PM work location where fans will be temporarily out of service. Alarms may be generated during the PM.**	
20	✓	Perform visual inspection (PVI) of the discharge grating at street level for trash/debris or overgrowth which might prevent or restrict airflow.	
30	✓	PVI the fire extinguisher and sign tag if it passes inspection.	
40	✓	Operate the fans locally in both manual "Exhaust" and "Supply" modes. PVI the general operation of fans for vibration and listen/check for any noise that may indicate abnormal conditions. Verify vent dampers and bypass dampers close while the fans operate in emergency modes (Supply and Exhaust).	
50	✓	PVI the fans for loose bolts or fasteners.	
60	✓	PVI the fan mounts and verify each fan is secure and the vibration isolators (springs/rubber) are intact.	
70	✓	**Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).**	
80	✓	PVI the fan housing, silencers, flexible ductwork connections for major tears or openings that would result in significant air leakage.	
90	✓	PVI of the controls located within the control panel(s) to verify there are no air leaks or disconnected air lines. For pneumatic controls, verify the regulated air pressure to the controls is between 20 and 25 PSI.	
100	✓	PVI the drain water separator in the pneumatic control cabinet and drain any accumulated water.	
110	✓	Verify the temperature gauge in the control cabinet reads approximately the same as the tunnel temperature.	
120	✓	PVI all fan and vent dampers and damper frames for damage or deformation. Look for missing mounting hardware/fasteners. Verify all damper blades are in place and aligned correctly.	

Task	Y	Task Description	Comments, Follow-Up WO#
130	✓	**Remove LOTO** and restore power to the fan. Ensure fan HOA switch is in "Remote" mode.	
140	✓	PVI Motor Control Center (MCC) for rust and water damage.	
150	✓	Verify fan shaft telephone operates by calling ROCC. Record the name of the ROCC operator.	**Name of ROCC Operator:** [redacted]
160	✓ ✓ ✓ ✓ ✓	Request ROCC to remotely operate the fans. The sequence commands should be as follows: **EMERGENCY ON EXHAUST** *(Verify the fans operate in exhaust and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify the fans stop.)* **EMERGENCY ON SUPPLY** *(Verify the fans operate in supply and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify fans stop.)* **RESTORE TO AUTO EXHAUST**	**Open COMM FLS Work Orders, if needed.**
170		Perform routine housekeeping tasks as needed. Clean shaft and remove debris/trash.	

NOTES: 1. Open Fire/Life Safety (FLS) work orders for any safety deficiency that was observed during the testing and inspection of the tunnel fans. (Includes deficiencies in graphics, Emergency Exit lights, handrails, overgrowth around hatch/grating at street level.)
2. Open a regular work order for any minor deficiency observed. (Includes clogged drains, deficiencies in lighting, doors, paint surfaces, etc.)

Date Completed: 10.14-16

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Supervisor's Signature: [redacted] ☑ QC Performed

WO #: 12964616

PLNT Form 209-1571 (07/01/2016)

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard PPE including approved shoes and WMATA-issued safety vest, safety glasses, flashlight, gloves, hearing protection and radio.		
Standard tools for general equipment mechanics.		

Preventive Maintenance
With Inspection and Testing

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID FS: BLF609 VS: VB15 VS: _____

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from Metrorail tunnels. The fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) during emergencies. The fans can also be operated independently at the fan shaft. The fans and dampers work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled through the fan shaft and ejected outside.

Always refer to the manufacturer's manual for equipment-specific maintenance procedures.

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	✓	**Notify Operation Control Center (OCC) the PM work location where fans will be temporarily out of service. Alarms may be generated during the PM.**	
20	✓	Perform visual inspection (PVI) of the discharge grating at street level for trash/debris or overgrowth which might prevent or restrict airflow.	
30	✓	PVI the fire extinguisher and sign tag if it passes inspection.	
40	✓	Operate the fans locally in both manual "Exhaust" and "Supply" modes. PVI the general operation of fans for vibration and listen/check for any noise that may indicate abnormal conditions. Verify vent dampers and bypass dampers close while the fans operate in emergency modes (Supply and Exhaust).	
50	✓	PVI the fans for loose bolts or fasteners.	
60	✓	PVI the fan mounts and verify each fan is secure and the vibration isolators (springs/rubber) are intact.	
70	✓	**Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).**	
80	✓	PVI the fan housing, silencers, flexible ductwork connections for major tears or openings that would result in significant air leakage.	
90	✓	PVI of the controls located within the control panel(s) to verify there are no air leaks or disconnected air lines. For pneumatic controls, verify the regulated air pressure to the controls is between 20 and 25 PSI.	
100	✓	PVI the drain water separator in the pneumatic control cabinet and drain any accumulated water.	
110	✓	Verify the temperature gauge in the control cabinet reads approximately the same as the tunnel temperature.	
120	✓	PVI all fan and vent dampers and damper frames for damage or deformation. Look for missing mounting hardware/fasteners. Verify all damper blades are in place and aligned correctly.	

Task	Y	Task Description	Comments, Follow-Up WO#
130	✓	Remove LOTO and restore power to the fan. Ensure fan HOA switch is in "Remote" mode.	
140	✓	PVI Motor Control Center (MCC) for rust and water damage.	
150	✓	Verify fan shaft telephone operates by calling ROCC. Record the name of the ROCC operator.	**Name of ROCC Operator:** [redacted]
160	✓ ✓ ✓ ✓ ✓	Request ROCC to remotely operate the fans. The sequence commands should be as follows: **EMERGENCY ON EXHAUST** *(Verify the fans operate in exhaust and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify the fans stop.)* **EMERGENCY ON SUPPLY** *(Verify the fans operate in supply and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify fans stop.)* **RESTORE TO AUTO EXHAUST**	**Open COMM FLS Work Orders, if needed.**
170		Perform routine housekeeping tasks as needed. Clean shaft and remove debris/trash.	

NOTES: 1. Open Fire/Life Safety (FLS) work orders for any safety deficiency that was observed during the testing and inspection of the tunnel fans. (Includes deficiencies in graphics, Emergency Exit lights, handrails, overgrowth around hatch/grating at street level.)
2. Open a regular work order for any minor deficiency observed. (Includes clogged drains, deficiencies in lighting, doors, paint surfaces, etc.)

Date Completed: 11-02-16

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Supervisor's Signature: [redacted] ☐ QC Performed

WO #: 13090062

PLNT Form 209-1571 (07/01/2016)

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard PPE including approved shoes and WMATA-issued safety vest, safety glasses, flashlight, gloves, hearing protection and radio.		
Standard tools for general equipment mechanics.		

9.6 Reference 6

Preventive Maintenance Photocopy Illegible

12143672

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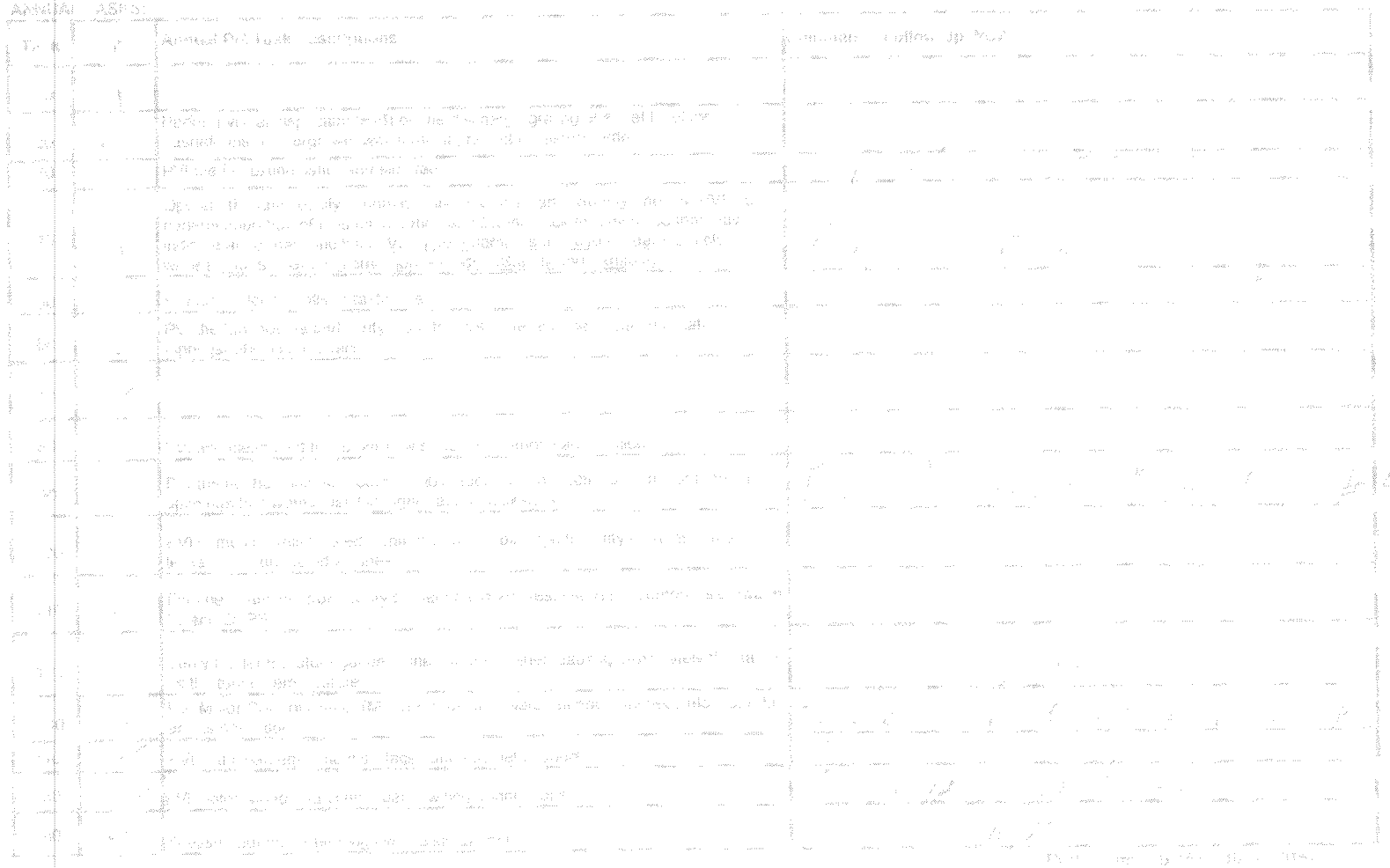

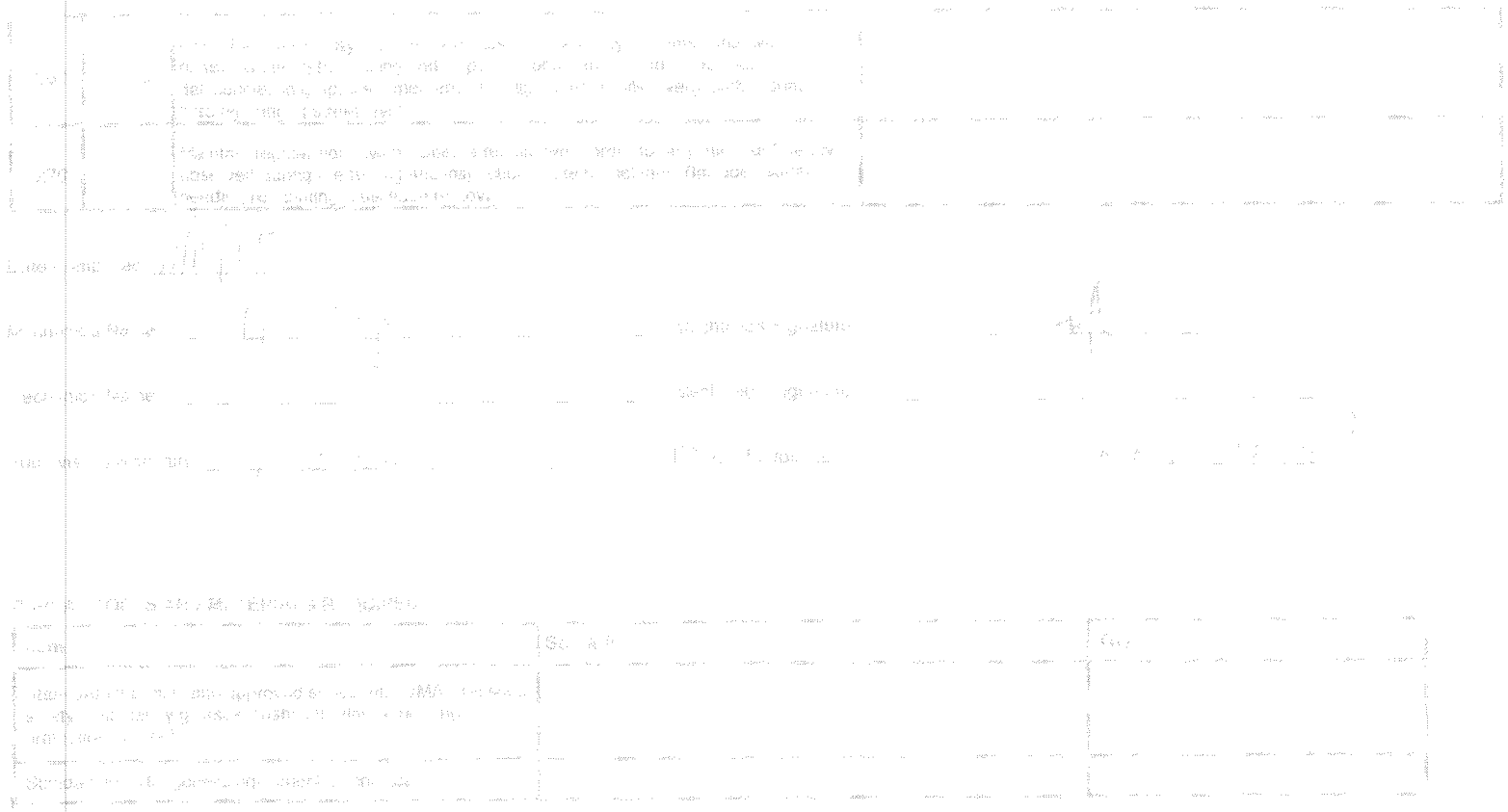

11-2015

9.7 Reference 7

Preventive Maintenance Form with Inconsistent Nomenclature

Preventive Maintenance
With Inspection and Testing

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID FS: FC08 VS: VC12 VS: VC13

12407313

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from the tunnels. These fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Rail Operations Command Center (ROCC). The fans can also be operated independently at the fan shaft during emergencies. The fans and dampers can work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled to the fan shaft and ejected outside. **Always refer to the manufacturer's manual for equipment-specific procedures.**

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	Y	Notify Operation Control Center (OCC) the PM work location where fans will be temporarily out of service. Alarms may be generated during the PM.	
20	Y	Perform visual inspection (PVI) of the discharge grating at street level for trash/debris or overgrowth which might prevent or restrict airflow.	
30	Y	PVI the fire extinguisher and sign tag.	
40	Y	Operate the fans locally in both manual "Exhaust" and "Supply" modes. PVI the general operation of fans for vibration and listen/check for any noise that may indicate abnormal conditions. Verify vent dampers and bypass dampers close while the fans operate in emergency modes (Supply and Exhaust).	
50	Y	PVI the fans for loose bolts or fasteners.	
60	Y	PVI the fan mounts and verify each fan is secure and the vibration isolators (springs/rubber) are intact.	
70	Y	Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).	
80	Y	PVI the fan housing, silencers, flexible ductwork connections for major tears or openings that would result in significant air leakages.	
90	Y	PVI of the controls located within the control panel(s) to verify there are no air leaks or disconnected air lines. For pneumatic controls, verify the regulated air pressure to the controls is between 20 and 25 PSI.	
100	Y	PVI the drain water separator in the pneumatic control cabinet and drain any accumulated water.	
110	Y	Verify the temperature gauge in the control cabinet reads approximately the same as the tunnel temperature.	
120	Y	PVI all fan and vent dampers and damper frames for damage or deformation. Look for missing mounting hardware/fasteners. Verify all damper blades are in place and aligned correctly.	
130	Y	Remove LOTO and restore power to the fan. Ensure fan HOA switch is in "Remote" mode.	

Task	Y	Task Description	Comments, Follow-Up WO#
140	Y	PVI Motor Control Center (MCC) for rust and water damage.	
150	Y	Verify fan shaft telephone operates by calling ROCC. Record the name of the ROCC operator.	Name of ROCC Operator: [redacted]
160	Y	Request ROCC to remotely operate the fans. The sequence commands should be as follows: **EMERGENCY ON EXHAUST** *(Verify the fans operate in exhaust and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify the fans stop.)* **EMERGENCY ON SUPPLY** *(Verify the fans operate in supply and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify fans stop.)* **RESTORE TO AUTO EXHAUST**	**Open COMM FLS Work Orders, if needed.**
170	Y	Open Fire/Life Safety (FLS) work orders for any safety deficiency that was observed during the testing and inspection of the tunnel fans. (Includes deficiencies in graphics, Emergency Exit lights, handrails, overgrowth around hatch/grating at street level.)	
180	Y	Maintain regular housework. Open a regular work order for any minor deficiency observed during the testing and inspection of the tunnel fans. (Includes surfaces needing re-painting, bulk trash removal.)	

Date Completed: 2-17-16

Mechanic's Name: [redacted] Mechanic's Signatur[redacted]

Mechanic's Name: [redacted] Mechanic's Signatur[redacted]

Supervisor's Signature: [redacted] ☐ QC Performed WO #: 12407313

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard PPE including approved shoes and WMATA-issued safety vest, safety glasses, flashlight, gloves, hearing protection and radio.		
Standard tools for general equipment mechanics.		

Preventive Maintenance
With Inspection and Testing

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID FS: FC08 VS: VC12 VS: VC11

12505959

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from the tunnels. These fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Rail Operations Command Center (ROCC). The fans can also be operated independently at the fan shaft during emergencies. The fans and dampers can work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled to the fan shaft and ejected outside. **Always refer to the manufacturer's manual for equipment-specific procedures.**

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	Y	Notify Operation Control Center (OCC) the PM work location where fans will be temporarily out of service. Alarms may be generated during the PM.	
20	Y	Perform visual inspection (PVI) of the discharge grating at street level for trash/debris or overgrowth which might prevent or restrict airflow.	
30	Y	PVI the fire extinguisher and sign tag.	
40	Y	Operate the fans locally in both manual "Exhaust" and "Supply" modes. PVI the general operation of fans for vibration and listen/check for any noise that may indicate abnormal conditions. Verify vent dampers and bypass dampers close while the fans operate in emergency modes (Supply and Exhaust).	
50	Y	PVI the fans for loose bolts or fasteners.	
60	Y	PVI the fan mounts and verify each fan is secure and the vibration isolators (springs/rubber) are intact.	
70	Y	Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).	
80	Y	PVI the fan housing, silencers, flexible ductwork connections for major tears or openings that would result in significant air leakages.	
90	Y	PVI of the controls located within the control panel(s) to verify there are no air leaks or disconnected air lines. For pneumatic controls, verify the regulated air pressure to the controls is between 20 and 25 PSI.	22psi
100	Y	PVI the drain water separator in the pneumatic control cabinet and drain any accumulated water.	
110	Y	Verify the temperature gauge in the control cabinet reads approximately the same as the tunnel temperature.	
120	Y	PVI all fan and vent dampers and damper frames for damage or deformation. Look for missing mounting hardware/fasteners. Verify all damper blades are in place and aligned correctly.	
130	Y	Remove LOTO and restore power to the fan. Ensure fan HOA switch is in "Remote" mode.	

Task	Y	Task Description	Comments, Follow-Up WO#
140	Y	PVI Motor Control Center (MCC) for rust and water damage.	
150	Y	Verify fan shaft telephone operates by calling ROCC. Record the name of the ROCC operator.	Name of ROCC Operator [redacted]
160	Y	Request ROCC to remotely operate the fans. The sequence commands should be as follows: **EMERGENCY ON EXHAUST** *(Verify the fans operate in exhaust and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify the fans stop.)* **EMERGENCY ON SUPPLY** *(Verify the fans operate in supply and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify fans stop.)* **RESTORE TO AUTO EXHAUST**	Open COMM FLS Work Orders, if needed.
170	Y	Open Fire/Life Safety (FLS) work orders for any safety deficiency that was observed during the testing and inspection of the tunnel fans. (Includes deficiencies in graphics, Emergency Exit lights, handrails, overgrowth around hatch/grating at street level.)	
180	Y	Maintain regular housework. Open a regular work order for any minor deficiency observed during the testing and inspection of the tunnel fans. (Includes surfaces needing re-painting, bulk trash removal.)	

Date Completed: 3-8-2016

Mechanic's Name: [redacted] Mechanic's Signature [redacted]

Mechanic's Name: [redacted] Mechanic's Signature [redacted]

Supervisor's Signature: [redacted] ☐ QC Performed

WO #: 12505959

PLNT Form 209-1571 (10/08/2015)

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard PPE including approved shoes and WMATA-issued safety vest, safety glasses, flashlight, gloves, hearing protection and radio.		
Standard tools for general equipment mechanics.		

Preventive Maintenance
With Inspection and Testing

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID **FS:** FC08 **VS:** VC12 **VS:** VC13

12612169

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from the tunnels. These fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Rail Operations Command Center (ROCC). The fans can also be operated independently at the fan shaft during emergencies. The fans and dampers can work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled to the fan shaft and ejected outside. **Always refer to the manufacturer's manual for equipment-specific procedures.**

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	Y	**Notify Operation Control Center (OCC) the PM work location where fans will be temporarily out of service. Alarms may be generated during the PM.**	
20	Y	Perform visual inspection (PVI) of the discharge grating at street level for trash/debris or overgrowth which might prevent or restrict airflow.	
30	Y	PVI the fire extinguisher and sign tag.	
40	Y	Operate the fans locally in both manual "Exhaust" and "Supply" modes. PVI the general operation of fans for vibration and listen/check for any noise that may indicate abnormal conditions. Verify vent dampers and bypass dampers close while the fans operate in emergency modes (Supply and Exhaust).	Panel Bulb Is Out
50	Y	PVI the fans for loose bolts or fasteners.	
60	Y	PVI the fan mounts and verify each fan is secure and the vibration isolators (springs/rubber) are intact.	
70	Y	**Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).**	
80	Y	PVI the fan housing, silencers, flexible ductwork connections for major tears or openings that would result in significant air leakages.	
90	Y	PVI of the controls located within the control panel(s) to verify there are no air leaks or disconnected air lines. For pneumatic controls, verify the regulated air pressure to the controls is between 20 and 25 PSI.	
100	Y	PVI the drain water separator in the pneumatic control cabinet and drain any accumulated water.	
110	Y	Verify the temperature gauge in the control cabinet reads approximately the same as the tunnel temperature.	
120	Y	PVI all fan and vent dampers and damper frames for damage or deformation. Look for missing mounting hardware/fasteners. Verify all damper blades are in place and aligned correctly.	
130	Y	**Remove LOTO** and restore power to the fan. Ensure fan HOA switch is in "Remote" mode.	

Task	Y	Task Description	Comments, Follow-Up WO#
140	Y	PVI Motor Control Center (MCC) for rust and water damage.	
150	Y	Verify fan shaft telephone operates by calling ROCC. Record the name of the ROCC operator.	**Name of ROCC Operator:** [redacted]
160	Y	Request ROCC to remotely operate the fans. The sequence commands should be as follows: **EMERGENCY ON EXHAUST** *(Verify the fans operate in exhaust and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify the fans stop.)* **EMERGENCY ON SUPPLY** *(Verify the fans operate in supply and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify fans stop.)* **RESTORE TO AUTO EXHAUST**	**Open COMM FLS Work Orders, if needed.**
170	Y	Open Fire/Life Safety (FLS) work orders for any safety deficiency that was observed during the testing and inspection of the tunnel fans. (Includes deficiencies in graphics, Emergency Exit lights, handrails, overgrowth around hatch/grating at street level.)	
180	Y	Maintain regular housework. Open a regular work order for any minor deficiency observed during the testing and inspection of the tunnel fans. (Includes surfaces needing re-painting, bulk trash removal.)	

Date Completed: 4-25-2016

Mechanic's Name [redacted] Mechanic's Signature: [redacted]

Mechanic's Name [redacted] Mechanic's Signature: [redacted]

Supervisor's Signature: [redacted] ☐ QC Performed WO #: 12612169

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard PPE including approved shoes and WMATA-issued safety vest, safety glasses, flashlight, gloves, hearing protection and radio.		
Standard tools for general equipment mechanics.		

9.8 Reference 8

Incomplete Preventive Maintenance Form

Preventive Maintenance
With Inspection and Testing

EQUIPMENT: Tunnel Fans and Vent Shaft Dampers

LOCATION ID FS: FC11 VS: _____ VS: _____

DESCRIPTION: Tunnel Fans and Vent Shafts (VS) are used to ventilate and remove smoke from Metrorail tunnels. The fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) during emergencies. The fans can also be operated independently at the fan shaft. The fans and dampers work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled through the fan shaft and ejected outside.

Always refer to the manufacturer's manual for equipment-specific maintenance procedures.

1320/654

MONTHLY TASKS:

Task	Y	Monthly PM Task Description	Comments, Follow-Up WO#
10	Y	Notify Operation Control Center (OCC) the PM work location where fans will be temporarily out of service. Alarms may be generated during the PM.	
20	Y	Perform visual inspection (PVI) of the discharge grating at street level for trash/debris or overgrowth which might prevent or restrict airflow.	
30	Y	PVI the fire extinguisher and sign tag if it passes inspection.	
40		Operate the fans locally in both manual "Exhaust" and "Supply" modes. PVI the general operation of fans for vibration and listen/check for any noise that may indicate abnormal conditions. Verify vent dampers and bypass dampers close while the fans operate in emergency modes (Supply and Exhaust).	Fan #2 Damper Motor Missing
50	Y	PVI the fans for loose bolts or fasteners.	
60	Y	PVI the fan mounts and verify each fan is secure and the vibration isolators (springs/rubber) are intact.	
70	Y	Remove power by turning off the disconnect switch and Lock Out/Tag Out (LOTO).	
80	Y	PVI the fan housing, silencers, flexible ductwork connections for major tears or openings that would result in significant air leakage.	
90	N/A	PVI of the controls located within the control panel(s) to verify there are no air leaks or disconnected air lines. For pneumatic controls, verify the regulated air pressure to the controls is between 20 and 25 PSI.	
100	N/A	PVI the drain water separator in the pneumatic control cabinet and drain any accumulated water.	
110	N/A	Verify the temperature gauge in the control cabinet reads approximately the same as the tunnel temperature.	
120	Y	PVI all fan and vent dampers and damper frames for damage or deformation. Look for missing mounting hardware/fasteners. Verify all damper blades are in place and aligned correctly.	

Task	Y	Task Description	Comments, Follow-Up WO#
130	Y	Remove LOTO and restore power to the fan. Ensure fan HOA switch is in "Remote" mode.	
140	Y	PVI Motor Control Center (MCC) for rust and water damage.	
150	Y	Verify fan shaft telephone operates by calling ROCC. Record the name of the ROCC operator.	**Name of ROCC Operator:** [redacted]
160		Request ROCC to remotely operate the fans. The sequence commands should be as follows: **EMERGENCY ON EXHAUST** *(Verify the fans operate in exhaust and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify the fans stop.)* **EMERGENCY ON SUPPLY** *(Verify the fans operate in supply and no abnormal indications or alarms were generated, either at the fan control panel or at the ROCC. For abnormal indication(s) that do not self-correct, generate the required work order(s).)* **EMERGENCY OFF** *(Verify fans stop.)* **RESTORE TO AUTO EXHAUST**	**Open COMM FLS Work Orders, if needed.**
170		Perform routine housekeeping tasks as needed. Clean shaft and remove debris/trash.	

NOTES: 1. Open Fire/Life Safety (FLS) work orders for any safety deficiency that was observed during the testing and inspection of the tunnel fans. (Includes deficiencies in graphics, Emergency Exit lights, handrails, overgrowth around hatch/grating at street level.)
2. Open a regular work order for any minor deficiency observed. (Includes clogged drains, deficiencies in lighting, doors, paint surfaces, etc.)

Date Completed: _____

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Mechanic's Name: [redacted] Mechanic's Signature: [redacted]

Supervisor's Signature: [redacted] ☐ QC Performed WO #: 13201454

PLNT Form 209-1571 (07/01/2016)

TYPICAL TOOLS AND MATERIALS REQUIRED:

Item	Stock #	Qty
Standard PPE including approved shoes and WMATA-issued safety vest, safety glasses, flashlight, gloves, hearing protection and radio.		
Standard tools for general equipment mechanics.		

9.9 Reference 9

Preventive Maintenance Form Missing Fan Amperage Readings

Preventive Maintenance (PM)

EQUIPMENT: Tunnel Fans and Jet Fan/Vent Shaft Dampers

LOCATION ID: FS: FC1 / VS: VC12 VS: VC15

DESCRIPTION: Tunnel Fans and Fan Shafts (FS)/Vent Shafts (VS) are used to remove smoke from the tunnels if there is a fire. These fans are reversible (can be operated in an exhaust mode or supply mode) and are controlled by the Operations Command Center (OCC) (can also be operated independently at the fan shaft) during emergencies. The fans and dampers work together to evacuate smoke. Vent shaft dampers close to seal the vent shafts and allow smoke or noxious fumes to be pulled to the fan shaft and ejected outside. Always refer to the manufacturer's manual for equipment-specific procedures.

ANNUAL TASKS:

Task	Y	Task Description	Comments, Follow-Up WO#
		Annual PM Tasks	
10	✓	Inspect and clean pilot tubes (air flow switches), remove any blockage.	
20	✓	Inspect general operation of fans for vibration or abnormal conditions.	
30	✓	Inspect for loose bolts or fasteners.	
40	✓	Verify fan is mounted securely and vibration isolators are intact, if applicable.	
50	✓	Inspect fan housing, silencers, flexible connection ductwork for tears.	
60	✓	Inspect pneumatic controls for air leaks and condensation.	Train FC1
70	✓	Verify regulated air pressure is 20- 25 PSI to controls.	
80	✓	Verify temperature gauge in pneumatic cabinet reads close to tunnel temp.	PLC
90	✓	Lubricate damper blades in fan and vent shaft(s), if needed.	
100	✓	Inspect fan/vent door(s), locks, closers, paint and graphics.	
110	✓	Inspect and clean equipment surfaces, interior of cabinets, phone.	
120	✓	Inspect Motor Control Center (MCC) and telephone for proper operation.	
130	✓	Test transfer switch (test button only).	
140	✓	Inspect fire extinguisher and sign tag.	
150	✓	Check fan/vent shaft, Emergency Exit lights.	
160	✓	Visually inspect stairs, ladders, and railings.	
170	✓	Ensure the hatch and grating are secured and do not create a tripping hazard.	

Task	Y	Task Description	Comments, Follow Up WO#
180	✓	Sweep and clean room as needed, spot re-lamp as required.	
190	✓	Inspect and clean drain grating for both fan and vent shaft(s).	
200	✓	Verify no excessive overgrowth around hatch/grating at street level.	
210	✓	Notify OCC of work location and the fans are temporarily out of service.	
220	✓	and remove power to fans by turning off disconnect switch.	
230	✓	Check motor wiring and control panel wiring connections.	
240	✓	Grease both motor bearings with 3 shots each.	
250	✓	Clean fan grill and housing.	
260	✓	Clean the fan blade hub and each fan blade. Check each blade for tightness.	
270	✓	Inspect each fan blade for stress or possible signs of premature cracks.	
280	✓	and restore power to the fan. Perform operation test with OCC.	
290		Request OCC to remotely operate the fans. The sequence should be as follows: EMERGENCY ON EXHAUST OK EMERGENCY ON SUPPLY OK AUTO EXHAUST OK Ensure that no abnormal indications or alarms were generated; make adjustments as needed and re-test if abnormal conditions or alarms occur.	Name of OCC Operator: [redacted]
300	✓	Verify operation of vent shaft dampers.	
310	✓	Restore to "Auto Exhaust."	
320	✓	Verify and check motor amperage, and record readings.	Readings. 25 Amp 25 Amp 26 Amp

There are 6 fans at this location. Only 3 amperage readings are recorded.

Date Completed: 07/14/15

Mechanic's Name: [redacted]

Mechanic's Signature: [redacted]

Supervisor's Signature:

☐ QC Performed

WO #: 1178457

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PLNT Form 208-1572 (02/15/2015)

9.10 Reference 10

Fan Amperage Readings Sheet

TUNNEL FAN AMPERAGE TEST

FAN 1

Leg	Supply	Exhaust
1	23.96	32.92
2	23.09	32.15
3	23.77	33.53

FAN 2

Leg	Supply	Exhaust
1	22.77	33.97
2	22.69	34.04
3	22.62	33.28

FAN 3

Leg	Supply	Exhaust
1	2284	33.08
2	2317	31.62
3	24.05	31.17

FAN4

Leg	Supply	Exhaust
1	19.16	29.39
2	19.46	29.60
3	19.42	28.87

FAN 5

Leg	Supply	Exhaust
1		
2		
3		

FAN 6

Leg	Supply	Exhaust
1		
2		
3		

Date: Fan Shaft: W/O #

9.11 Reference 11

Maximo Preventive Maintenance Entry

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

Work Order #:
10750912
Status: CLOSE

10750912

06/12/2014 14:16
Type: PM

Work Description: 10750912: F03, PLNT, TUNNEL FAN, FL01, PM
Job Plan Description: PLNT, TUNNEL FAN, MONTHLY, PM

Work Information

	68083	FAN, TUNNEL, SYSTEM, FL01, MAINE AVE & 9TH ST SW, L'ENFANT PLAZA, F03	Shop Code: PLEQ-GEM5	Parent:	
Asset Tag:	F03FL01.TFSY	Alias: TUNNEL FAN	Maint. Office: PLNT-EQMT-GEM5	Create Date:	1/28/2014 19:20
Facility Loc:	F03	L'ENFANT PLAZA STATION (TOP)	Labor Group:	Act Start:	2/28/2014 05:52
Location:	6714	F03, L'ENFANT PLAZA, STATION, MEZZANINE, 082, N, ROOM N208, MECHANICAL ROOM	Crew: EQMTG507	Act Comp:	2/28/2014 05:52
Failure Class:	PLNT057	PLNT, TUNNEL FAN	GL Account: WMATA-02-31550-50499160-042-**********-*****-OPR**	Target Start:	2/27/2014 00:00
Problem Code:			Supervisor:	Target Comp:	2/27/2014 00:00
Requested By:			Request Phone:	Sched Start:	

Name:	Employee#:	Start Time:	Finish Time:

Task IDs

Task ID	
10	COMPLETE CHECKLIST, TUNNEL FAN, MONTHLY, PM

Compone | Work Accomp: | Reason: | Status: CLOSE | Position: | Warranty N

Actual Labor

Task ID	Labor	Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
	[redacted]	2/27/14	2/27/14	07:00	10:00	Y	03:00	00:00	$102.20
		2/27/14	2/27/14	07:00	10:00	Y	03:00	00:00	$79.10
								Total Actual Labor:	$181.30

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

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06/12/2014 14:16
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Failure Reporting

Cause	Description	Remedy	Description	Supervisor	Remark Date

Remarks:

Washington Metropolitan Area Transit Authority
Maintenance and Material Management System
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Asset Tag: F03FL01.TFSY	Alias: TUNNEL FAN SYSTEM	Maint. Office: PLNT-EQMT-GEM5	Create Date: 1/28/2014 19:20	
Facility Loc: F03	L'ENFANT PLAZA STATION (TOP)	Labor Group:	Act Start: 2/28/2014 05:52	
Location: 6714	F03, L'ENFANT PLAZA, STATION, MEZZANINE, 082, N, ROOM N208, MECHANICAL ROOM	Crew: EQMTG507	Act Comp: 2/28/2014 05:52	
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Name: **Employee#:** **Start Time:** **Finish Time:**

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