



Washington Metropolitan Area Transit Authority  
**ANNUAL INTERNAL REVIEW 2017**

## Metrorail Major Repair & Overhaul (MRO) Processes

QICO Internal Review

July 19, 2017



Quality Assurance, Internal Compliance & Oversight (QICO)  
*"Quality Trumps Quantity"*



# QICO INTERNAL REVIEW

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## Internal Review Summary

### Why QICO Performed This Review:

- This internal review is intended to provide Metro's senior management with an assessment to validate current practices and work performance within the Railcar Major Repair and Overhaul (MRO) Shops. The review will promote the actions needed to address any uncovered issues.
- QICO is independent from the functions it oversees, authorized by the Metro General Manager to conduct objective audits 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 while in-progress, and interviewed key personnel.
- Review findings and required actions are rated based on 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/](http://www.wmata.com/initiatives/transparency/).

**July 2017**

## Metrorail Major Repair & Overhaul Processes

### QICO's Internal Review Results:

*Formally documenting MRO practices and processes will improve overall efficiency and reliability.*

### QICO's internal review identified and noted several **Wins** and **Areas for Improvement**:

- ✓ Technician training records & certifications are up-to-date.
- ✓ For cases where repair/overhaul instruction exists manuals are accessible to technicians.
- ✓ Maintenance tools & equipment are being serviced and calibrated as required.
- ✓ Fire extinguishers and eye washing stations are in order, and emergency evacuation plans are posted.
- While the MRO strives to reduce costs and ensure part availability, additional controls could help improve reliability.
- Many MRO practices are not formally documented; including a comprehensive process flow, quality control plan, written procedures and repair/overhaul instructions.
- MRO shops are not in full compliance with inspection requirements for some overhead and jib cranes and use of job-specific personal protective equipment (PPE).
- First-aid kits located in MRO shop spaces are inconsistently inspected and maintained.

### Required Actions:

**QICO-MRO-17-01:** Evaluate processes for handling, storing, and identifying the status of parts and materials, implement improvements to improve availability and reliability of parts and materials.

*(Risk Rating: Elevated)*

**QICO-MRO-17-02:** Review the priority for each component requiring a repair procedure, develop a schedule based upon need and available resources.

*(Risk Rating: High)*

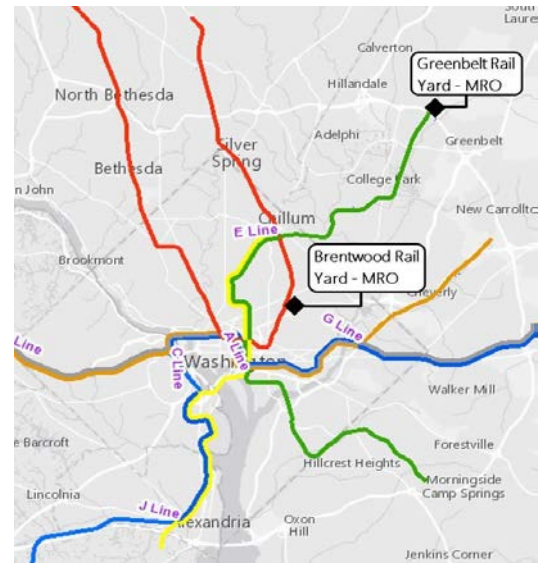
**QICO-MRO-17-03:** Assess current safety practices, ensure all items that require a regular inspection are monitored for compliance.

*(Risk Rating: Elevated)*

# 1 DEPARTMENT/FUNCTION OVERVIEW

## Car Maintenance Major Repair & Overhaul Processes

As a branch of Car Maintenance (CMNT), the Major Repair & Overhaul (MRO) group performs corrective maintenance on failed railcar components (over 700 in number) identified during preventative maintenance inspections in Service and Inspection (S&I) shops. It also performs heavy overhaul of railcar components during major mid-life upgrades. MRO is responsible for the entire WMATA railcar fleet, which currently consists of the 2000, 3000, 5000, and 6000 series railcars, with the new 7000 series railcars soon to be incorporated. 1000 and 4000 fleet responsibilities are continuously being diminished, as those fleets have been completely decommissioned as of July 1, 2017. Currently WMATA has two main MRO locations: Greenbelt Rail Yard and Brentwood Rail Yard. Brentwood MRO currently has a total of 88 employees and the Greenbelt Annex and Truck Shop combines for 207 employees total. Mechanics and electricians report to supervisors for each shop, who in turn report to shop supervisors. Shop supervisors report to the assistant superintendent and the superintendent. Each MRO location has one (1) Superintendent who reports to the CMNT general superintendent.



### 1.1 MRO LOCATIONS & SHOP FUNCTIONS

#### Greenbelt Rail Yard (MRO Opened 2006)



Aerial view. MRO highlighted (Beltsville, MD).

- **Electronic Shop** – [ATC equipment](#), icon modules, ballast for lighting, brake control, [VMS equipment](#), communication equipment (Intercom, signs), [propulsion converters](#), etc.
- **Electrical Shop** – [electrical wiring](#), relays (high & low voltage)
- **HVAC Shop** – [heating, ventilation and air conditioning](#)
- **Coupler Shop** – [couplers](#) for all series railcars
- **Motor Shop** – [traction motors](#) for all series railcars
- **Pneumatic Shop** – [brake valves](#), air powered components
- **Air Compressor Shop** – [air compressors](#) (oil and non-oil)
- **Truck Shop** – [truck set](#), [calipers](#), other brake equipment
- **Machine Shop** – fabrication, mechanical parts and tooling
- **Paint Shop** – [paint, decals, logos on railcar](#)

#### Brentwood Rail Yard (Opened 1974)



Aerial view. MRO highlighted (Washington, DC).

- **Structural Shop** – windows, seats, stations, carpeting, body and structural for a series cars, etc.
- **Truck Shop** – [truck sets](#), [calipers](#), [brake disc \(friction ring\)](#) other mechanical brake equipment
- **Machine Shop** – fabrication, mechanical parts and tooling

## 2 REVIEW METHODOLOGY

### Internal Review Stakeholders

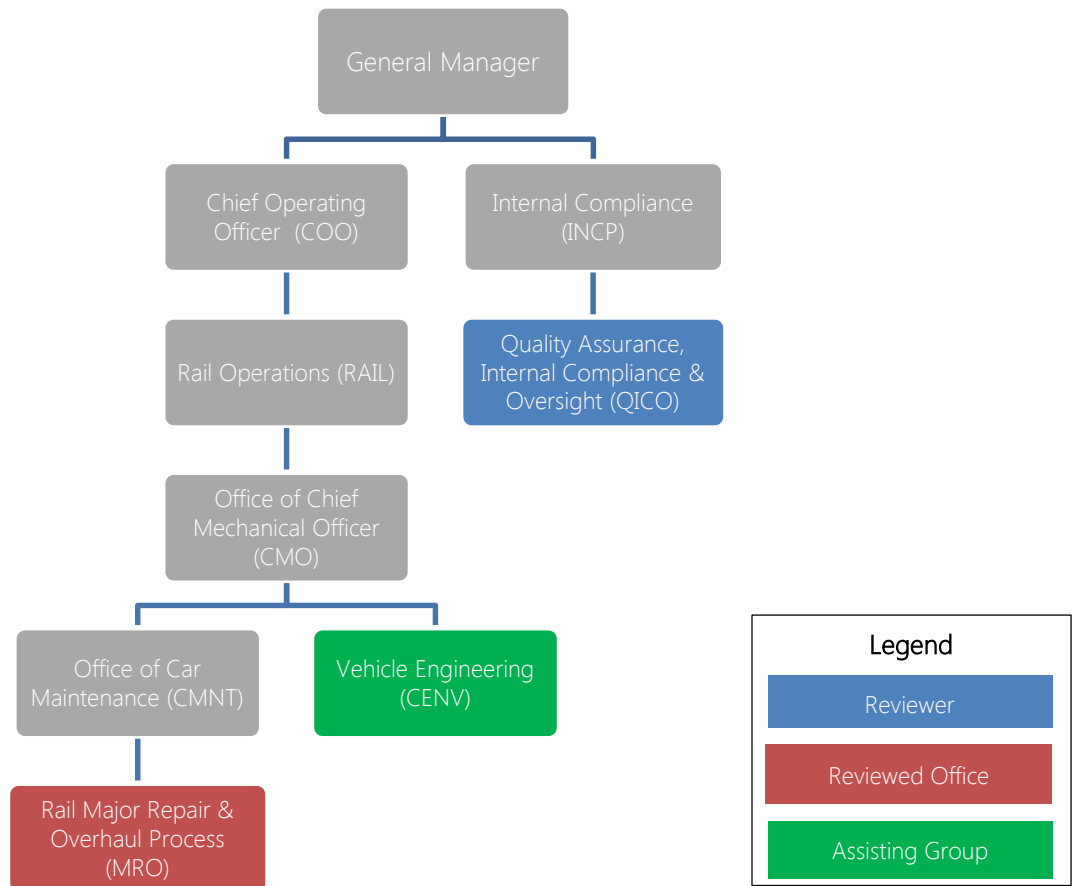
The Office of Quality, Internal Compliance and Oversight (QICO) conducted an internal review of the Car Maintenance Major Repair and Overhaul group (MRO), which resides within and reports to the Office of Car Maintenance (CMNT). The internal review assessed MRO's operational practices and maintenance procedures on railcar components and took place from October 2016 through June 2017.

QICO conducted desk interviews, performed field observations, and reviewed governing MRO documentation. Desk interviews were conducted with MRO Management teams at Greenbelt Annex on March 24, 2017, Brentwood MRO on March 25, 2017 and Greenbelt Truck Shop & Machine Shop on March 29, 2017 ([See Appendix E for desk interview questionnaires](#)).

Field observations took place at Greenbelt Annex on March 29, 2017, Greenbelt Truck Shop on April 1, 2017, and Brentwood MRO on April 3, 2017.

QICO also performed 14 component inspections at Greenbelt Annex MRO during the months of October 2016 through April 2017 ([See Section 8.1 for Inspection Summary Table](#)).

QICO noted both positive findings (What worked well) and areas of improvement. The 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). Recommendations are combined into **Required Actions**, which summarize the steps action owners must take to address deficiencies.



## 2.1 REVIEW SCOPE

Category	Description
<p>Review of Existing Documentation</p>	<ul style="list-style-type: none"> <li>- Governing Maintenance Documentation: Approved MRO Rebuild Procedures.</li> <li>- Governing MRO <a href="#">Standard Operating Procedures (SOP)</a>.               <ul style="list-style-type: none"> <li>• SOP 1.02 Management of Torque Indicating Devices Rev. 4 (Dated: 1/5/2015)</li> <li>• SOP 1.04 Documenting Corrective Maintenance Work Orders Rev. 3.4 (Dated: 4/7/2016)</li> <li>• SOP 1.08 Shelf Life Management Program Rev. 2 (Dated: 9/8/2015)</li> <li>• SOP 2.04 Attaining Job Classification Training Requirements Rev 5.1 (Dated: 6/1/2016)</li> <li>• SOP 2.10 Supervisor Duties Rev. 0 (Dated: 9/13/2016)</li> </ul> </li> <li>- Inspection records such as supervisor quality checks and technician bench tests results.</li> <li>- Employee list, training, certification, and/or qualification documents from each location.</li> <li>- QICO Document Request Forms for each MRO location are available upon request.</li> </ul> <p><a href="#">See Appendix D for QICO Document Request Forms from each location</a></p>
<p>Interviews of Key Personnel – MRO Management</p>	<ul style="list-style-type: none"> <li>- Greenbelt Annex MRO               <ul style="list-style-type: none"> <li>- Superintendent – [REDACTED]</li> <li>- Assistant Superintendent – [REDACTED]</li> <li>- Shift Supervisor – [REDACTED]</li> </ul> </li> <li>- Greenbelt Truck Shop               <ul style="list-style-type: none"> <li>- Superintendent – [REDACTED]</li> <li>- Assistant Superintendent – [REDACTED]</li> <li>- Acting Shop Supervisor – (Shift Supervisor) [REDACTED]</li> </ul> </li> <li>- Brentwood MRO               <ul style="list-style-type: none"> <li>- Superintendent – [REDACTED]</li> <li>- Assistant Superintendent – [REDACTED]</li> <li>- Shop Supervisor – [REDACTED]</li> </ul> </li> </ul>
<p>Field Observations</p>	<ul style="list-style-type: none"> <li>- Work site visits: Greenbelt Annex MRO, Greenbelt Truck Shop, and Brentwood MRO.</li> <li>- Component documentation (work orders, asset numbers, serialization, labels).</li> <li>- Verification of packaging, shipping, &amp; storage.</li> <li>- Tools &amp; equipment calibration.</li> <li>- Inspection reports (bench testing sheets / MRO supervisor quality checks, etc.).</li> <li>- <a href="#">MAXIMO</a> usage for corrective and planned maintenance activities.</li> </ul>

## 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 cleanliness.
	Quality Control Measures	Internal management controls that ensure the consistency and reliability of work performed.
	Materials and Tooling	Measurable properties of parts and tools used to perform work.
Records Management	Work Order Management	Protocols established to control maintenance scheduling, documentation, and tracking.
	Processes	Documented requirements for departmental activities.
	Testing/Quality Checks	Documented records of supervisor quality checks and bench testing of overhauled/repaired components.
	Training	Documented training, certification and qualification records
	Records Storage and Retention	Documented requirements for the maintenance of records and documentation.
Safety	PPE	Requirements for personal protective equipment.
	First Aid Kits & Eye Washing Stations	First aid kits and eye washing stations positioned and can be identified throughout work area.
	Emergency Evacuation plan	Required emergency evacuation plan posted and identifiable.
	Hazardous Waste & Material Control	Hazardous waste / Material control designated storage areas.
	Applicable Job Safety Requirements	Any documented safety requirements that apply to specific work performed.
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,
	Procedural Requirements	Formal documented standards that identify specific actions to be taken.

## 2.3 RISK ASSESSMENT SUMMARY

**Note:** Required actions are rated based on severity of risk. Refer to Figure 1 [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
Records Management	Training and certification for sampled MRO employees are up-to-date.	<ul style="list-style-type: none"> <li>- Each MRO location was able to provide training records indicating technician proficiency for their assigned duties. QICO received on-the-job training (OJT) records for technicians and certificates for welding, rigging practices and sling capacities. QICO found employees to be in compliance with training and certification requirements.</li> </ul>
Safety	Fire extinguishers and eye washing stations are available and monthly inspections have been conducted. Emergency evacuation plans are posted and easy to interpret.	<ul style="list-style-type: none"> <li>- Fire extinguishers are available and have been previously inspected. They can be identified easily by signage posted above their location on the walls. Inspections were up-to-date at all locations, and all extinguishers are clear of obstructions.</li> <li>- Building emergency evacuation plans are posted and easily recognizable, with all doors clear of obstructions.</li> <li>- Numerous eye-wash stations are available and have been inspected. They are clear of obstructions.</li> </ul> <p><i>(Source: MRO field observations)</i></p>
Compliance with Standards	Existing approved repair and overhaul instructions are accessible via hard copy, shop floor computer kiosks and office work stations in each MRO shop.	<ul style="list-style-type: none"> <li>- At the Greenbelt Truck Shop, technicians have at their stations repair/overhaul instructions (hard copies) for select components. There is clear revision control denoted on the cover of each procedure. Technicians also have access to <a href="#">Documentum</a>, where the most recent revisions are uploaded.</li> <li>- Each MRO location reviewed by QICO had multiple work stations, with a computer and printer that technicians could use to access available documents.</li> <li>- Truck shop management have assigned a technician for ensuring the maintenance manuals are current. This technician receives new publications from the management team and ensures other technicians are advised of the updates. Updates to manuals are discussed during pre-shift safety briefings.</li> </ul>
Compliance with Standards	All MRO locations are in compliance with calibration requirements for tools and equipment.	<ul style="list-style-type: none"> <li>- During field observation, QICO found that all MRO locations are in compliance with required calibration of tools and equipment. This includes torque-indicating tools and <a href="#">bench test equipment (BTE)</a>.</li> </ul> <p><i>(Sources: SOP 1.02 Management of Torque Indicating Devices (Rev. 4), SOP 3.05 Procedures for Precision Measuring Devices, Shop Equipment, and Special Tools).</i></p>



## 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	<p>F-MRO-17-01</p> <p>While the MRO strives to reduce costs and ensure part availability, material handling requires additional controls to improve reliability.</p> <p><u><a href="#">Operational Risk Elevated (4,4)</a></u> <span style="color: yellow;">■</span></p>	<ul style="list-style-type: none"> <li>- During field observations at Greenbelt Annex and Greenbelt Truck Shop, QICO observed storage shelves/areas where salvaged parts were being stored along with new parts.</li> <li>- The criteria for salvaging certain parts was too vague and inconsistent. (<a href="#">Appendix G: Photograph #2, #3, #5</a>)</li> <li>- At Greenbelt Annex MRO, QICO discovered that due to the lack of storage space, components that are being removed from decommissioned 1000 and 4000 series railcars have no dedicated storage area and are being left sitting in hallways, or just placed on the floor within storage areas. (<a href="#">Appendix G: Photograph #6</a>)</li> <li>- Components were found sitting out without proper identification (<a href="#">work order</a> documents, failure tag, etc.), making it unclear the status of the material (fail, good, awaiting parts, or testing). (<a href="#">Appendix G: Photograph #6</a>)</li> <li>- Shortage of spare parts has negatively affected throughput (the rate of repaired defective components) of overhauled components. (<a href="#">Appendix G: Photograph #1</a>)</li> <li>- At Greenbelt Truck Shop it was observed that <a href="#">brake caliper</a> suspension pins (not clean or inspected) were being saved along with other salvaged parts for reuse. (<a href="#">Appendix G: Photograph #4</a>) (Source: QICO field observations, Greenbelt Truck Shop)</li> <li>- QICO observed numerous electronic components left out on workbenches, not packaged, and without any <a href="#">electrostatic discharge (ESD) protection</a>. (<a href="#">Appendix G: Photograph #10 and #11</a>)</li> </ul> <p><b>Recommendation:</b> Evaluate current processes for handling, storing, and identifying the status of parts and materials.</p>

## 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	<p>F-MRO-17-02</p> <p>MRO practices require additional documentation including, a comprehensive process flow, quality control plan, written procedures and repair/overhaul instructions.</p> <p><i>Operational Risk</i> <i>High (4.5)</i> <span style="color: red;">■</span></p>	<ul style="list-style-type: none"> <li>- At the time the internal reviews were conducted, approximately 7% of repaired parts coming out of MRO were repaired using an available Vehicle Engineering (CENV) instruction manual. MRO currently works on 700+ different parts or components and only 45 components have a CENV <a href="#">Maintenance Service Instruction (MSI)</a> available.</li> <li>- <a href="#">(See Appendix F for list of Approved MRO Rebuild Procedures per Documentum as of April 1, 2017)</a></li> <li>- There are no time studies to determine mean time of repairs and/or overhauls.</li> <li>- QICO identified a component repair/process flow chart used by MRO. However, this flow chart is not associated or included within any written documents. <a href="#">(See Appendix G: Photograph #7)</a></li> </ul> <p><b>Recommendation:</b> Review the priority for each component requiring a repair procedure, develop a schedule based upon need and available resources.</p>

## 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
Safety	<p>F-MRO-17-03</p> <p>MRO shops are not in full compliance with inspection requirements for some overhead and jib cranes and use of job-specific <u>personal protective equipment (PPE)</u>.</p> <p><u>Safety Risk</u> <u>High (4.5)</u> <span style="color: red;">■</span></p>	<ul style="list-style-type: none"> <li>- QICO observed MRO cranes had overdue inspection dates and several cranes had no inspection certification information displayed. As an example, an overhead crane (asset # [REDACTED]) had an annual rigging inspection due date of April 2015. Jib crane 9 had an annual rigging inspection due date of April 2016. (<a href="#">Appendix G: Photograph #8 &amp; #9</a>). Equipment inspections have been verified by PLNT and CMNT has provided QICO Certificates of Load Test. These were received 6/9/17</li> <li>- At Greenbelt Annex and Greenbelt Truck Shop, QICO observed technicians in the work area not wearing hard hats or bump caps during crane movement of heavy equipment.</li> <li>- Per WMATA's Metrorail Safety Rules and Procedures Handbook (MSRPH) Quick Reference Guide for <u>PPE</u> Requirements:             <ul style="list-style-type: none"> <li>o <a href="#">Per OSHA regulations (Standards – 29 CFR) 1910.135(a)(1)</a> - <i>The employer shall ensure that each affected employee wears a protective helmet when working in areas where there is a potential for injury to the head from falling objects.</i></li> <li>o <a href="#">Per OSHA regulations (Standards – 29 CFR) 1926.100</a> - <i>Employees working in areas where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock and burns, shall be protected by protective helmets.</i></li> </ul> </li> </ul> <p><b>Recommendation:</b> Assess current safety practices and ensure all items that require a regular inspection are monitored for compliance.</p>
Safety	<p>F-MRO-17-04</p> <p>First-aid kits located in MRO shop spaces are inconsistently inspected and maintained.</p> <p><u>Safety Risk</u> <u>Elevated (3.5)</u> <span style="color: orange;">■</span></p>	<ul style="list-style-type: none"> <li>- QICO observed between 3/29/17 to 4/1/2017 that first-aid kits have not been inspected for expired items nor properly maintained (stocked/cleaned).</li> </ul> <p><b>Recommendation:</b> Assess current safety practices, ensure all items that require a regular inspection are monitored for compliance.</p>

## 5 OTHER OBSERVATIONS

Measure	Observation	Description
Performance of Work	<p><b>O-MRO-17-01</b> There are no fixed measures in place by MRO for technicians to receive component based cross-training.</p>	<ul style="list-style-type: none"> <li>- Although Greenbelt Annex MRO was able to provide a cross-training matrix for all of its shops, QICO discovered that there are no fixed measures or development plans in place by leadership to ensure cross-training for all personnel. This affects worker flexibility, efficiency and overhaul/repair workmanship.</li> <li>- The cross-training that technicians are receiving consists only of on-the-job training by a technician who has experience with working on that particular component. Cross-training does not consist of any classroom or computer course activities, and due to the lack of available repair/overhaul manuals, most cross-training does not have written processes to follow. <i>(Source: Interviews with MRO management)</i></li> </ul>
Quality Control Measures	<p><b>O-MRO-17-02</b> Due to the lack of spare parts, Service and Inspection (S&amp;I) shops are removing parts from overhauled assemblies to make lower level repairs on trains.</p>	<ul style="list-style-type: none"> <li>- QICO observed assemblies in MRO facilities that had been overhauled and sent to the S&amp;I shop for use, but were returned because the S&amp;I shop removed parts from the overhauled assembly to make lower level repairs on railcars. <a href="#">(Appendix G: Photographs #12 &amp; #13)</a> <i>(Source: QICO performing field observation on 3/29/2017 at Greenbelt Annex &amp; interview with technician on finding)</i></li> </ul>
Applicable Job Safety Requirements	<p><b>O-MRO-17-03</b> There is no warning sounds prior to overhead lifting/crane operation.</p>	<ul style="list-style-type: none"> <li>- QICO discovered that overhead equipment would move before an alert sounded.</li> <li>- <a href="#">Per OSHA regulations (Standards – 29 CFR) 1910.179(i) - Warning device: Except for floor-operated cranes a gong or other effective warning signal shall be provided for each crane equipped with a power traveling mechanism.</a> <i>(Source: Observed during field observations at Greenbelt Annex MRO 3/30/2017 &amp; Greenbelt Truck Shop 4/1/2017)</i></li> </ul>
Records Management	<p><b>O-MRO-17-03</b> Greenbelt Truck Shop and Brentwood MRO are not utilizing Documentum for record keeping of tool &amp; equipment calibration certificates.</p>	<ul style="list-style-type: none"> <li>- While hard copies of equipment calibration records exist per SOP 1.02, documents were not uploaded into Documentum as required.</li> <li>- SOP 1.02 Management of Torque Indicating Devices (Rev. 4: Dated 1/5/2015) Section 3.4.4 states: "Ensure an up-to-date certificate of calibration is uploaded to Documentum or MAXIMO for each asset in use. If a copy of this certificate is not in Documentum, one must be produced within 24-hours.</li> </ul>

## 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
<p><b>QICO-MRO-17-01:</b> Evaluate processes for handling, storing, and identifying the status of parts and materials, implement improvements to improve availability and reliability of parts and materials. Elevated <span style="color: yellow;">■</span></p>	<p>F-MRO-17-01 <span style="color: yellow;">■</span></p> <p>While the MRO strives to reduce costs and ensure part availability, material handling requires additional controls to improve reliability.</p>	CMNT
<p><b>QICO-MRO-17-02:</b> Review the priority for each component requiring a repair procedure, develop a schedule based upon need and available resources. High <span style="color: red;">■</span></p>	<p>F-MRO-17-02 <span style="color: red;">■</span></p> <p>MRO practices require additional documentation including, a comprehensive process flow, quality control plan, written procedures and repair/overhaul instructions.</p>	CMNT CENV
<p><b>QICO-MRO-17-03:</b> Assess current safety practices and ensure all items that require a regular inspection are monitored for compliance. High <span style="color: red;">■</span></p>	<p>F-MRO-17-03 <span style="color: red;">■</span></p> <p>Non-compliance with inspection requirements for some overhead and jib cranes and use of job-specific personal protective equipment (PPE).</p>	CMNT
	<p>F-MRO-17-04 <span style="color: yellow;">■</span></p> <p>First-aid kits located in MRO shop spaces are inconsistently inspected and maintained.</p>	CMNT

# 7 CORRECTIVE ACTION PLANS



**INTERNAL REVIEW**

**Metro's Railcar Maintenance Major Repair and Overhaul**

In response to the internal review report for Railcar Maintenance Major Repair and Overhaul dated July 17 2017, QICO has coordinated with Operations and Engineering departments to develop 3 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**

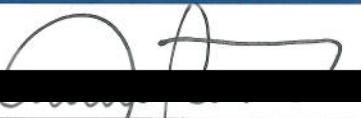
**Corrective Action Plan (CAP) Commitment**

  
\_\_\_\_\_  
Joseph Leader  
Chief Operating Officer (COO)

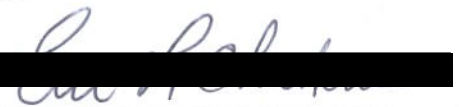
8/9/17  
Date

**WMATA INTERNAL OVERSIGHT**

**Corrective Action Plan (CAP) Acknowledgement**

  
\_\_\_\_\_  
Angel Peña  
Managing Director, Quality Assurance, Internal Compliance & Oversight (QICO)

08/09/17  
Date

  
\_\_\_\_\_  
Eric Christensen  
Chief, Internal Compliance (INCP)

8/10/17  
Date

  
\_\_\_\_\_  
Paul J. Wiedefeld  
General Manager & Chief Executive Officer (GM/CEO)

8/10/17  
Date



CORRECTIVE ACTION PLAN

Purpose and Scope

On July 19, 2017 QICO issued a comprehensive report from an internal review into Railcar Maintenance Major Repair and Overhaul. This Corrective Action Plan (CAP) has been developed to address the findings and required action per QICO-MRO-17-01.

QICO Findings

QICO Recommendations

F-MRO-17-01: While the MRO strives to reduce costs and ensure part availability, material handling requires additional controls to improve reliability.

Evaluate current processes for handling, storing, and identifying the status of parts and materials, implement improvements to improve availability and reliability of parts.

Required Actions

QICO-MRO-17-01: Evaluate processes for handling, storing, and identifying the status of parts and materials, implement improvements to improve availability and reliability of parts and materials.

Risk Rating: Elevated

Plan Description

CMNT will evaluate and establish new SOP(s) for identification and storing of parts in the overhaul process.

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.

PLAN SCHEDULE

Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	New SOP(s)	Establish SOP(s) for identification and storing of parts in the overhaul process.	Larry Skelton (CMNT)	08/01/17	11/01/17
2	Tool Box Meeting and SOP Acknowledgement	Present and discuss with MRO personnel new SOP(s), including employee signature acknowledgement of new SOP(s) in the meeting roster.	Larry Skelton (CMNT)	11/01/17	01/31/18
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	01/31/18	03/07/18

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

COMPLETION DOCUMENTATION

Performance Measures

- Evidence of compliance with SOP(s) developed under actionable item #1.
- 95% of active MRO personnel provide signature for new SOP(s).


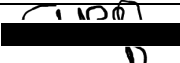




RESPONSIBLE PARTIES

CMNT	Larry Skelton	
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SECOND LEVEL RESPONSIBILITY

Chief Mechanical Officer	John Doherty	
AGM, RAIL	Andy Off	

**CORRECTIVE ACTION PLAN**

**Purpose and Scope**

On July 19, 2017 QICO issued a comprehensive report from an internal review into Railcar Maintenance Major Repair and Overhaul. This Corrective Action Plan (CAP) has been developed to address the findings and required action per QICO-MRO-17-02.

**QICO Finding**

**QICO Recommendation**

**F-MRO-17-02:** MRO practices require additional documentation including, a comprehensive process flow, quality control plan, written procedures and repair/overhaul instructions.  
Review the priority for each component requiring a repair procedure, develop a schedule based upon need and available resources.

**Required Actions**

**QICO-MRO-17-02:** Review the priority for each component requiring a repair procedure, develop a schedule based upon need and available resources.

**Risk Rating:** High ■

**Plan Description**

CMNT and CENV will develop the existing MRO Process Flow and procedures for overhaul of components. Procedures will include overhaul instructions and quality control plan.

**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.

**PLAN SCHEDULE**

Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	Develop MRO Process Flow	Develop a written process flow for MRO.	Larry Skelton (CMNT)	08/01/17	11/01/17
2	Process Implementation	Implementation of new MRO process flow. This will include presentation of the updated process to MRO personnel during tool box meetings and signature acknowledgement in the meeting roster.	Larry Skelton (CMNT)	11/01/17	01/31/18
3	Overhaul Procedure List	Develop a complete list of components that require a rebuild or overhaul procedure. This list will identify the top 30 items for initial procedure development.	Larry Skelton (CMNT)	08/01/17	11/01/17
4	Procedure Development Schedule	Establish a schedule to develop procedures for all components identified in the overhaul procedure list, presenting a strategy for completion.	Sachit Kakkar (CENV)	11/01/17	03/14/18
3	Rebuild/Overhaul Procedures	Develop procedures for overhaul of components, beginning with the top 30 items identified in coordination with CMNT. Procedures will include overhaul instructions and quality control plan.	Sachit Kakkar (CENV)	08/01/17	12/12/18



PLAN SCHEDULE

Actionable items	Description	Responsible Party*	Estimated Start	Estimated Completion
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	12/12/18	01/23/19

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

COMPLETION DOCUMENTATION

Performance Measures

- 95% of active MRO personnel provide signature for updated process flow.
- 100% of the top 30 components, identified in the overhaul procedure list under actionable item #3, have complete rebuild/overhaul procedure.
- Evidence with compliance with rebuild/overhaul procedures developed under actionable item #4.

RESPONSIBLE PARTIES

CMNT	Larry Skelton	
CENV	Sachit Kakkar	

SECOND LEVEL RESPONSIBILITY

Chief Mechanical Officer	John Doherty	
AGM, RAIL	Andy Off	

**CORRECTIVE ACTION PLAN**

**Purpose and Scope**

On July 19, 2017 QICO issued a comprehensive report from an internal review into Railcar Maintenance Major Repair and Overhaul. This Corrective Action Plan (CAP) has been developed to address the findings and required action per **QICO-MRO-17-03**.

**QICO Findings**

**QICO Recommendation**

**F-MRO-17-03:** Non-compliance with inspection requirements for some overhead and jib cranes and use of job-specific personal protective equipment (PPE).

Assess current safety practices, ensure all items that require a regular inspection are monitored for compliance.

**F-MRO-17-04:** First-aid kits located in MRO shop spaces are inconsistently inspected and maintained.

**Required Action**

**QICO-MRO-17-03:** Assess current safety practices, ensure all items that require a regular inspection are monitored for compliance.

**Risk Rating:** High ■

**Plan Description**

**F-MRO-17-03:** CMNT will review existing processes and develop new procedures for equipment usage including cranes. CMNT will either work with OPMS or a consultant to create a new equipment usage curriculum and train all employees

**F-MRO-17-04:** CMNT will work with procurement to secure a contractor to ensure that the first aid kits are inspected and maintained in accordance with OSHA 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.

**PLAN SCHEDULE**

Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
1	New SOPs	Review existing processes and develop new procedures for equipment use, including cranes.	Larry Skelton (CMNT)	08/01/17	11/01/17
2	Equipment Usage-Training Curriculum	Develop training for employees on procedures and required PPE for use of overhead and jib cranes.	Larry Skelton (CMNT)	11/01/17	12/27/17
3	Training Schedule	Generate a schedule to train all MRO personnel on updated procedures and PPE.	Larry Skelton (CMNT)	11/01/17	12/27/17
4	Training – ELM Reports	Copies of the first 3 classes ELM reports	Larry Skelton (CMNT)	12/27/17	02/21/18
5	First Aid Kit Inventory	Complete list of first aid kits in MRO shop areas, including location and inspection responsibility.	Larry Skelton (CMNT)	11/01/17	12/27/17



PLAN SCHEDULE

Actionable items		Description	Responsible Party*	Estimated Start	Estimated Completion
6	Criteria and checklist for inspection of first aid kits.	Develop a criteria and checklist for inspection of first aid kits. Ensure first aid kits meet OSHA requirements. Develop inventory list for assigned kits.	Larry Skelton (CMNT)	12/27/17	02/21/18
7	Completed Checklists	Provide completed checklists for 3 months	Larry Skelton (CMNT)	02/21/18	04/24/18
8	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	04/24/18	05/24/18

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

COMPLETION DOCUMENTATION

Performance Measures

- 95% of active MRO personnel trained according to schedule generated under actionable item #3.
- 100% of required first aid kits inventoried for inspection.
- Evidence of completed inspections of first aid kits using updated criteria under actionable item #6.

RESPONSIBLE PARTIES

CMNT	Larry Skelton	
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SECOND LEVEL RESPONSIBILITY

Chief Mechanical Officer	John Doherty	
AGM, RAIL	Andy Off	

## 8 FIELD AUDIT ANALYSIS

### SUMMARY

QICO conducted thirteen (13) component assessments and five (5) truck inspections within the Greenbelt and Brentwood MROs from October 2016 through March 2017. These assessments have been analysed and presented in the following inspection summary table. The inspection summary table shows the discrepancies from nine (9) of thirteen (13) component assessments conducted and five (5) truck inspections. The discrepancies found have been broken down into different categories: Quality of Work, Compliance of Standards, Records Management and Safety.

Based upon the assessments, it is evident that MRO is lacking in each of the four categories. During the desk interviews, MRO management discussed with QICO officers the need for more component-based training for technicians, lengthy delays obtaining parts once a purchase request has been made to PRMT, a lack of CENV involvement with developing and producing work instruction manuals, and a lack of floor awareness by shop supervisors to observe technician practices during maintenance. Of the four categories, Quality of Work stands out as the area where most discrepancies are found. Several of the discrepancies found during the component assessments and inspections were tied to technicians not following available work instruction manuals (CENV approved or OEM supplied) or a lack of manuals available to guide employees through the process of repairing the component. Also, the lack of training materials and courses available for technicians to properly service the equipment plays a big factor in the resulting quality of work.

With implementing proper repair/overhaul manuals and developing training for technicians, MRO can significantly reduce the chances or even eliminate most of the deficiencies found.

[See Appendix H for "A-CMNT-20161020-01" - HRMM Section 3-5-18 - Line Contactor Overhaul](#) – Quality of Work

[See Appendix I for "A-CMNT-20161108-01 - Gear Box Overhaul](#) – Quality of Work

[See Appendix J for "QAI-20170214-03 - 2K/3K Front Truck 9a4-523" - Truck Overhaul inspection](#) – Quality of Work

In reference to QICO finding F-MRO-17-06, an example of parts being salvaged was found during a component audit on the Alstom High Speed Circuit Breaker (HSCB). After interviewing the MRO technician, the "spring" that was replaced comes from floor stock; the item was salvaged from another HSCB (no WMATA part number) and as such the condition of these springs is unknown.

[See Appendix K for audit "A-CMNT-20170206-01" - High Speed Circuit Breaker Asset #344690](#)

## 8.1 INSPECTION SUMMARY TABLE FROM INDIVIDUAL COMPONENT AUDITS

Inspection Details			Number of Discrepancies Identified			
Report Number	Date inspected	Shop	Quality of Work	Compliance to Standards	Records Management	Safety
A-CMNT-20161019-01 2K/3K/6K Line Contactor	10/19/16	GB	6	0	1	0
A-CMNT-20161020-01 2K/3K/6K Line Contactor	10/24/16	GB	16	6	3	0
A-CMNT-20161108-01 Gearbox Overhaul	11/21/16	BW	9	1	0	0
A-CMNT-20161215-01 6K Current Collector Assembly	12/15/16	BW	0	0	0	0
A-CMNT-20161219-01 2K/3K/6K Line Contactor	12/19/16	GB	1	0	0	0
A-CMNT-20170104-01 2K/3K/6K High Speed Circuit Breaker	1/03/17	GB	0	3	0	0
A-CMNT-20170130-01 2K/3K/4K HP4-Brake Actuator	1/16/17	GB	9	2	1	1
A-CMNT-20170206-01 2K/3K/6K High Speed Circuit Breaker	2/02/17	GB	2	1	0	0
A-CMNT-20170210-01 2K/3K Main Power Lead	2/15/17	GB	2	0	0	0
QAI-20170125-04 2K/3K Front Truck	1/25/17	GB Truck	8	0	0	0
QAI-20170126-01 2K/3K Rear Truck	1/26/17	GB Truck	8	0	0	0
QAI-20170214-03 2K/3K Front Truck	2/14/17	GB Truck	6	0	0	0
QAI-20170301-04 6K Rear Truck	3/01/17	GB Truck	6	0	0	0
QAI-20170313-05 6K Front Truck	3/13/17	GB Truck	4	0	0	0
<b>14 Total reports</b> (9 process audits; 5 truck inspections)			<b>77</b>	<b>13</b>	<b>5</b>	<b>1</b>

## 9 SUPPLEMENTAL MATERIAL



## **9.1 APPENDIX A: RISK ASSESSMENT**

# APPENDIX A: RISK ASSESSMENT

## Risk Assessment Methodology

### 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, unfavourable 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

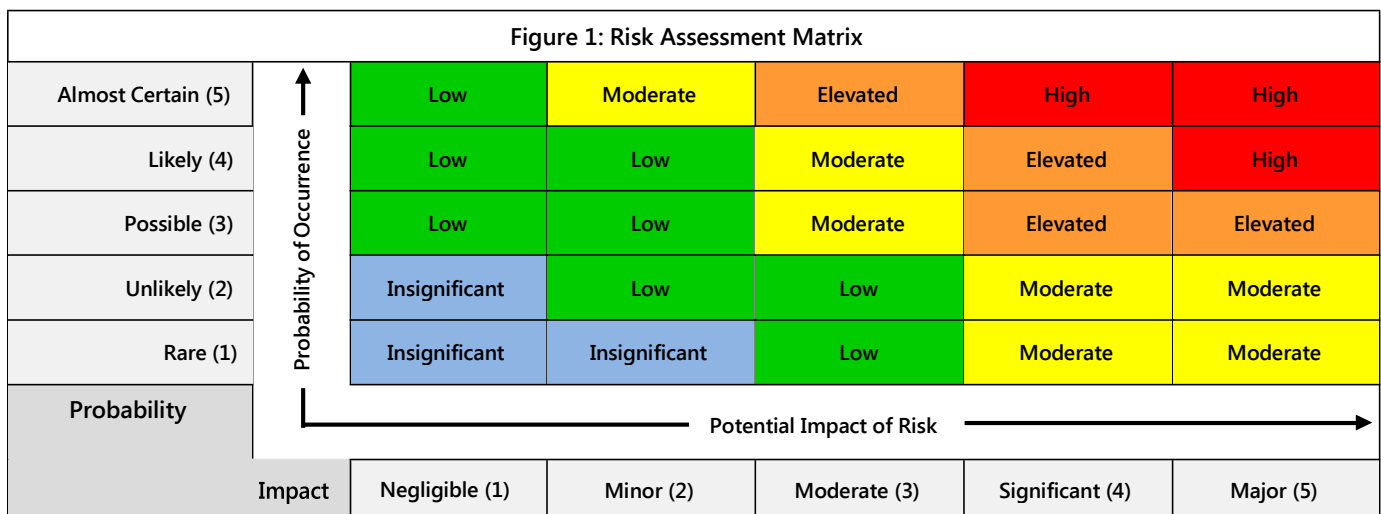
- *Technological* – Risk associated with unauthorized access to information, unavailable or unreliable information, technology not meeting business needs and compromised information security

### 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)



## APPENDIX A: RISK ASSESSMENT

### Risk Assessment Methodology

#### Probability of Occurrence of Risk Events Defined

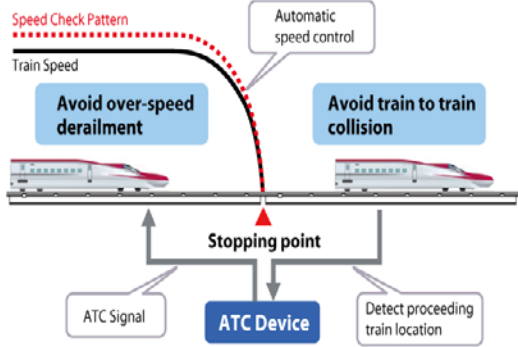


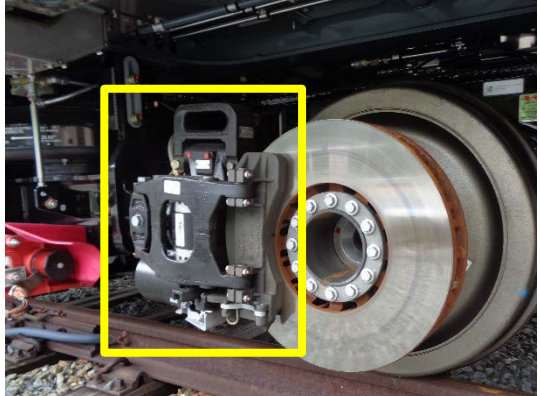
Rare | 1 – Reasonable assumption that this risk will not occur  
Unlikely | 2 – Reasonable assumption that this risk will likely not occur  
Possible | 3 – Reasonable assumption that this risk may occur  
Likely | 4 – Reasonable assumption that this risk will likely occur  
Almost Certain | 5 – Reasonable assumption that this will occur

#### Potential Impact of Risk Events Defined



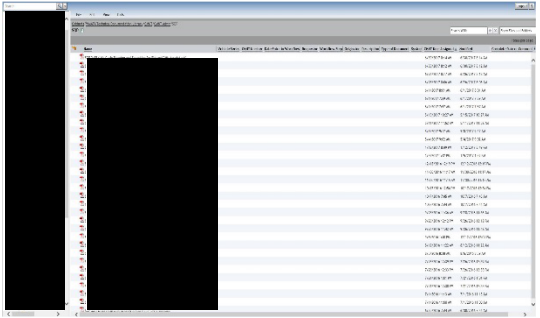
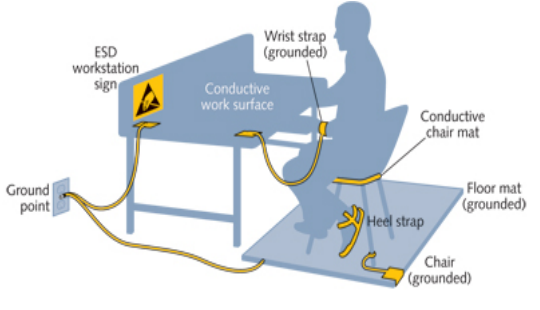
Negligible | 1 – Unlikely to cause the activity to fail to meet part of its objectives.  
Minor | 2 – May cause a failure of the business process to meet part of its objectives, which may expose Metro to minor financial losses, less-effective or efficient operations, some non-compliance with laws and 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.

## 9.2 APPENDIX B: DEFINITIONS

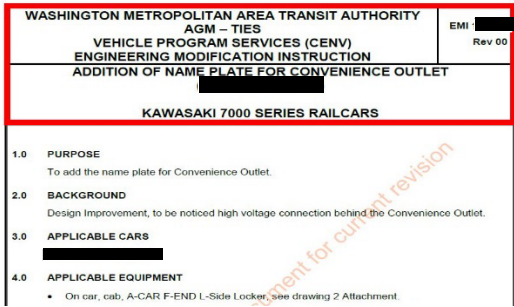
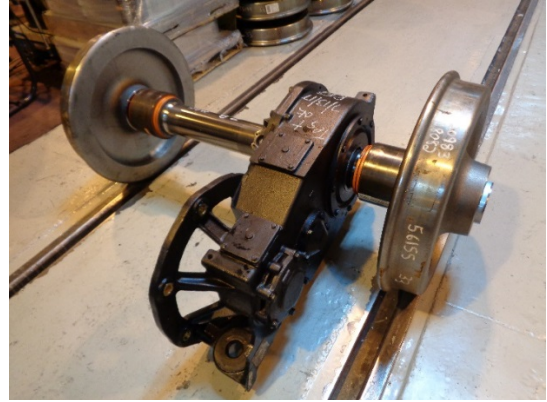
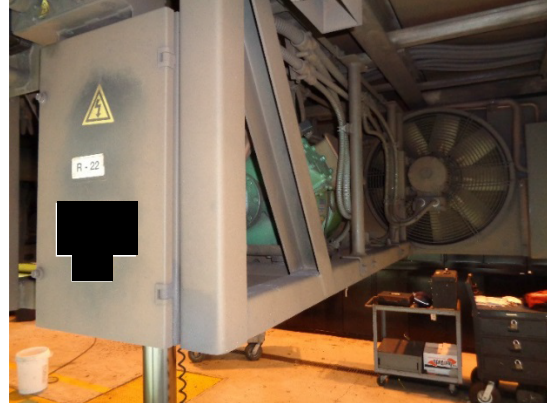

## 9.2 APPENDIX B: DEFINITIONS

Definitions	Photos
<p><b>Automatic train control (ATC)</b> Automatic Train Control (ATC) is a general class of train protection systems for railways that involves a speed control mechanism in response to external inputs. The track circuit is the foundation to the principle of ATC. Metro uses audio frequency track circuits which provide for:</p> <ul style="list-style-type: none"> <li>- Train detection</li> <li>- Train separation</li> <li>- Speed Control</li> <li>- Integrated routing logic</li> </ul>	 <p>The diagram illustrates the ATC system's role in speed control. It shows a train's speed profile on a track. A red dotted line represents the 'Speed Check Pattern'. The 'Automatic speed control' system ensures the train's speed stays below this pattern to 'Avoid over-speed derailment'. Additionally, the system 'Detects preceding train location' to 'Avoid train to train collision'. Key components shown include the 'ATC Signal', 'ATC Device', and 'Stopping point'.</p>
<p><b>Bench Testing equipment (BTE)</b> The equipment used to evaluate new or repaired components, devices, apparatus, etc., prior to installation to ensure that it is in perfect condition. Most BTEs require some form of calibration/read out validation.</p>	 <p>A blue, ruggedized bench testing equipment (BTE) device with a digital display screen and various control buttons and ports on its front panel.</p>
<p><b>Brake air compressor</b> Overhauled by the Air Compressor Shop, this is a component of the Friction Brake system and supplies the compressed air for the normal service brake and emergency brake.</p>	 <p>A photograph of a brake air compressor unit mounted on a metal frame in a workshop setting. A black rectangular redaction box is placed over the central part of the image.</p>
<p><b>Brake caliper</b> The brake caliper changes controlled air into mechanical force across a brake disc for controlled braking, or loss of brake pipe pressure will initiate emergency brake.</p>	 <p>A close-up photograph of a brake caliper assembly mounted on a large, circular brake disc. A yellow rectangular box highlights the caliper mechanism.</p>

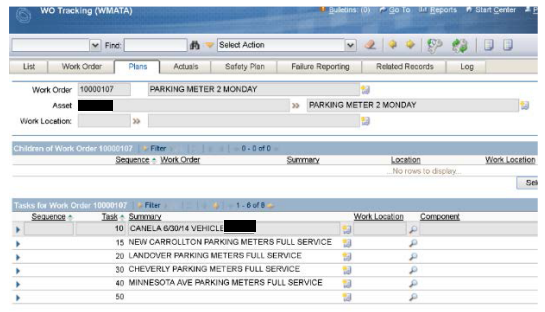

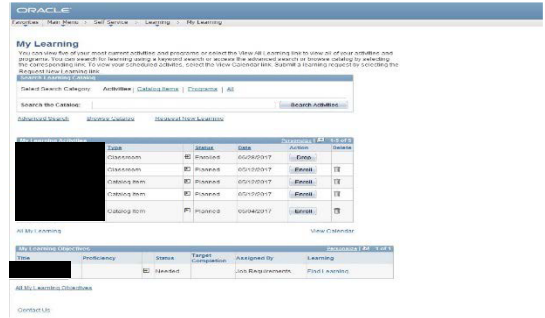

## 9.2 APPENDIX B: DEFINITIONS

Definitions	Photos
<p><b>Brake disc (Friction ring)</b> A brake disc or friction ring is a type of brake that uses calipers to squeeze pairs of pads against a disc in order to create friction that retards the rotation of a shaft, such as a vehicle axle, either to reduce its rotational speed or to hold it stationary. The energy of motion is converted into waste heat which must be dispersed.</p>	
<p><b>Coupler</b> A coupler is a mechanism for connecting railcars to form a train. The design of the coupler is standard, and is almost as important as the track gauge, since flexibility and convenience are maximised if all railcars can be coupled together. The equipment that connects the coupler to the railcar is known as the draft gear. Railcars are connected to form 4, 6 and 8 car consists (as needed by operations).</p>	
<p><b>Documentum</b> Software asset management system that provides a single source for documentation storage and controlled access.</p>	
<p><b>Electrostatic Discharge (ESD) Protection</b> Used to prevent the sudden flow of electricity between two electrically charged objects caused by contact, an electrical short, or dielectric breakdown.</p>	

## 9.2 APPENDIX B: DEFINITIONS




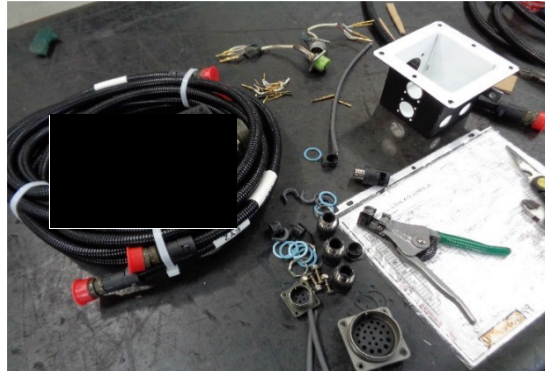
Definitions	Photos
<p><b>Engineering Modification Instruction (EMI)</b>                      An EMI is a document authorizing and recording design changes throughout the prototyping and life-cycle phases of a part/component. EMI documents a developed by Vehicle Engineering group (CENV).</p>	 <p>WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY                      AGM – TIES                      VEHICLE PROGRAM SERVICES (CENV)                      ENGINEERING MODIFICATION INSTRUCTION                      ADDITION OF NAME PLATE FOR CONVENIENCE OUTLET                      KAWASAKI 7000 SERIES RAILCARS</p> <p>1.0 PURPOSE                      To add the name plate for Convenience Outlet.</p> <p>2.0 BACKGROUND                      Design Improvement, to be noticed high voltage connection behind the Convenience Outlet.</p> <p>3.0 APPLICABLE CARS                      [REDACTED]</p> <p>4.0 APPLICABLE EQUIPMENT                      • On car, cab, A-CAR F-END L-Side Locker, see drawing 2 Attachment</p>
<p><b>Gearbox</b>                      The gearbox provides a method of obtaining from the traction motor the right power at the right speed to operate the train.                      The gearbox ensures:</p> <ul style="list-style-type: none"> <li>- The full traction motor output is available over its designed working speed range</li> <li>- High torque is available at starting</li> <li>- The torque is capable of smooth variation</li> <li>- Minimum duration of loss of tractive effort when changing gear.</li> </ul>	
<p><b>HVAC Compressor / Condenser Unit</b>                      The compressor is the central functioning unit of any cooling system and the same is true of the HVAC compressor. In general, a compressor is a mechanism that, as its name suggests, compresses gas by diminishing its volume. This is the primary basis of any heating, ventilation and air conditioning system (HVAC).</p>	
<p><b>Maintenance Service Instruction (MSI)</b>                      A MSI delineate responsibilities and procedures for performing certain maintenance overhaul/repair functions. MSI documents a developed by Vehicle Engineering group (CENV).</p>	<p>ways check source document for current revision</p>  <p>WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY                      AGM – RAIL                      VEHICLE PROGRAM SERVICES (CENV)                      MAINTENANCE AND SERVICE INSTRUCTIONS                      7K MODIFICATION OF THE COLLECTOR SHOE ADJUSTMENT                      KAWASAKI 7000 SERIES RAILCARS</p> <p>1.0 PURPOSE                      This MSI modifies the adjustment settings of the current collector shoes on the 7000 Series Railcars.</p> <p>2.0 BACKGROUND                      The purpose of this MSI is to advise CMNT of revised settings for the adjustment of the 7K collector assembly. The revised adjustment will improve the ability of the current collector to maintain contact over a wider range of third rail height profiles, and ensure reliable operation across the entire system.                      The current collector collects DC electric power through sliding contact of the current collector shoe on the third rail. Adjustment means are provided for the on-rail shoe angle and contact pressure, and off-rail height.                      A few mainline incidents have occurred whereby 7000 cars lost power and became disabled because the collector shoes did not maintain contact with the third rail. In each case, at least one</p>

## 9.2 APPENDIX B: DEFINITIONS



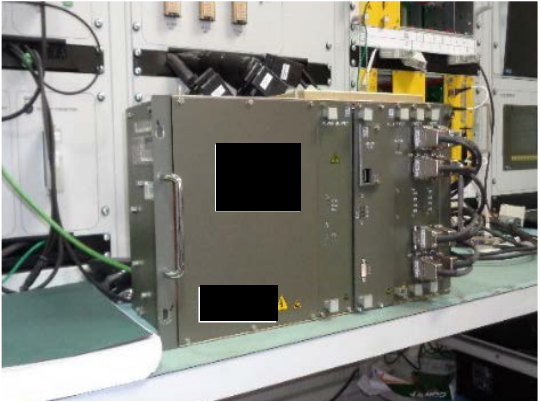
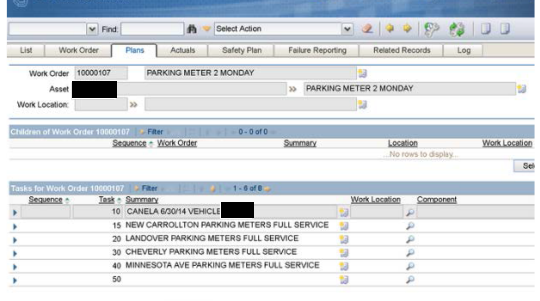
Definitions	Photos
<p><b>MAXIMO</b> MAXIMO is WMATA’s maintenance management system used for work order, incident, and track defect tracking.</p>	
<p><b>Paint Shop</b> The paint booth is an environment controlled shop area where painting of railcars and other cosmetic work is carried out.</p>	
<p><b>PeopleSoft ELM</b> A computer based program that documents all the pertinent training data for WMATA employees and serves as their training record repository.</p>	
<p><b>Personal Protective Equipment (PPE)</b> The protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter.</p>	



## 9.2 APPENDIX B: DEFINITIONS

Definitions	Photos																																																												
<p><b>Pneumatic brake relay valve</b>                      Repaired and overhauled in the Pneudraulic Shop, relay valves change controlled air pressure to a large controlled volume that can be used by friction brake system.</p>																																																													
<p><b>Propulsion Converter (CFM)</b>                      Repaired and overhauled by the electronic shop, the CFM converts 700V DC 3<sup>rd</sup> rail voltage to AC voltage for use by the propulsion traction motors.</p>																																																													
<p><b>Standard Operating Procedure (SOP)</b>                      Standard Operating Procedures (SOP) delineate responsibilities and procedures for performing certain Metrorail functions.</p>	 <table border="1"> <thead> <tr> <th colspan="4">Washington Metropolitan Area Transit Authority</th> </tr> <tr> <th colspan="4">OFFICE OF CAR MAINTENANCE</th> </tr> <tr> <th colspan="4">Standard Operating Procedure</th> </tr> </thead> <tbody> <tr> <td>CATEGORY</td> <td colspan="3">TOPIC</td> </tr> <tr> <td>Operational/Maintenance</td> <td colspan="3">Torque Indicating Devices</td> </tr> <tr> <td>SOP NO.</td> <td colspan="3">TITLE</td> </tr> <tr> <td>1.02</td> <td colspan="3">Management of Torque Indicating Devices</td> </tr> <tr> <td>LATEST REVISION NO.</td> <td>ORIGINATION DATE</td> <td>DATE REVIEW DUE</td> <td>EXPIRATION DATE</td> </tr> <tr> <td>4</td> <td>January 10, 2010</td> <td>January 4, 2019</td> <td>None</td> </tr> <tr> <td>LATEST REVISION DATE</td> <td colspan="3">LATEST REVIEW DATE</td> </tr> <tr> <td>January 5, 2015</td> <td colspan="3">January 5, 2017</td> </tr> <tr> <td colspan="4">SOP APPLIES TO:</td> </tr> <tr> <td colspan="4">All Car Maintenance (CMNT) Personnel</td> </tr> <tr> <td colspan="4">DEPARTMENT/OFFICE/INDIVIDUAL OF PRIMARY RESPONSIBILITY (OPR)</td> </tr> <tr> <td colspan="4">CMNT/Manager, Technical Support Services</td> </tr> </tbody> </table>	Washington Metropolitan Area Transit Authority				OFFICE OF CAR MAINTENANCE				Standard Operating Procedure				CATEGORY	TOPIC			Operational/Maintenance	Torque Indicating Devices			SOP NO.	TITLE			1.02	Management of Torque Indicating Devices			LATEST REVISION NO.	ORIGINATION DATE	DATE REVIEW DUE	EXPIRATION DATE	4	January 10, 2010	January 4, 2019	None	LATEST REVISION DATE	LATEST REVIEW DATE			January 5, 2015	January 5, 2017			SOP APPLIES TO:				All Car Maintenance (CMNT) Personnel				DEPARTMENT/OFFICE/INDIVIDUAL OF PRIMARY RESPONSIBILITY (OPR)				CMNT/Manager, Technical Support Services			
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<p><b>Tachometer electrical harness</b>                      Overhauled by the Electric Shop, this harness connects electrical wheel speed data to a CPU (Central Processor) in the Propulsion Converter (CFM).</p>																																																													

## 9.2 APPENDIX B: DEFINITIONS

Definitions	Photos																																			
<p><b>Traction motor</b></p> <p>The traction motor turns AC electrical power provided by the propulsion converter (CFM) into mechanical power to move the railcar.</p>																																				
<p><b>Trucks</b></p> <p>Trucks serve a number of purposes:</p> <ul style="list-style-type: none"> <li>- Supports the rail vehicle body</li> <li>- Houses axles which the wheels are mounted on each end with a roller bearing</li> <li>- Houses brake equipment</li> <li>- Houses traction motors which propels the train</li> <li>- Provides stability on both straight and curved track</li> <li>- Houses the suspension which absorbs vibration and minimizes the impact of centrifugal forces for a comfortable ride quality</li> </ul>																																				
<p><b>Vehicle Monitoring System (VMS) Equipment - Event Recorder</b></p> <p>Repaired by the electronic shop, the VMS system records the status of train electrical indicators for post-accident investigations and is required by the Federal Railroad Administration.</p>																																				
<p><b>Work Order (WO)</b></p> <p>A Work Order (WO) specifies a particular task and the labor, materials, services, and tools required to complete the task. Work Orders are tracked primarily through Maximo.</p>	 <p>The screenshot shows the 'WO Tracking (WMATA)' interface. It displays a table of tasks for work order 10000107, 'PARKING METER 2 MONDAY'. The tasks listed are:</p> <table border="1"> <thead> <tr> <th>Sequence</th> <th>Task</th> <th>Summary</th> <th>Work Location</th> <th>Component</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>CANELA 60014 VEHICLE</td> <td></td> <td></td> <td></td> </tr> <tr> <td>15</td> <td>NEW CARROLLTON PARKING METERS FULL SERVICE</td> <td></td> <td></td> <td></td> </tr> <tr> <td>20</td> <td>LANDOVER PARKING METERS FULL SERVICE</td> <td></td> <td></td> <td></td> </tr> <tr> <td>30</td> <td>CHEVERUS PARKING METERS FULL SERVICE</td> <td></td> <td></td> <td></td> </tr> <tr> <td>40</td> <td>MINNESOTA AVE PARKING METERS FULL SERVICE</td> <td></td> <td></td> <td></td> </tr> <tr> <td>50</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Sequence	Task	Summary	Work Location	Component	10	CANELA 60014 VEHICLE				15	NEW CARROLLTON PARKING METERS FULL SERVICE				20	LANDOVER PARKING METERS FULL SERVICE				30	CHEVERUS PARKING METERS FULL SERVICE				40	MINNESOTA AVE PARKING METERS FULL SERVICE				50				
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## **9.3 APPENDIX C: APPLICATION OF REGULATORY CAPS**

**APPENDIX C: APPLICATION OF REGULATORY CAPS**

Measure	Finding	QICO Review During Review
<p>Regulatory Findings - FTA</p>	<p><b>CAP R-2-16-d</b></p> <p><i>WMATA must establish guidelines for maintenance employees responsible for providing on-the-job training (OJT).</i></p> <p><b>Status as of 8/8/2017: Under FTA Review</b></p>	<ul style="list-style-type: none"> <li>- QICO found that the actionable items to satisfy FTA CAP R-2-16-d have been submitted to the FTA for review and closure. Three (3) of the five (5) items have been closed. Training classes have begun and MRO has had selected on-the-job (OJT) instructors (technicians) who have attended or is currently enrolled to attend training. Supervisors have attended in-house QA training.</li> <li>- QICO found that OJT instructor checklists have been developed for CMNT however, there is no specific training developed for MRO activities.</li> </ul>

## 9.4 APPENDIX D: DOCUMENT REQUEST FORMS



# QUALITY ASSURANCE, INTERNAL COMPLIANCE & OVERSIGHT (QICO) ROLLING STOCK ASSURANCE PROGRAM

## DOCUMENT REQUEST FORM

<b>Department Audited: Office of Car Maintenance (CMNT) – Major Repair &amp; Overhaul Process (MRO) – Greenbelt Annex MRO, Greenbelt Truck Shop &amp; Brentwood MRO</b>		<b>STATUS</b> D = Delivered/Date N = Not Delivered/Expected Date U = Unavailable at this time
<b>Date of Audit: 3/23/2017 – 6/30/2017</b> <b>Auditors:</b> _____, _____, _____, _____, _____		
DOCUMENT REQUESTED	DATE DUE	
1. OAPs associated with MRO	3/24/2017	U
2. SOPs (Not relating to component overhaul)	3/24/2017	U
3. MRO Operating Procedures	3/24/2017	U
4. Supervisor audits / Quality checks – 10 Past audits/checks	3/24/2017	D – 3/24/2017
5. Training records (OJT / Certifications) – Sample 6 employees	3/24/2017	D – 3/24/2017
6. Tooling / Equipment Calibration records	3/24/2017	D – 3/24/2017
7. List of Employees assigned to Greenbelt Annex MRO	3/24/2017	D – 3/24/2017
8. List of Employees assigned to Greenbelt Truck Shop	3/24/2017	D – 3/29/2017
9. List of Employees assigned to Brentwood MRO	3/24/2017	D – 4/3/2017

## 9.5 APPENDIX E: DESK INTERVIEW QUESTIONNAIRES



# Rolling Stock Assurance Program

## CMNT – MRO Assessment Checklist

### MRO ASSESSMENT CHECKLIST

<b>QICO REPRESENTATIVES:</b>	[REDACTED], [REDACTED], [REDACTED]		
<b>LOCATION:</b>	Greenbelt Annex MRO	<b>DATE:</b>	3/30/2017
<b>CRITERIA OF AUDIT:</b>	<ul style="list-style-type: none"> <li>- Procedure – Processing Steps</li> <li>- Documentation Associated with Components – Record Keeping</li> <li>- Quality Checks / Completion Sign Off Sheets</li> <li>- Shipping &amp; Storage</li> <li>- Employee &amp; Supervisor Training / Certification – Record Keeping</li> </ul>	<b>PERSONNEL INTERVIEWED:</b>	<ul style="list-style-type: none"> <li>- Superintendent – [REDACTED]</li> <li>- Assistant Superintendent – [REDACTED]</li> <li>- Shop Supervisor (LS-9) – [REDACTED]</li> </ul>

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
<b>DESK INTERVIEW</b>					
Procedure					
1.	What are the written procedures once a component has failed on a railcar and it has to be brought to the MRO Shop?	<ul style="list-style-type: none"> <li>- During an interview with MRO Management at Greenbelt Annex, it was stated that there is no set procedure for a step by step process on component overhauls (from the time of failure through overhaul, testing and completion).</li> <li>- Managers mentioned SOP 1.04 – Procedures for Recording Corrective Maintenance Work Order(s) for Rail Vehicle(s), Roadway Maintenance Machine(s), and Small Equipment.</li> <li>- This SOP does not cover the entire process from failure of a component through being overhauled/repaired, tested and completed.</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.	What are the different groups and or departments that make up MRO?	<p>Greenbelt Annex consist of 11 shops:</p> <ul style="list-style-type: none"> <li>- Electronic Shop</li> <li>- Electrical Shop</li> <li>- HVAC Shop</li> <li>- Coupler Shop</li> <li>- Component Shop</li> <li>- Motor Shop</li> <li>- Pneudraulic Shop</li> <li>- Air Compressor Shop</li> <li>- Truck Shop</li> <li>- Machine Shop</li> <li>- Paint Shop</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>





# Rolling Stock Assurance Program

## CMNT – MRO Assessment Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
3.	Are the procedures or work instructions up to date and are they easily accessible?	<ul style="list-style-type: none"> <li>- CMNT management notifies the supervisors of any new versions of documents which are uploaded to Documentum.</li> <li>- Revisions are discussed during toolbox meetings and hard copies are updated in work binders by supervision.</li> <li>- Hard copies are easily accessible on the shop floor and there are also interactive computer kiosks located throughout the shop that allows technicians to verify the revision level on the work instructions/procedure.</li> <li>- Old work instructions are discarded whenever updated procedures/work instructions are made available.</li> <li>- (Manuals were verified during the field observation on March 30, 2017 to ensure most recent revisions are being used.)</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	What factors are preventing the MRO Shop from producing work of the highest possible quality?	<ul style="list-style-type: none"> <li>- Lack of WMATA approved component repair/overhaul written procedures by CENV. (This in turn affects compliance, quality, safety, reliability and workmanship)</li> <li>- Delayed receipt of parts once a request has been made. Procurement is responsible for sourcing parts. (This in turn leads to higher dwell time, affects productivity, and also leads to cannibalizing parts from other railcars)</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5.	What reviews and approvals are in place before releasing a completed product?	<ul style="list-style-type: none"> <li>- Supervisors are required to conduct quality spot checks per SOP 2.10 – Supervisor Duties, Section 6.8, 6.9, 6.10.</li> <li>- Superintendent/Assistant Superintendent is also responsible for verifying completed work orders before closing them out.</li> <li>- Technicians are responsible for completing a checklist, bench test completion sign off sheet, and updating Maximo data on the component being worked on.</li> <li>- Supervisor verifies the completion sign off sheet and MAXIMO work order work order before updating the status to complete.</li> <li>- Superintendent closes the task per SOP 1.4 - Procedures for Recording Corrective Maintenance Work Order(s) for Rail Vehicle(s), Roadway Maintenance Machine(s), and Small Equipment; section 6.5 - Assignment of Rail</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO Assessment Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
		Vehicle CM Work Order; section 6.6 - Reviewing a Rail Vehicle CM Work Order and; section 6.7 - Closing a Rail Vehicle CM Work Order			
6.	Is the environment, infrastructure and tools being utilized during the task adequate to achieve conformity?	- MRO Management is concerned shop is not prepared for the 7K fleet due to the lack of space to facilitate parts/components overhaul, additional work benches, test equipment and storage.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7.	When failed components arrive to the MRO facility, how are their statuses being tracked?	- Serialized items are being documented in Maximo for work order tracking purpose. Non Serialized items are entered into FSR for tracking purposes. FSR connects data to Maximo to allow personnel to track work progress.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	What is your equipment or tool calibration process? Request records. How are the records being stored?	<ul style="list-style-type: none"> <li>- Calibration of tools are monitored electronically by Maximo and also by the Supervisors.</li> <li>- As tool calibration due dates approach Maximo generates a work order for that particular tool. Maximo also has the capability to generate an exception report for Supervisors to be able to track these tools and equipment.</li> <li>- Supervisors also maintain hard copy filing which is reviewed monthly using a compliance tracker.</li> <li>- Outside contractors, (ELI/ I&amp;I Slings) come on site to validate and recalibrate tools and equipment.</li> <li>- If the tool was fabricated by the machine shop, it is sent back to be validated and recalibrated.</li> <li>- (SOP 1.02 – Management of Torque Indicating Devices (Rev. 4)) (SOP 3.05 - Procedures for Precision Measuring Devices, Shop Equipment, and Special Tools)</li> <li>- (QICO reviewed calibration records through document request and during field observations on March 30, 2017.) (See Reference 3)</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	What is the repair priority for a component once it has been received and is there a shelf life to components?	- There is no first in first out priority on components, repairs are being conducted based on the demand for the components, Maintenance Action Request (MAR) (SOP 1.04: Section 6.4 – Rail Vehicle CM Work Order Prioritization).	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO Assessment Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
		- There is no shelf life for components, however, certain materials/parts used to make repairs does have a shelf life. (SOP 1.08 – Shelf Life Management Program)			
10.	What are the procedures for storing a component once it has been overhauled?	- No written procedure available. - Once a component has been repaired/overhauled a PO is created by the Supervisor/Lead Man/Clerk to Metro Supply Facility (MSF) 400 for pick up. All repaired/overhauled components are shipped out to MSF 400 for storage and distribution as needed. - (Process was viewed during the field observation on March 30, 2017)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
11.	What are the procedures for shipping a component once it has been overhauled?	- No written procedure available for shipping, packing and handling. - A PO is created by Supervisor/Lead Man/Clerk for record keeping. MSF 400 receives that PO and send a truck to collect item(s). Once collected it is delivered to MSF 400 until it is needed by a shop.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12.	Is there a written procedure on how electronic components are handled and stored?	- It was reported during the interview that there is no written procedure available for how to handle and store electronic components and no guidelines electrostatic discharge protection.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Supervisor</b>					
13.	What is the management structure of MRO across the authority?  How many supervisors does this MRO location have?	1) Chief Mechanical Officer (CMO) 2) General Superintendent (CMNT) 3) Assistant General Superintendent (CMNT) 4) Superintendents (MRO) 5) Assistants Superintendent (MRO) 6) Shop Supervisor LS9 7) Shift Supervisor LS8  Two (2) Shop Supervisors (LS-9), ten (10) Floor Supervisors	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
14.	Are Supervisors performing Quality Checks? If yes, request documentation.	- Per SOP 2.10 Supervisor Duties – Section 6.8, 6.9, 6.10) Supervisors are required to conduct quality checks. - (QICO reviewed samples of supervisor quality spot checks collected through document request.) (See Reference 5)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO Assessment Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
15.	Are Supervisors trained to conduct Quality Checks? If yes, request documentation of the training.	- There is no written requirements for supervisors to receive Quality Check training. However, a training course have been conducted for Supervisors to receive quality training. An email with a roster was presented to QICO to show the enrollment list for the courses.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16.	What programs besides Maximo are being used to document the work?	- FSR – Used to document non-serialized components which then communicates that collected data to Maximo.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17.	Have supervisors been trained to utilize Maximo?	- It was reported that all supervisors were trained to use Maximo. MRO management did not provide a training roster to validate response.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18.	Are Supervisors responsible for completing sign off sheets once components are overhauled?	- Technicians are responsible for completing a sign off sheet or checklist which is then verified by the Shift Supervisor as part of his’/hers’ daily task. - (QICO reviewed bench test completion sheets collected through a document request.) (See Reference 6)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19.	How are you verifying if the Supervisors are performing their tasks? Is this being documented?	- Shop Supervisors, LS-09s, are responsible for completing performance plans for every Shift Supervisor bi-annually and are responsible for reviewing and verifying completed Quality Checks. Projections of upcoming work reviewed monthly. - A work order is completed by a Supervisor and it’s closed by Assistant Superintendent /Superintendent. It is not being documented manually by the Superintendent or Assistant Superintendent but it can be tracked in Maximo by referencing the user information that’s making changes to the work order status.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Training</b>					
20.	Are technicians being trained/qualified on the overhaul or repair procedure they are being assigned to? If, yes, verify documentation. How long is the training period for a technician?	- Yes, technicians are being trained through OJT. Length of training depends on the component/system in which they are working on. - (QICO reviewed technician training records collected through document request.) (See Reference 2)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO Assessment Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
21.	What does the Supervisor training involve?	<ul style="list-style-type: none"> <li>- HR mandatory trainings, Supervisor training, Performance Plan courses. Supervisors can also take available career development courses. Employee should be able to track training in PeopleSoft ELM.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
22.	Is there any testing associated with the training for technicians? If yes, what are requirements for a passing grade?	<ul style="list-style-type: none"> <li>- Certifications requires testing.</li> <li>- Upgrading job classification (AA, A, B, C, D) requires employees to take a written and practical test once a year. If technicians do not pass testing for promotion they have to wait 6 months for the next testing. Passing grade is 75%.</li> <li>- No testing is required for OJT.</li> <li>- MRO technicians are required to be certified and current for the Roadway Worker Protection.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO Audit Checklist

### MRO ASSESSMENT CHECKLIST

<b>QICO REPRESENTATIVES:</b> [REDACTED]	
<b>LOCATION:</b>	Greenbelt Truck Shop
<b>DATE:</b>	4/1/2017
<b>CRITERIA OF AUDIT:</b>	<ul style="list-style-type: none"> <li>- Procedure – Processing Steps</li> <li>- Documentation Associated with Components – Record Keeping</li> <li>- Quality Checks / Completion Sign Off Sheets</li> <li>- Shipping &amp; Storage</li> <li>- Employee &amp; Supervisor Training / Certification – Record Keeping</li> </ul>
<b>PERSONNEL INTERVIEWED:</b>	<ul style="list-style-type: none"> <li>- Superintendent – [REDACTED]</li> <li>- Assistant Superintendent – [REDACTED]</li> <li>- Acting Shop Supervisor (LS-9) – [REDACTED]</li> <li>- TMDE – [REDACTED] (Mechanic)</li> </ul>

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
<b>DESK INTERVIEW</b>					
Procedure					
1.	What are the written procedures once a component has failed on a railcar and it has to be brought to the Greenbelt Truck Shop?	<ul style="list-style-type: none"> <li>- During the interview at the Greenbelt Truck Shop, it was stated that there is no set procedure for a step by step process on component overhaul (from the time of failure through overhaul, testing and completion).</li> <li>- Managers mentioned SOP 1.04 – Procedures for Recording Corrective Maintenance Work Order(s) for Rail Vehicle(s), Roadway Maintenance Machine(s), and Small Equipment.</li> <li>- This SOP does not cover the entire process from failure of a component through being overhauled/repaired, tested and completed.</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.	What are the different groups and/or departments that make up MRO?	Greenbelt Truck Shop is made up of: <ul style="list-style-type: none"> <li>- Structure shop - Windows, seats, carpeting, body panels, and cosmetics.</li> <li>- Caliper &amp; Hub shop</li> <li>- Truck shop</li> <li>- Machine shop - Fabricate tools, parts, and gear boxes.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.	Are the procedures or work instructions up to date and are they easily accessible?	<ul style="list-style-type: none"> <li>- CMNT management notifies the supervisors of any new versions of documents which are uploaded to Documentum.</li> <li>- Revisions are discussed during toolbox meetings and hard copies are updated in work binders by supervision.</li> <li>- Hard copies are easily accessible on the shop floor and there are also interactive computer</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO Audit Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
		<p>kiosks located throughout the shop that allows technicians to verify the revision level on the work instructions/procedure.</p> <ul style="list-style-type: none"> <li>- Old work instructions are discarded whenever updated procedures/work instructions are made available.</li> <li>- (Manuals were verified during the field observation on April 1, 2017 to ensure most recent revisions are being used.)</li> </ul>			
4.	What factors are preventing the MRO Shop from producing work of the highest possible quality?	<ul style="list-style-type: none"> <li>- It was reported by MRO management that non-availability of parts, and the lack of training courses for technicians affects the Truck Shop's ability to produce work of the highest quality.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5.	What reviews and approvals are in place before releasing a completed product?	<ul style="list-style-type: none"> <li>- Supervisors are required to conduct quality spot checks per SOP 2.10 – Supervisor Duties, Section 6.8, 6.9, 6.10.</li> <li>- Superintendent/Assistant Superintendent is also responsible for verifying completed work orders before closing them out.</li> <li>- Technicians are responsible for completing a checklist, bench test completion sign off sheet, and updating Maximo data on the component being worked on.</li> <li>- Supervisor verifies the completion sign off sheet and MAXIMO work order work order before updating the status to complete.</li> <li>- Superintendent closes the task per SOP 1.4 - Procedures for Recording Corrective Maintenance Work Order(s) for Rail Vehicle(s), Roadway Maintenance Machine(s), and Small Equipment; section 6.5 - Assignment of Rail Vehicle CM Work Order; section 6.6 - Reviewing a Rail Vehicle CM Work Order and; section 6.7 - Closing a Rail Vehicle CM Work Order</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Are the workplace, infrastructure and tools being utilized during the task adequate to achieve conformity?	<ul style="list-style-type: none"> <li>- MRO Management is concerned shop is not prepared for the 7K fleet due to the lack of space to facilitate parts/components overhaul, additional work benches, test equipment and storage..</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7.	When failed components arrive to the MRO facility, how are their statuses being tracked?	<ul style="list-style-type: none"> <li>- All components are documented in Maximo as long as they have a valid Maximo Identification number. A well processed work order links a</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO Audit Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
		<p>serialized component to the parent assets. Component that are successfully overhauled, are shipped to Metro Supply Facility (MSF) 400 for storage and distribution purpose.</p>			
8.	What is your equipment or tool calibration process? Request records. How are the records being stored?	<ul style="list-style-type: none"> <li>- Greenbelt's Truck Shop has a designated person to handle equipment and tools calibration (TMDE).</li> <li>- The calibration binders are updated every month. As tool calibration due dates approach, MAXIMO generates a work order and the said tool/equipment is pulled from the service.</li> <li>- Contractor (ELI / I&amp;I Slings) is notified to come on site for tool/equipment validation and recalibration.</li> <li>- Maximo also has the capability to generate an exception report for Supervisors or TMDE technician to be able to track these tools and equipment that require calibration.</li> <li>- (QICO reviewed calibration records through document request and during field observations on April 1, 2017.) [REDACTED]</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	What is the repair priority for a component once it has been received and is there a shelf life to components?	<ul style="list-style-type: none"> <li>- There is no first in, first out priority on component repairs. Repairs/overhauls are being done based on the demand for the components.</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10.	What are the procedures for storing a component once it has been overhauled?	<ul style="list-style-type: none"> <li>- No written procedure available for storing trucks. Greenbelt Truck Shop has a storage area where completed, waiting for parts, and waiting to be overhaul trucks are kept.</li> <li>- The Truck Availability Report (TAR), a function within Maximo, is used to monitor all trucks that are in the Truck Shop inventory. The TAR displays the status and the location of the trucks being overhauled.</li> <li>- Once a truck overhaul is completed and closed in MAXIMO an S&amp;I location can view the truck inventory and create a purchase order for a truck pick up.</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
11.	What are the procedures for shipping a component once it has been overhauled?	<ul style="list-style-type: none"> <li>- There is no written procedures for transporting a railcar truck set.</li> <li>- Technicians who hold CDL licenses are</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>





# Rolling Stock Assurance Program

## CMNT – MRO Audit Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
		responsible of transporting overhauled /non overhauled trucks to and from different maintenance facilities.			
<b>Supervisor</b>					
12.	<p>What is the management structure of MRO across the authority?</p> <p>How many supervisors does this MRO location have?</p>	<ol style="list-style-type: none"> <li>1) Chief Mechanical Officer (CMO)</li> <li>2) General Superintendent (CMNT)</li> <li>3) Assistant General Superintendent (CMNT)</li> <li>4) Superintendents (MRO)</li> <li>5) Assistants Superintendent (MRO)</li> <li>6) Shop Supervisor LS9</li> <li>7) Shift Supervisor LS8</li> </ol> <p>Three (3) Supervisors:</p> <ul style="list-style-type: none"> <li>- 2 of the 3 Shift Supervisors are out sick. (As of March 29, 2017)</li> <li>- 1 of the 3 Shift Supervisors is acting Shop Supervisor (LS-9)</li> <li>- There are currently (4) acting Supervisors.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13.	Are Supervisors performing Quality Checks? If yes, request documentation.	<ul style="list-style-type: none"> <li>- Per SOP 2.10 Supervisor Duties – Section 6.8, 6.9, 6.10) Supervisors are required to conduct quality checks.</li> <li>- (QICO reviewed samples of supervisor quality spot checks collected through document request.) [REDACTED]</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	Are Supervisors trained to conduct Quality Checks? If yes, request documentation of the training.	<ul style="list-style-type: none"> <li>- There is no written requirements for supervisors to receive Quality Check training. However, it was reported during the interview that Supervisors received a training course on quality checks. MRO management did not provide a training roster to validate response.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	What programs besides Maximo are being used to document the work?	<ul style="list-style-type: none"> <li>- Greenbelt Truck Shop uses no other program to document the work being completed.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16.	Have supervisors been trained to utilize Maximo?	<ul style="list-style-type: none"> <li>- It was reported that all supervisors were trained to use Maximo. MRO management did not provide a training roster to validate response.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17.	Are Supervisors responsible for completing sign off sheets once components are overhauled?	<ul style="list-style-type: none"> <li>- Technicians are responsible for completing a sign off sheet or checklist which is then verified by the Shift Supervisor as part of his/her daily task.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO Audit Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
		- (QICO reviewed bench test completion sheets through collected through a document request.) [REDACTED]			
18.	How are you verifying if the Supervisors are performing their tasks? Is this being documented?	<ul style="list-style-type: none"> <li>- Shop Supervisors, LS-09s, are responsible for completing performance plans for every Shift Supervisor bi-annually and are responsible for reviewing and verifying completed Quality Checks.</li> <li>- (QICO reviewed Supervisor Quality Checks collected through document request.) [REDACTED]</li> <li>- Projections of upcoming work and completed work are reviewed monthly.</li> <li>- A work order is completed by a Supervisor and it's closed by Assistant Superintendent /Superintendent.</li> <li>- It is not being documented manually by the Superintendent or Assistant Superintendent but it can be tracked in Maximo by referencing the user information that's making changes to the work order status.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Training</b>					
19.	Are technicians being trained/qualified on the overhaul or repair procedure they are being assigned to? If, yes, verify documentation. How long is the training period for a technician?	<ul style="list-style-type: none"> <li>- Technicians at the Greenbelt Truck Shop receive on-job-training (OJT).</li> <li>- Length of training depends on the component/system on.</li> <li>- Particular skills set like Welding, magnetic particles hindering and H1 certifications, training is provided by outside contractors.</li> <li>- (QICO reviewed technician training records collected through document request.) [REDACTED]</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.	What does the Supervisor training involve?	<ul style="list-style-type: none"> <li>- Supervisors have to take supervisor training and other mandatory training set by the Human Resources (HR) Department.</li> <li>- Supervisors can also take available career development courses in the form of computer based training (CBTs) and classroom courses based upon class availability. Employees able to track training in PeopleSoft ELM.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO Audit Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
21.	Is there any testing associated with the training for technicians? If yes, what are requirements for a passing grade?	<ul style="list-style-type: none"> <li>- The training Department is responsible for administrating written and practical promotional tests. MRO technicians are required to be certified and current for the Roadway Worker Protection.</li> <li>- Four (4) promotion tests: C, B, A &amp;AA - 75% is the passing grade.</li> <li>- Certifications requires testing.</li> <li>- No testing is required for OJT.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Rolling Stock Assurance Program  
 CMNT – MRO ASSESSMENT Checklist

<b>MRO ASSESSMENT CHECKLIST</b>			
<b>QICO REPRESENTATIVES:</b>	[REDACTED]		
<b>LOCATION:</b>	Brentwood MRO Shop	<b>DATE:</b>	4/3/2017
<b>CRITERIA OF AUDIT:</b>	<ul style="list-style-type: none"> <li>- Procedure – Processing Steps</li> <li>- Documentation Associated with Components – Record Keeping</li> <li>- Quality Checks / Completion Sign Off Sheets</li> <li>- Shipping &amp; Storage</li> <li>- Employee &amp; Supervisor Training / Certification – Record Keeping</li> </ul>	<b>PERSONNEL INTERVIEWED:</b>	<ul style="list-style-type: none"> <li>- Superintendent – [REDACTED]</li> <li>- Assistant Superintendent – [REDACTED]</li> <li>- Shop Supervisor (LS-9) – [REDACTED]</li> </ul>

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
<b>DESK INTERVIEW</b>					
Procedure					
1.	What are the written procedures once a component has failed on a railcar and it has to be brought to the MRO Shop?	<ul style="list-style-type: none"> <li>- During an interview with MRO Management at Brentwood MRO Shop, it was stated that there is no set procedure for a step by step process on component overhaul process (from the time of failure through overhaul, testing and completion).</li> <li>- Managers mentioned SOP 1.04 – Procedures for Recording Corrective Maintenance Work Order(s) for Rail Vehicle(s).</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.	What are the different groups and/or departments that make up MRO?	Brentwood MRO Shop is made up of: <ul style="list-style-type: none"> <li>- Structural Shop - Windows, seats, carpeting, body panels, and cosmetics.</li> <li>- Mechanical Shop - Heavy overhaul and truck repair.</li> <li>- Machine Shop - Fabricate tools, parts, and gear boxes.</li> <li>- Electrical Shop - Propulsion, HVAC, and door assembly.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.	Are the procedures or work instructions up to date and are they easily accessible?	<ul style="list-style-type: none"> <li>- CMNT management notifies the supervisors of any new versions of documents which are uploaded to Documentum. Revisions are discussed during toolbox meetings and hard copies are updated in work binders by supervision.</li> <li>- Hard copies are easily accessible on the shop floor and there are also interactive computer kiosks located throughout the shop that allows technicians to verify the revision level on the</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



## Rolling Stock Assurance Program

### CMNT – MRO ASSESSMENT Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
		<p>work instructions/procedure.</p> <ul style="list-style-type: none"> <li>(Manuals were verified during the field observation on April 3, 2017 to ensure most recent revisions are being used.)</li> </ul>			
4.	What factors are preventing the MRO Shop from producing work of the highest possible quality?	<ul style="list-style-type: none"> <li>It was reported by MRO management that insufficient man power, non-availability of parts, and the lack of training courses for technicians affects the MRO shop from producing work of the highest quality.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5.	What reviews and approvals are in place before releasing your work product?	<ul style="list-style-type: none"> <li>Supervisors are required to conduct quality spot checks per SOP 2.10 – Supervisor Duties, Section 6.8, 6.9, 6.10.</li> <li>Superintendent/Assistant Superintendent is also responsible for verifying completed work orders before closing them out.</li> <li>Technicians are responsible for completing a checklist, bench test completion sign off sheet, and updating Maximo data on the component being worked on.</li> <li>Supervisor verifies the completion sign off sheet and MAXIMO work order work order before updating the status to complete.</li> <li>Superintendent closes the task per SOP 1.4 - Procedures for Recording Corrective Maintenance Work Order(s) for Rail Vehicle(s), Roadway Maintenance Machine(s), and Small Equipment; section 6.5 - Assignment of Rail Vehicle CM Work Order; section 6.6 - Reviewing a Rail Vehicle CM Work Order and; section 6.7 - Closing a Rail Vehicle CM Work Order</li> <li>SOP 2.10 Duties and Responsibilities for Supervisors</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Are the workplace, infrastructure and tools being utilized during the task adequate to achieve conformity?	<ul style="list-style-type: none"> <li>MRO management reported the workplace is not adequate due to space constraints. The fleet being upgraded and there are concerns the facility in some areas cannot support the equipment.</li> <li>It was also reported that there is insufficient man power, lack of spare parts and lack of component based training courses.</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7.	When failed components arrive to the MRO facility, how are their statuses being tracked?	<ul style="list-style-type: none"> <li>All components are documented in Maximo as long as they have a valid Maximo Identification number. A well processed work order links a</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO ASSESSMENT Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
		<p>serialized component to the parent assets. Part/ component/equipment that are successfully overhauled, are shipped to Metro Supply Facility (MSF) 400 for storage and distribution purpose.</p>			
8.	<p>What is your calibration process? How are the records being stored?</p>	<ul style="list-style-type: none"> <li>- Calibration of tools is monitored electronically by Maximo and also by the Supervisors. As tool calibration due dates approach, Maximo generates a work order for that particular tool.</li> <li>- Maximo also has the capability to generate an exception report for Supervisors to be able to track these tools and equipment.</li> <li>- Supervisors also maintain hard copy filing which is reviewed monthly using a compliance tracker.</li> <li>- As tools calibration approach they are pulled from service and contractors, (ELI / I&amp;I Slings) comes on site to be validate and recalibrate the equipment.</li> <li>- If the tool was fabricated by the in house machine shop, it is sent back to be validated and recalibrated. (SOP 1.02 – Management of Torque Indicating Devices (Rev. 4)) (SOP 3.05 - Procedures for Precision Measuring Devices, Shop Equipment, and Special Tools)</li> <li>- (QICO reviewed calibration records through document request and during field observations on April 3, 2017.) [REDACTED]</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	<p>What is the repair priority for a component once it has been received and is there a shelf life to components?</p>	<ul style="list-style-type: none"> <li>- There is no first in, first out priority on component repairs. Repairs/overhauls are being conducted based on the demand for the components.</li> <li>- There is a lack of procedure for repair priority.</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10.	<p>What are the procedures for storing a component once it has been overhauled?</p>	<ul style="list-style-type: none"> <li>- No written procedure available for shipping, packing and handling.</li> <li>- Brentwood keeps inventory for shop repairs</li> <li>- Once repaired the parts are returned to inventory using Maximo and shipped to Metro Supply Facility (MSF) 400</li> <li>- Trucks are entered into the Truck Availability Report (TAR) in Maximo.</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO ASSESSMENT Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
11.	What are the procedures for shipping a component once it has been overhauled?	<ul style="list-style-type: none"> <li>- It was reported during the interview that there is no written procedure available for shipping, packing and handling.</li> <li>- A PO is created by Supervisor/Lead Man/Clerk for record keeping. Metro Supply Facility (MSF) 400 receives the PO and sends a truck to collect item(s).</li> <li>- Sometimes have dedicated package containers, crates and/or palettes. Smaller components are packaged based on the available packaging resources.</li> <li>- Once collected it is delivered to MSF 400 until it is needed by a shop.</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12.	Is there a written procedure on how electronic components are handled and stored?	<ul style="list-style-type: none"> <li>- It was reported during the interview that there is no written procedure available for how to handle and store electronic components and no guidelines electrostatic discharge protection.</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Supervisor</b>					
13.	<p>What is the management structure of MRO across the authority?</p> <p>How many supervisors does this MRO location have?</p>	<ol style="list-style-type: none"> <li>1) Chief Mechanical Officer (CMO)</li> <li>2) General Superintendent (CMNT)</li> <li>3) Assistant General Superintendent (CMNT)</li> <li>4) Superintendents (MRO)</li> <li>5) Assistants Superintendent (MRO)</li> <li>6) Shop Supervisor LS9</li> <li>7) Shift Supervisor LS8</li> </ol> <p>Five (5) supervisors</p> <ul style="list-style-type: none"> <li>- 3 on 1<sup>st</sup> Shift</li> <li>- 2 on 2<sup>nd</sup> Shift</li> </ul> <p>There is no 3<sup>rd</sup> shift</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
14.	Are Supervisors performing Quality Checks?	<ul style="list-style-type: none"> <li>- Per SOP 2.10 Supervisor Duties – Section 6.8, 6.9, 6.10) Supervisors are required to conduct quality checks.</li> <li>- (QICO reviewed samples of supervisor quality spot checks collected through document request.) [REDACTED]</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	Are Supervisors trained to conduct Quality Checks? If yes, request documentation of the training.	<ul style="list-style-type: none"> <li>- There is no written requirements for supervisors to receive Quality Check training. However, it was reported during the interview that Supervisors received a training course on quality checks. MRO management did not provide a training roster to validate response.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Rolling Stock Assurance Program

## CMNT – MRO ASSESSMENT Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
16.	What programs besides Maximo are being used to document the work?	<ul style="list-style-type: none"> <li>- Daily Work Assignments</li> <li>- Fleet logs</li> <li>- Drive folder on Superintendent and Assistant Superintendent's personal computers.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17.	Have supervisors been trained to utilize Maximo?	<ul style="list-style-type: none"> <li>- It was reported that all supervisors were trained to use Maximo. MRO management did not provide a training roster to validate response.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18.	Are Supervisors responsible for completing sign off sheets once components are overhauled?	<ul style="list-style-type: none"> <li>- Technicians are responsible for completing a sign off sheet or checklist which is then verified by the Shift Supervisor as part of his/her daily task.</li> <li>- (QICO reviewed bench test completion sheets collected through a document request.) [REDACTED]</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19.	How are you verifying if the Supervisors are performing their tasks? Is this being documented?	<ul style="list-style-type: none"> <li>- Superintendents and or Assistant Superintendents must review all work orders before they can be closed.</li> <li>- Only Superintendents and or Assistant Superintendents can close a work order</li> <li>- Supervisors also receive a performance evaluation.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Training</b>					
20.	Are technicians being trained/qualified on the overhaul or repair procedure they are being assigned to? If, yes, verify documentation. How long is the training period for a technician?	<ul style="list-style-type: none"> <li>- All technicians had a folder for all certifications completed</li> <li>- The training varies based on requirements</li> <li>- (QICO reviewed technician training records collected through document request.) [REDACTED]</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.	What does the Supervisor training involve?	<ul style="list-style-type: none"> <li>- HR mandatory trainings, Supervisor training, Performance Plan courses.</li> <li>- Supervisors can also take available career development courses. Employee should be able to track training in PeopleSoft ELM.</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>





## Rolling Stock Assurance Program

### CMNT – MRO ASSESSMENT Checklist

No	EVALUATION CRITERIA	COMMENTS	YES	NO	N/A
22.	Is there any testing associated with the training for technicians? If yes, what are requirements for a passing grade?	<ul style="list-style-type: none"> <li>- No testing is required for OJT.</li> <li>- Certifications requires testing.</li> <li>- Upgrading job classification (AA, A, B, C, D) requires employees to take written and practical tests once a year. If technicians do not pass testing for promotion they have to wait 6 months for the next testing. Passing grade is 75%.</li> <li>- MRO technicians are required to be certified and current for the Roadway Worker Protection.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## **9.6 APPENDIX F: APPROVED MRO REBUILD PROCEDURES PER DOCUMENTUM**

## Approved MRO Rebuild Procedures

In Documentum as of April 1, 2017


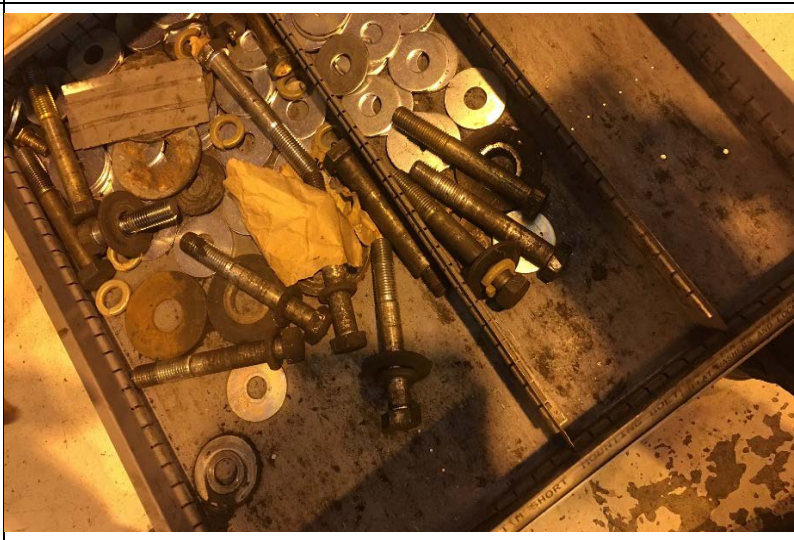

	MSI	Title	Item
<b>6000 Series</b>	150037	Traction motor rebuild, inspection, and test	
	150044	High speed coupling installation	
	150081	Front end coupler electrical head contact spring force measurement	
<b>5000 Series</b>	160049	Line switch assemblies overhaul and test procedure	
	160050	Master controller overhaul and test procedure	
	160051	5K truck overhaul procedure	
	160055	Traction motor rebuild	
	160056	CAF front mechanical coupler overhaul procedure	
	160059	Truck control unit overhaul and test procedure	
	160060	Emergency pipe control unit overhaul and test procedure	
	160067	Current collector subassembly rebuild procedure	
	160070	Air compressor motor overhaul procedure	
	160072	Rotary valve overhaul	
	160074	5K gearbox overhaul	
	160076	Condensor motor overhaul procedure	
	160077	Evaporator motor overhaul procedure	
	160078	Propulsion blower motor (position X) overhaul procedure	
	160083	High speed coupling installation	
	160099	Compressor/condenser assembly overhaul procedure	
	160103	ICON-M module overhaul procedure	
160104	5K tach harness overhaul and test procedure		
160122	Cab heater overhaul procedure		
160127	Front end coupler electrical head contact spring force measurement		
<b>4000 Series</b>	170097	S-1 Servotrol control valve overhaul inspection and test	
	170098	Propulsion blower assembly and motor rebuild overhaul inspection and test	
	170099	Power brake controller overhaul and test procedure	
	170100	Free wheeling diode heat sink module overhaul	
	170102	Resistor bank assembly frame (GR2) overhaul repair inspection and test procedure	
	170108	4K thyristor assembly overhaul procedure	
	170109	High speed coupling installation	
	170111	Propulsion filter capacitor overhaul	
	170112	PBC up magnetic valve	
	170113	PBC down magnetic valve	
	170114	LSX magnetic valve overhaul	
	170119	4K contactor/interlock assembly type UMD 1251 overhaul	
	170140	Front end coupler electrical head contact spring force measurement	
<b>2000-3000 Series</b>	180203	AC traction motor overhaul	
	180218	Master controller	
	180220	S-1 Servotrol control valve overhaul inspection and test	
	180222	Evaporator motor overhaul procedure	
	180228	High speed coupling installation	
	180247	Evaporator motor/blower assembly overhaul procedure	
	180249	2-3K duplex solenoid valve overhaul and test procedure	
	180254	HVAC compressor-condenser unit overhaul procedure	
	180273	Front end coupler electrical head contact spring force measurement	

## 9.7 APPENDIX G: PHOTOGRAPHS

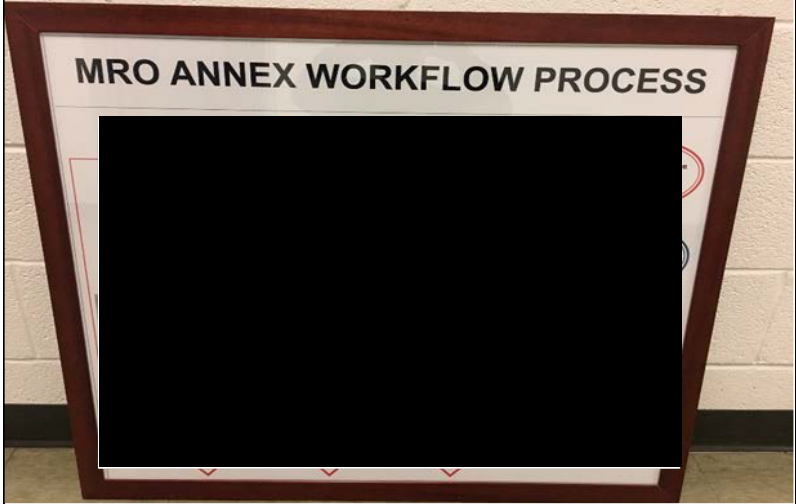

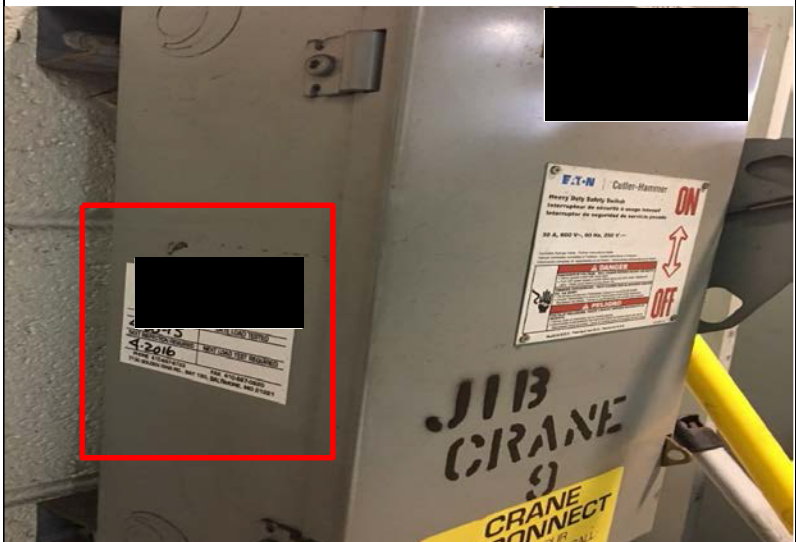
## 9.7 APPENDIX G: PHOTOGRAPHS

Finding & Description	Photos
<p>Photograph #1</p> <p>F-MRO-17-01</p> <p>The photograph shows overhaul 5K trucks awaiting brake discs for completion. Trucks have been sitting over a month waiting for parts. <i>(Source of information: Truck Shop Supervisor)</i></p> <p><i>(Source: QICO performing field observation on 3/29/2017 11:50 AM - Greenbelt Truck Shop)</i></p>	 <p>Arrows indicate where brake disc would be installed.</p>
<p>Photograph #2</p> <p>F-MRO-17-01</p> <p>At the Greenbelt Annex Compressor Shop, salvaged air hoses are being saved for reuse if new parts are not available. At the time of the field observation, new air hoses were available in stock. These air hoses are made of rubber which over time deteriorates affecting safety, part performance, and railcar reliability.</p> <p><i>(Source: QICO performing field observation on 3/31/2017 10:13 AM)</i></p>	 <p>Salvaged air hoses saved for reuse (Rubber)</p> <p>New air hoses stored in the same area</p>
<p>Photograph #3</p> <p>F-MRO-17-01</p> <p>At Greenbelt Truck Shop it was observed that brake calliper suspension pins (not clean or inspected) were being saved with other salvaged parts for reuse.</p> <p><i>(Source: QICO performing field observation on 3/29/2017 12:15 PM)</i></p>	 <p>Used Brake Calliper Pins</p>

## 9.7 APPENDIX G: PHOTOGRAPHS

Finding & Description	Photos
<p>Photograph #4</p> <p>F-MRO-17-01</p> <p>Used brake pads, brackets, bolts, and air hoses unorganized on storage shelves.</p> <p><i>(Source: QICO performing field observation on 3/29/2017 12:15 PM)</i></p>	
<p>Photograph #5</p> <p>F-MRO-17-01</p> <p>At Greenbelt Truck Shop it was observed traction motor bolts (not clean or inspected) were being saved for re-use.</p> <p><i>(Source: QICO performing field observation on 3/29/2017 12:23 PM)</i></p>	
<p>Photograph #6</p> <p>F-MRO-17-01</p> <p>At Greenbelt Annex, line contactor switches were observed sitting on a pallet with no associated tagging for reference at Greenbelt Annex MRO.</p> <p><i>(Source: QICO performing field observations at Greenbelt Annex 3/30/2017 9:17 AM)</i></p>	

## 9.7 APPENDIX G: PHOTOGRAPHS

Finding & Description	Photos
<p>Photograph #7</p> <p>F-MRO-17-02</p> <p>The photograph shows the workflow process for component that is due for overhaul or has fail.</p> <p><i>(Source: Presented at Desk Interview by Greenbelt Annex MRO Management 3/24/2017 8:39 AM)</i></p>	
<p>Photograph #8</p> <p>F-MRO-17-03</p> <p>Past due annual rigging inspection date on jib cranes and overhead cranes.</p> <p><i>(Source: QICO performing field observations at Greenbelt Annex 3/30/2017 9:17 AM)</i></p>	
<p>Photograph #9</p> <p>F-MRO-17-03</p> <p>Past due annual rigging inspection date on jib cranes and overhead cranes.</p> <p><i>(Source: QICO performing field observations at Greenbelt Annex 3/30/2017 9:17 AM)</i></p>	

## 9.7 APPENDIX G: PHOTOGRAPHS

### Finding & Description

### Photos

#### Photograph #10

F-MRO-17-01

At Greenbelt Annex MRO, an electrical component was left without any electrostatic discharge (ESD) protection.

*(Source: QICO performing field observations at Greenbelt Annex 3/30/2017)*



#### Photograph #11

F-MRO-17-01

At Greenbelt Annex MRO, an inspected electrical component was left without any electrostatic discharge (ESD) protection.

*(Source: QICO performing field observations at Greenbelt Annex 3/30/2017)*



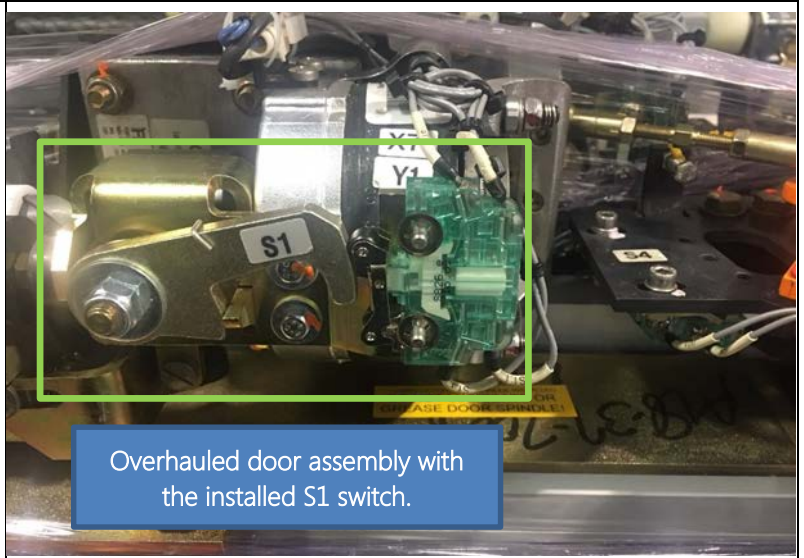
#### Photograph #12

OBSERVATION

O-MRO-17-02

At Greenbelt Annex MRO, QICO discovered S1 switches on overhauled door assemblies were being removed by S&I shops and then sent back to MRO.

*(Source: QICO performing field observation on 3/30/2017 9:33 AM at Greenbelt Annex & interview with technician on finding)*





## 9.7 APPENDIX G: PHOTOGRAPHS

### Finding & Description

Photograph #13

OBSERVATION  
O-MRO-17-02

At Greenbelt Annex MRO, QICO discovered S1 switches on overhauled door assemblies were being removed by S&I shops and then sent back to MRO.

*(Source: QICO performing field observation on 3/30/2017 9:33 AM at Greenbelt Annex & interview with technician on finding)*

### Photos



## **9.8 APPENDIX H: "A-CMNT-20161020-01" – HRMM SECTION 3-5-18 'LINE CONTACTOR OVERHAUL'**



**WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY**  
 DEPARTMENT OF QUALITY & INTERNAL COMPLIANCE OPERATIONS (QICO)  
 OFFICE OF QUALITY MISSION ASSURANCE

**CMNT MRO PROCESS AUDIT REPORT**

REPORT NUMBER:	A-CMNT-20161020-01	NOTIFICATION DATE:	10/24/2016
POLICY/PROCEDURE NUMBER:	6K HRMM Section 3-5-18	AUDIT DATE:	10/20/2016
POLICY/PROCEDURE DESCRIPTION:	HRMM Section 3-5-18 "Line Contactor Overhaul"	RESPONSE DUE DATE:	11/8/2016
CMNT SUPERINTENDENT:	[REDACTED]	RAILCAR SERIES:	6K
CMNT SUPERVISOR:	[REDACTED]	WMATA P/N:	[REDACTED]
AUDITED DEPARTMENT/SHOP:	Electric Component Shop	EQUIPMENT S/N:	None used
PREPARED BY:	[REDACTED]	ASSET #	None

**SCOPE:**

QMA shall audit CMNT policies, procedures and documentation requirements related to Major Repair and Overhaul of rail car systems, subsystems and components. QMA shall confirm compliance with approved WMATA policies and procedures and recommend any improvements needed.

**AUDIT CHECKLIST:** LEGEND – **Yes** = Conforming, observed with no discrepancies noted; **No** = Nonconforming, not in compliance with procedures; **N/O** = Not Observed; **N/A** = Not Applicable

No.	ITEM	COMPLIANCE				DISCREPANCY	CORRECTIVE ACTION
		Yes	No	N/O	N/A		
<b>1.0</b>	<b>PROCEDURE: Alstom Line Contactor Overhaul, HRMM Section 3-5-18</b>						
1.1	Remove and inspect Arc Chute (Page 3-5-150 and 151) 1. Arc Chute Dimension A 2. Original Contact thickness		X			1. Arc Chute Dimension A not measured. 2. Contactor was not energized during contact inspection.	
1.2	Replace and inspect Auxiliary Contacts (Page 3-5-152 and 153) 1. Torque screws to .7ft-lb (8.5 inch pounds)		X			1. Torque values not followed.	
1.3	Replace Braid (Page 3-5-154.1) 1. Torque Hardware to 18.4 ft-lb (221 inch pounds)		X			1. Torque values not followed.	
1.4	Replace Spacer and Mobile Armature (Page 3-5-154.2, 154.3 and 154.4) 1. Measure distance between Armature and coil with 12mm Go-No Go gauge.		X			1. A 12mm round pin gauge was available, however, Technicians unclear of Pass/Fail criteria.	
1.5	Replace Spring and Spring Holding Pins (Page 3-5-154.4) and RMM Chapter 3 Section 4 1. Contactor Spring Condition		X			1. Contactor Spring not inspected for serviceable condition.	

1.6	Setting Main Pole Opening (Page 3-5-155, 156 and 157) 1. Dimension B 2. Dimension D		X			1. Dimension B measured but not recorded. 2. Dimension D not checked.	
1.7	Setting Main Pole Pressure (Page 3-5-155, 156 and 158) 1. Verify 22 +/- 2.2 lb contact spring pressure.		X			1. Fundamental misunderstanding of the Setting procedure.	
1.8	Setting Minimum Closing Voltage (Page 3-5-159 and 160) 1. Verify 20Vdc +1 -0		X			1. Fundamental misunderstanding of the Setting procedure.	
1.9	Setting of Auxiliary Blocks Stroke (Page 3-5-160) 1. Measurement H		X			1. 1mm minimum reserve stroke (Measurement H) not checked.	
1.10	Verifying Distance between Fixed Contact Parts and Blow Out Coil. (Page 3-5-160) 1. Distance D		X			1. Distance D not checked.	
1.11	Verifying Distance between Blow Out Coil Windings (Page 3-5-161) 1. Distance F		X			1. Distance F not checked.	
1.12	Verification of Auxiliary Contacts (Page 3-5-161) 1. Bench Test Unit	X					
1.13	Install the Arc Chute (Page 3-5-161) 1. Install Arc Chute, then with power connected operate the unit.		X			1. Contactor was not operated with power after Arc Chute installed.	
<p><u>Comments:</u> QMA observed Arc Chutes and plastic items cleaned in a sandblaster. The Coil and Armature mechanism was placed in a plastic media blaster. This was done for cleaning. Plastic parts were blown off with compressed air and then washed with water. The Coil and Armature assembly was blown off with compressed air. In one instance, CRC was used to lube the Armature, (after blasting) during the "Setting Minimum Closing Voltage" procedure.</p>							

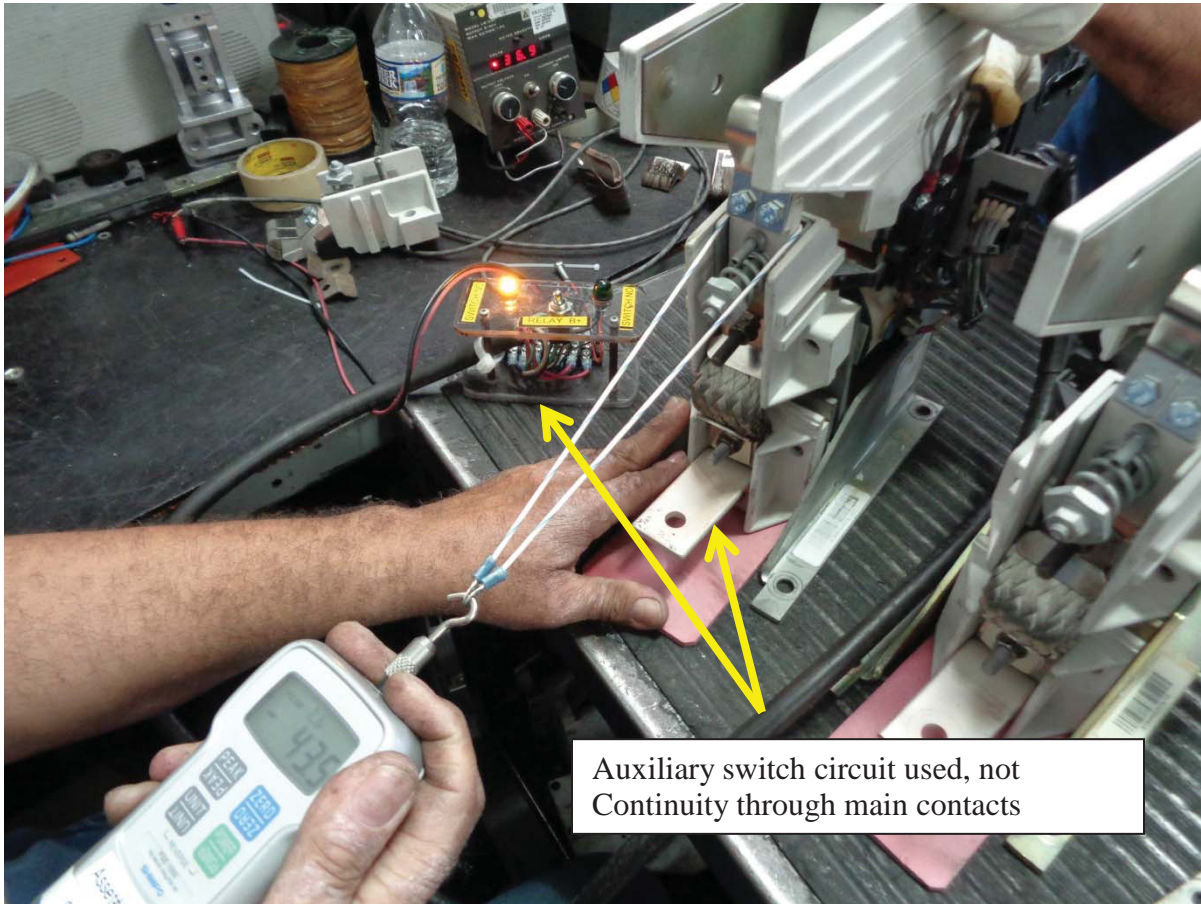
No.	ITEM	COMPLIANCE				DISCREPANCY	CORRECTIVE ACTION
		Yes	No	N/O	N/A		
<b>2.0</b>	<b>TOOLS AND MATERIALS:</b> MSI Sections 6.0, 7.0; CMNT SOP 3.05						
2.1	Approved/Proper Tools in use: <ul style="list-style-type: none"> <li>Feeler gauges</li> <li>12mm Pin Gauge</li> <li>20mm Gauge</li> <li>44lb Spring Gauge or equivalent</li> <li>Torque Wrench</li> </ul>		X			<ul style="list-style-type: none"> <li>A Torque Wrench was not present.</li> <li>12mm pin gauge and the 20mm gauge do not have Asset # or Calibration sticker.</li> </ul>	
2.2	Tool(s), Shop Equipment, Special Tool(s) and Measuring Device(s) calibration / validation requirements met:	X					
2.3	Approved/Proper Materials in use:		X			<ul style="list-style-type: none"> <li>CRC used to lube the Armature is not listed in "Supplies"</li> </ul>	
<u>Comments:</u>							
<b>3.0</b>	<b>DOCUMENTATION:</b> CMNT SOP 1.04, 1.05, 1.06						

3.1	Preventive Maintenance W/O(s) are properly documented in Maximo:				X		
3.2	Corrective Maintenance W/O(s) are properly documented in Maximo:				X		
3.3	Deferred Maintenance W/O(s) are properly documented in Maximo:				X		
<p><b>Comments:</b> Microelettrica Scientifica Data Stickers are sometimes visible complete with a Serial Number. Serial Numbers are not recorded in the FSR System. Line Contactors have no visibility. Per HRMM Section 3-5-18, The Main Pole opening dimension and the main contact pressure are to be recorded in a data sheet, these values are not currently recorded.</p>							
<b>4.0 EMPLOYEE TRAINING: CMNT SOP 2.04</b>							
4.1	Classroom training for CMNT personnel provided:		X			<ul style="list-style-type: none"> <li>No formal training on this equipment</li> </ul>	
4.2	On The Job Training (OJT) for CMNT personnel provided:	X				<ul style="list-style-type: none"> <li>OJT only</li> </ul>	
4.3	Applicable training properly documented:		X			<ul style="list-style-type: none"> <li>No OJT documentation at this time.</li> </ul>	
<p><b>Comments:</b></p>							

AUDIT OBSERVATIONS						
ITEM	Yes	No	N/O	N/A	COMMENTS	
<b>GENERAL PROCEDURE:</b>						
Procedure on-hand / readily available:		X			Document used was a Microelettrica Scientifica manual that is not in Documentum. The 6K HRMM Section 3-5-18 was not used.	
Procedure in use is the current revision:		X			The Microelettrica Scientifica Document appears to be "Back Door" information that is not revised.	
Other ( <i>explain</i> ):		X			No MSI procedure exists	
<b>CONFIGURATION CONTROL:</b>						
Component is current revision/configuration level:				X		
EMI(s):				X		
ETP(s):				X		
Other ( <i>explain</i> ):	X				This contactor is scheduled for replacement per EMI # [REDACTED] for 6K series, and EMI # [REDACTED] for 2K/3K series cars at a future date. Installation of Schaltbau Contactors.	
<b>INCOMING COMPONENT INSPECTION:</b>						
Failure Data Tag included/completed w/ component:			X		<ul style="list-style-type: none"> <li>Component Tags where not observed</li> </ul>	
Packaging included w/ component:			X			
<b>OUTGOING COMPONENT INSPECTION:</b>						
WMATA P/N Label affixed:		X				
Equipment / Asset # affixed:		X				
Service Date Label affixed:		X				
Packaging included w/ component:			X			
<b>GENERAL SAFETY:</b>						
PPE:	X					
Other ( <i>explain</i> ):				X		

## FINDINGS:

- Finding 1.7



1. The Technicians are not following HRMM Section 3-5-18; Page 3-5-157 and 3-5-158 when “Setting Main Pole Pressure”. They are using the Auxiliary switch circuit to note the spring pressure on the contact tips. When the main contacts open, they are looking for a value above 44lbs (pulling the armature away from the energized coil). Per Section 3-5-18, 44lbs is the recommended range of the pressure gauge to be used. The actual spring setting value should be 22lbs +/- 2.2lbs, and continuity through the main contacts should be used to note the spring pressure on the main contact tips, when the spring starts to compress and the contact tips open.
2. This procedure is also called out in the Microeletica Scientifica Document, and is the same as HRMM Section 3-5-18.

- Finding 1.8

1. The Technicians continue on to “Setting Minimum Closing Voltage”, but they are not following HRMM Section 3-5-18. A combination of Contactor Spring *and* **Contact tip spring** adjustments are made to obtain the minimum Closing Voltage. HRMM Section 3-5-18 Calls for using only the Contactor Spring for this adjustment. The Microeletica document is the same as HRMM Section 3-5-18 on this portion as well.

**Note:** Four more post Overhaul Line Contactors have also been inspected, after the initial Audit.

██████████ was found to have ██████████ of Contact tip pressure. ██████████ was found to have ██████████ of Contact tip pressure, and ██████████ was found to have ██████████ of Contact tip pressure, S/N ██████████ has ██████████ of Contact tip pressure, 3 of the 4 are out of tolerance. QMA has possession of these Line Contactors that have been evaluated, and a 5<sup>th</sup> Contactor that was used for familiarization prior to the Audit

**OBSERVATIONS:**



1. While no cleaning technique is specified in HRMM Section 3-5-18, QMA strongly advises against cleaning parts of this nature in any type of Grit/Media blaster.

<b>REPORT DISTRIBUTION:</b>		
CMNT: [REDACTED]; [REDACTED]; [REDACTED]; <i>Shop Superintendent; Shop Asst. Superintendent</i>		
<b>QMA OFFICER:</b> [REDACTED]	<b>AUDITED SUPERINTENDENT:</b>	<b>QMA MANAGER:</b> [REDACTED]
<b>DATE: 10/24/2016</b>	<b>DATE:</b>	<b>DATE: 10/24/2016</b>

Please provide QMA with a written response regarding all discrepancies, prior to the response due date. Include discrepancy status, immediate corrective measure(s) and permanent corrective measure(s) taken to eliminate recurrence of all discrepancies.



## **9.9 APPENDIX I: "A-CMNT-20161108-01 – GEAR BOX OVERHAUL**



**WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY  
OFFICE OF ASSURANCE, QUALITY AND PERFORMANCE (AQAP)  
DEPARTMENT OF QUALITY AND INTERNAL COMPLIANCE OPERATIONS (QICO)  
QUALITY MISSION ASSURANCE (QMA)  
CMNT MRO PROCESS AUDIT REPORT**

<b>REPORT NUMBER:</b>	A-CMNT-20161108-01	<b>NOTIFICATION DATE:</b>	11/21/2016
<b>POLICY/PROCEDURE NUMBER:</b>	MSI 180231[2/3K] Rev 00; MSI [REDACTED], [5K]; MSI [REDACTED] [6K]	<b>AUDIT DATE:</b>	11/08/2016 – 11/18/2016
<b>POLICY/PROCEDURE DESCRIPTION:</b>	WESTINGHOUSE GEAR BOX (DRIVE UNIT) OVERHAUL	<b>RESPONSE DUE DATE:</b>	12/21/2016
<b>CMNT SUPERINTENDENT:</b>	[REDACTED]	<b>RAILCAR SERIES:</b>	All RAIL CAR's
<b>CMNT SUPERVISOR:</b>	[REDACTED]	<b>WMATA P/N:</b>	
<b>AUDITED DEPARTMENT/SHOP:</b>	Brentwood MRO – Machine Shop	<b>EQUIPMENT S/N:</b>	[REDACTED]
<b>PREPARED BY:</b>	[REDACTED]	<b>ASSET #</b>	[REDACTED]

**SCOPE:**

QMA shall audit CMNT policies, procedures and documentation requirements related to Major Repair and Overhaul of rail car systems, subsystems and components. QMA shall confirm compliance with approved WMATA policies and procedures and recommend any improvements needed.

**AUDIT CHECKLIST:** LEGEND – **Yes** = Conforming, observed with no discrepancies noted; **No** = Nonconforming, not in compliance with procedures; **N/O** = Not Observed; **N/A** = Not Applicable

No.	ITEM	COMPLIANCE				DISCREPANCY	CORRECTIVE ACTION
		Yes	No	N/O	N/A		
<b>1.0</b>	<b>PROCEDURE: MSI 180231[2/3K] Rev 00; MSI 160074 Rev. 01, [5K]; MSI 150047 Rev. 00 [6K] GEAR DRIVE UNITS OVERHAUL PROCEDURE.</b>						
1.1	<b>MSI Procedural Step 9.1.1 – 9.1.5:</b> Cleaning and Preparation of Gear Drive Unit Prior to Disassembly		X			Do not use "JETWASH" while steam cleaning	
1.2	<b>MSI Procedural Step 9.2.1 – 9.2.7:</b> Check Gear Drive Unit Backlash Prior to Disassembly		X			Inadequate Dial Indicator Base & Gauge. Torque 15 to 25 ft-lbs not used.	
1.3	<b>MSI Procedural Step 9.3.1 – 9.3.4:</b> Disassembly of the Gear Drive Unit Low Speed Assembly	√					
1.4	<b>MSI Procedural Step 9.4.1 – 9.4.8:</b> Disassembly of the Gear Drive Unit (High Speed Assembly)	√					
1.5	<b>MSI Procedural Step 9.5.1 – 9.5.15:</b> Disassembly of the Gear Drive Unit Intermediate Assembly		X			Hydraulic puller/kit's equipment do not meet requirements of CMNT SOP 3.05	
1.6	<b>MSI Procedural Step 9.6.1 – 9.6.2:</b> Clean and Inspect Gear Box Case and Reusable Parts Removed	√					

1.7	<b>MSI Procedural Step 9.7.1 – 9.7.4:</b> Inspect High Speed Inboard Cap Tapped Holes for Ground Brush Installation	√				Already modified, third tapped hole blocked off with plate	
1.8	<b>MSI Procedural Step 9.8.1 – 9.8.11:</b> Overhaul Gear Drive Unit Low Speed Assembly		X			Hydraulic Pressing Equipment (Roll-Bed), and 3-Jaw Puller do not meet requirements of CMNT SOP 3.05	
1.9	<b>MSI Procedural Step 9.9.1 – 9.9.10:</b> Overhaul Gear Drive Unit Intermediate Assembly	√					
1.10	<b>MSI Procedural Step 9.10.1 – 9.10.10:</b> Overhaul Gear Drive Unit High-Speed Assembly		X			Heating (Oven) Equipment do not meet requirements of CMNT SOP 3.05	
1.11	<b>MSI Procedural Step 9.11.1 – 9.11.28:</b> Assemble Gear Drive Unit Intermediate Assembly	√					
1.12	<b>MSI Procedural Step 9.12.1 – 9.12.18:</b> Assemble Gear Drive Unit High-Speed Assembly	√					
1.13	<b>MSI Procedural Step 9.13.1 – 9.13.16:</b> Assemble Gear Drive Unit Low-Speed Assembly	√					
1.14	<b>MSI Procedural Step 9.14.1 – 9.14.7:</b> Checking Backlash after Gear Drive Unit Low-Speed Assembly		X			Inadequate Dial Indicator Base & Gauge. See Finding 1	
1.15	<b>MSI Procedural Step 9.15:</b> Painting Gear Drive Unit			√			
1.16	<b>MSI Procedural Step 9.16:</b> Record Completed Gear Drive Unit Serial Number in MAXIMO						
1.18	<b>MSI Procedural Step 10.0</b> Test Spin Gear Drive units According to Steps 9.12.17 and 9.14.7		X			Test Run Equipment do not meet requirements of CMNT SOP 3.05	
1.19	<b>MSI Procedural Step 11.0:</b> DOCUMENTATION: Record Completed Gear Drive Units Serial Number in MAXIMO.						
1.15	<u>Comments:</u>						

No.	ITEM	COMPLIANCE				DISCREPANCY	CORRECTIVE ACTION
		Yes	No	N/O	N/A		
<b>2.0</b>	<b>TOOLS AND MATERIALS:</b> MSI Sections 6.0, 7.0; CMNT SOP 3.05						
2.1	Approved/Proper Tools in use:		X				
2.2	Tool(s), Shop Equipment, Special Tool(s) and Measuring Device(s) calibration / validation requirements met:		X				
2.3	Approved/Proper Materials in use:	√					
	<u>Comments:</u>						
<b>3.0</b>	<b>DOCUMENTATION:</b> CMNT SOP 1.04, 1.05, 1.06						
3.1	Preventive Maintenance W/O(s) are properly documented in Maximo:	√					

3.2	Corrective Maintenance W/O(s) are properly documented in Maximo:	√				
3.3	Deferred Maintenance W/O(s) are properly documented in Maximo:			√		
Comments:						
<b>4.0 EMPLOYEE TRAINING: CMNT SOP 2.04</b>						
4.1	Classroom training for CMNT personnel provided:	√				
4.2	On The Job Training (OJT) for CMNT personnel provided:	√				
4.3	Applicable training properly documented:	√				
Comments:						

AUDIT OBSERVATIONS						
ITEM	Yes	No	N/O	N/A	COMMENTS	
<b>GENERAL PROCEDURE:</b>						
Procedure on-hand / readily available:	√					
Procedure in use is the current revision:	√					
Other ( <i>explain</i> ):						
<b>CONFIGURATION CONTROL:</b>						
Component is current revision/configuration level:	√					
EMI(s):				√		
ETP(s):				√		
Other ( <i>explain</i> ):						
<b>INCOMING COMPONENT INSPECTION:</b>						
Failure Data Tag included/completed w/ component:	√					
Packaging included w/ component:	√					
<b>OUTGOING COMPONENT INSPECTION:</b>						
WMATA P/N Label affixed:				√		
Equipment / Asset # affixed:				√		
Service Date Label affixed:				√		
Packaging included w/ component:				√		
<b>GENERAL SAFETY:</b>						
PPE:	√					
Other ( <i>explain</i> ):						

## FINDINGS:

1. The following tools, measuring devices and/or shop equipment required for GEAR BOX OVERHAUL were inadequate and/or do not meet requirements per CMNT SOP 3.05:
  - a. Hydraulic Puller Equipment. – Not resident in MAXIMO and/or Missing appropriate asset label.
  - b. Hydraulic Pressing Equipment (Roll-Bed), – Not resident in MAXIMO, missing appropriate asset label, pressure gauge missing calibration label.
  - c. 3-Jaw Puller. – Not resident in MAXIMO and/or Missing appropriate asset label.
  - d. Test Run Equipment. – Not resident in MAXIMO and/or Missing appropriate asset label.
  - e. Heating (Oven) Equipment. – Not resident in MAXIMO and/or Missing appropriate asset label.
  - f. Dial Indicator. - Inadequate Base, Gauge not calibrated.

**CMNT RESPONSE:** We will comply with CMNT SOP 3.05 requirements.

2. Update MSI180231 Rev 00 and the Associated MSI's ( [REDACTED] ):
  - a. MSI:
    - Lacks approved form for documentation.
  - b. Section 9.7:
    - The phrase "High Speed" should be corrected as "low Speed".
  - c. Section 9.7.1:
    - The phrase "High Speed" should be corrected as "low Speed".
    - The reference given as "Figure 1, Item 16" should be corrected as "Figure 1, Item 53".
  - d. Section 9.7.2:
    - The reference given as "Figure 16" should be corrected as "Figure 17".
  - e. Section 9.7.3 and Section 9.7.4:
    - The phrase "High Speed" should be corrected as "low Speed".
  - f. Section 9.11.4:
    - The reference given as "step 8.11.1" should be corrected as "Step 9.11.1".
  - g. Section 9.12.8:
    - The reference given as "step 8.7" should be corrected as "Step 9.7".
    - The phrase "High Speed" should be corrected as "low Speed".
    - The reference give as "Figure 1, Item 14" should be corrected as "Figure 1, Item 53".
  - h. Section 9.12.11:
    - The reference given as "step 8.12.3" should be corrected as "Step 9.12.3".
  - i. Figure 17:
    - The Figure name "High Speed Inboard Cap" should be corrected as "Low Speed Inboard Cap"

**CMNT RESPONSE:** We will request for engineering assistance to update the MSI.

## OBSERVATIONS:

- None

<b>REPORT DISTRIBUTION:</b>		
CMNT: [REDACTED]		
<b>QMA OFFICER:</b> [REDACTED]	<b>AUDITED SUPERINTENDENT:</b> [REDACTED]	<b>QMA MANAGER:</b>
<b>DATE:</b>	<b>DATE:</b>	<b>DATE:</b>

**Please provide QMA with a written response regarding all discrepancies, prior to the response due date. Include discrepancy status, immediate corrective measure(s) and permanent corrective measure(s) taken to eliminate recurrence of all discrepancies.**

**9.10 APPENDIX J: "QAI-20170214-03 – 2K/3K  
FRONT TRUCK 9A4-523"**



# Rolling Stock Assurance Program

## Quality Assurance Inspection (QAI) Report

2017

### Report Details

Report Number:	QAI-20170214-03	QICO Representative:	[REDACTED]
		Supervisor (For the Shop receiving the inspection):	[REDACTED]
Shop Location:	Greenbelt	Asset Type	Rail: Revenue Vehicle (RRV)
Inspection Type:	Part Inspection	Car/Equipment Number:	2-3K Front Truck 9A4-523
		Asset Number:	
		Document Number (ETP/EMI/MSI):	
Inspection Date:	2/14/2017	Follow-up Inspection Date:	Click here to enter a date.
CMNT:	CMNT - Car Maintenance	Section:	Truck/Car Body

*\*Issue Category and Issue Sub-Category codes are used by QICO to classify findings for data reporting. Please contact a QICO Representative if you wish to request a copy of the codes.*

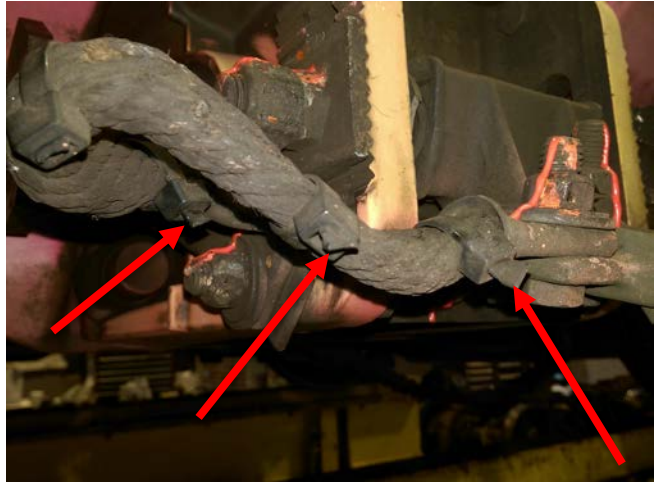
No.	Issue Category Code*	Issue Sub-Category Code*	Description of Discrepancy	Accepted By & Date (Sign/Initial/Stamp)	
				CMNT Rep.	QICO Insp.
1	4	22.14	Damaged P-clamp insulation or wheel #1 hand brake cable, next to HP4 #3.	[REDACTED]	[REDACTED] 2-15-17
2	5	22.2	Tie wraps not trimmed on right side collector shoe assembly shunt strap.	[REDACTED]	[REDACTED] 2-15-17
3	5	22.2	Tie wraps not trimmed on left side collector shoe assembly shunt strap.	[REDACTED]	[REDACTED] 2-15-17
4	4	22.14	Damaged P-clamp insulation or wheel #1 hand brake cable, next to HP4 #3.	[REDACTED]	[REDACTED] 2-15-17
5	7	22.2	Missing torque stripes on both sides leveling valve.	[REDACTED]	[REDACTED] 2-15-17
6	4	22.1	Damaged wheel #1 hand brake cable, above TM #2.	[REDACTED]	[REDACTED] 2-15-17



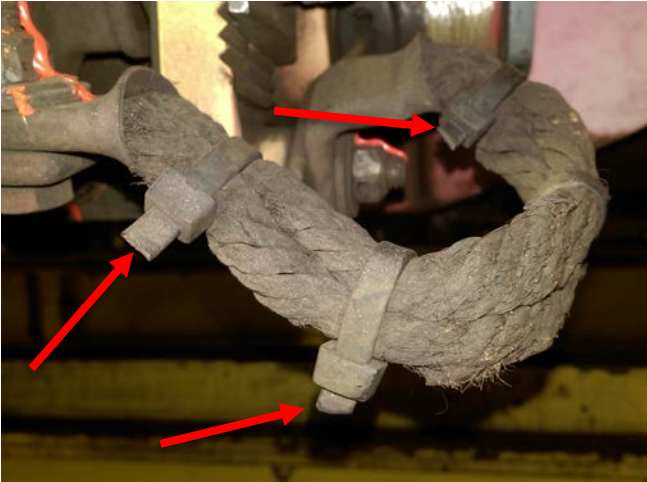
1



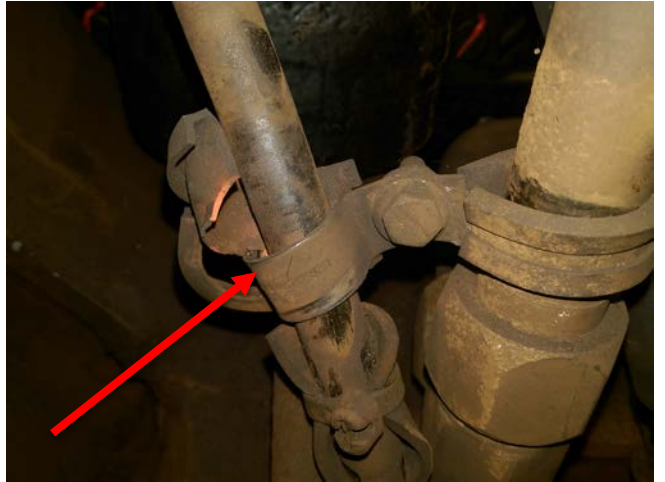
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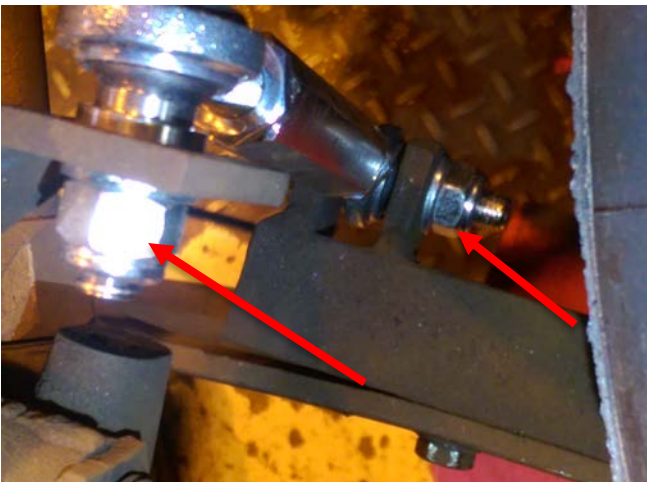
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4



5



6



## **9.11 APPENDIX K: "A-CMNT-20170206-01" – HIGH SPEED CIRCUIT BREAKER ASSET #344690**



## ROLLING STOCK ASSURANCE PROGRAM

REVIEWER	██████████	CONTROL NO.	A-CMNT-20170206-01
RESPONSIBLE PARTY	CMNT	SUBJECT	Alstom High Speed Circuit Breaker Asset # ██████████
REPORT DATE	03/02/2017	LOCATION	Greenbelt

ASSESSMENT	
Category	Description
Purpose	The purpose of this assessment is to investigate the high failure rate of a specific Alstom High Speed Circuit Breaker (HSCB), Asset # ██████████, and see if findings have implications for other HSCB's. This Asset has failed 4 times on 4 different rail cars and is documented on report # A-CMNT-20170104-01
Scope	This report will focus on findings discovered after the initial CENV testing and CMNT repair/overhaul. Initial CENV testing found the HSCB "trip current" value to be ██████████, ██████████ +/- ██████████ is required. CMNT replaced the "trip current" mechanism, high voltage contacts and Arc horns as well as the low voltage electromagnet.

EXECUTIVE SUMMARY	
Summary of Results	
<ul style="list-style-type: none"> <li>QICO tested the "Contact Force" of HSCB Asset# ██████████ per Alstom instructions (See page 4) after CMNT repair, and prior to CENV high current testing. Contact Force should be ██████████. force +/- ██████████. Asset # ██████████ was found to be at the extreme high end of the tolerance at ██████████ to ██████████. force.</li> <li>QICO also found an internal adjustment of the HSCB ██████████ (per 6K and 2K3K HRMM) to be out of tolerance at ██████████</li> <li>CENV retested HSCB Asset # ██████████ after CMNT initial repair and QICO evaluation. CENV did not release Asset # ██████████ for service due to an abnormal "Green Arc" that occurred during the high current trip test. A "Green color" is an indication of <i>burning copper</i>. Per CENV:</li> </ul> <p><b>During the test we observed, an arcing that seems a bit abnormal. As a result we are planning to take a few action to narrow down the probable cause of the arcing. The first action is to replace the pushing spring, and re-test the HSCB for any change. The second action is to adjust the gap tolerance in the contactor armature and re-test the HSCB and observe any change.</b></p> <ul style="list-style-type: none"> <li>Further repairs were made to address QICO and CENV observations (replacement of spring and internal adjustment correction). The high current testing resumed, and CENV verified the disappearance of the "Green Arc". High current "trip value" was set to ██████████. The internal adjustment value was ██████████</li> </ul>	



## ROLLING STOCK ASSURANCE PROGRAM

- QICO retested the "Contact Force" of HSCB Asset # 344690 per Alstom instructions after final repair and high current testing. Contact Force was found to have improved to 38.5 to 39 lbs. of force, moving closer to the 36 lbs. force called for. Asset # 344690 has been released for service.

### RESULTS

Category	Recommended Action	Action Owner
Procedure	- MS [REDACTED] is being developed by CENV for overhaul of Alstom High Speed Circuit Breakers, and includes measuring contact force and setting internal adjustments.	CENV
Procedure	- However, since these points already exist in OEM documentation and implications have been observed on a "repeater" HSCB, QICO recommends incorporating these checks now, for all HSCB's.	CMNT
Shop Practice	- Per informal interview with MRO personnel, the "spring" that was replaced comes from floor stock, items salvaged from other HSCB (no WMATA part number) and as such the condition of these springs is unknown. The IPC calls this a "rack spring", Alstom part # [REDACTED]. QICO recommends installing new OEM parts. (See photo 1)	CMNT
Shop Practice	- Per informal interview with MRO personnel, the High Current Trip Mechanism that was replaced also comes from floor stock, salvaged from other units, and has an internal spring (no WMATA part number). The condition of the Trip Mechanism springs is also unknown. The IPC Alstom part number is [REDACTED] QICO recommends installing new OEM parts. (See photo 2).	CMNT

PREPARED BY:

QICO OFFICER

[REDACTED]

APPROVED BY:

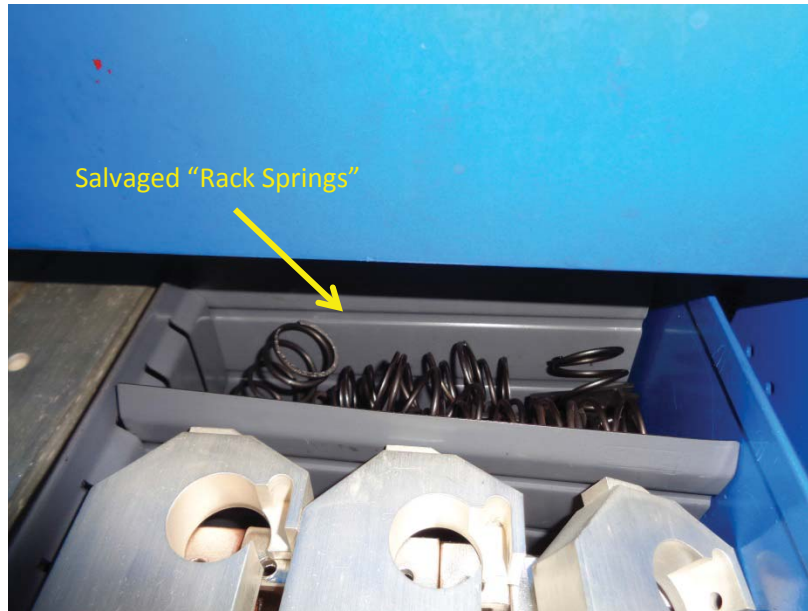
QICO MANAGER

[REDACTED]

Photograph 1



## ROLLING STOCK ASSURANCE PROGRAM



Photograph 2

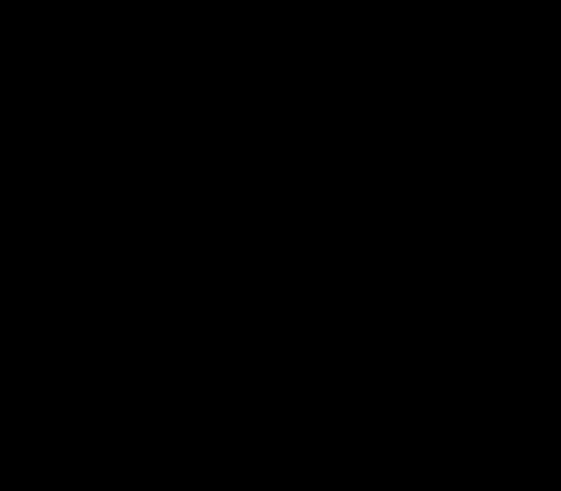
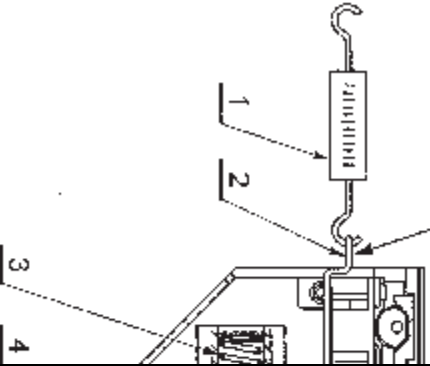




Measurement of contact force



Adaptor tool



- 1. Electrically close the unit.
  - 2. Measure the force required to unstick the power contacts.
  - 3. The value of the force must be  $1.6 \pm 2 \text{ daN}$ .
  - 4. If this is not the case, completely dismantle the unit.
- Check the condition of the various springs used to produce the contact force, i.e.
- The tapered washers inside the electromagnet,
  - The electromagnet return spring,
  - The rack return spring.