The Washington Metrorail Safety Commission

Safety Audit

of the Washington Metropolitan Area Transit Authority

Audit of Elevators and Escalators

DRAFT

Final Report:
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Prepared under the authority of the Washington Metrorail Safety Commission

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Executive Summary

The Washington Metrorail Safety Commission (WMSC) performed this audit of Washington Metropolitan Area Transit Authority (WMATA) Metrorail's Elevators and Escalators programs through in-depth interviews, site visits, and document and data reviews conducted in February and March of 2025, with additional follow-up and document reviews through April 2025.

Metrorail operates nearly 1,000 elevators and escalators, more than any other transit agency in North America. Constant preventative and corrective maintenance operations are required to keep these units in a state of good repair which keeps the Metrorail system safe and accessible for riders, Metrorail personnel, and first responders. Metrorail currently has several projects related to elevator and escalator replacement or rehabilitation underway.

Metrorail operates nearly 1,000 elevators and escalators, more than any other transit agency in North America.

The scope of this audit included Metrorail's elevator and escalator programs including elevator and escalator inspection, maintenance, operational practices and procedures and associated training. These were assessed in relation to rules, procedures, regulations and best practices, and the related aspects of Metrorail's safety plan, governing policy and procedure development, implementation and compliance, management structure, planning and governance, and associated training.

This audit also focused on Metrorail corrective action plans including Metrorail's Quality Assurance, Internal Compliance & Oversight (Quality) internal audits and corrective action plans, WMSC corrective action plans, and WMATA recommended corrective actions that are overseen by the WMSC along with review of any related safety event investigations involving elevators and escalators.

The WMSC appreciates the cooperation of Metrorail personnel throughout the interviews and observations conducted for this audit, including promptly addressing hazards and safety concerns identified by the WMSC during onsite activities that required immediate mitigations.

This audit identified critical areas where Metrorail does not follow its procedures and requirements. There are 5 findings that Metrorail is required to address through the corrective

Full details on each finding are stated in the Findings and Minimum Corrective Actions section of this report.

action process. There is additionally 2 recommendations for Metrorail's consideration. The findings and recommendations identified are:

- **Finding #1: Metrorail elevators and escalators mechanics are not reviewing job hazard analyses as required by Metrorail procedures.**
- **Finding #2: Metrorail does not proactively monitor calibration expiration for elevators and escalators equipment.**
- **Finding #3: Metrorail personnel are entering elevator pits which have active electrical circuits with standing water present.**
- **Finding #4: Metrorail elevator and escalator personnel are not trained on fall protection requirements listed within its job hazard analyses.**
- **Finding #5: Metrorail is not maintaining or displaying elevator or escalator certificates on-site as required by local jurisdictions.**

Recommendation 1: Metrorail elevator and escalator job descriptions are incomplete and a subset do not reflect current job responsibilities.

Recommendation 2: Metrorail's Office of Elevators and Escalators Services uses multiple systems to capture data which could impair data management and result in discrepancies.

Full details on each finding are stated in the Findings and Minimum Corrective Actions section of this report. Metrorail is required to propose corrective action plans to address each finding no later than 30 days after the issuance of this report.

Background and **Scope**

Background and Scope

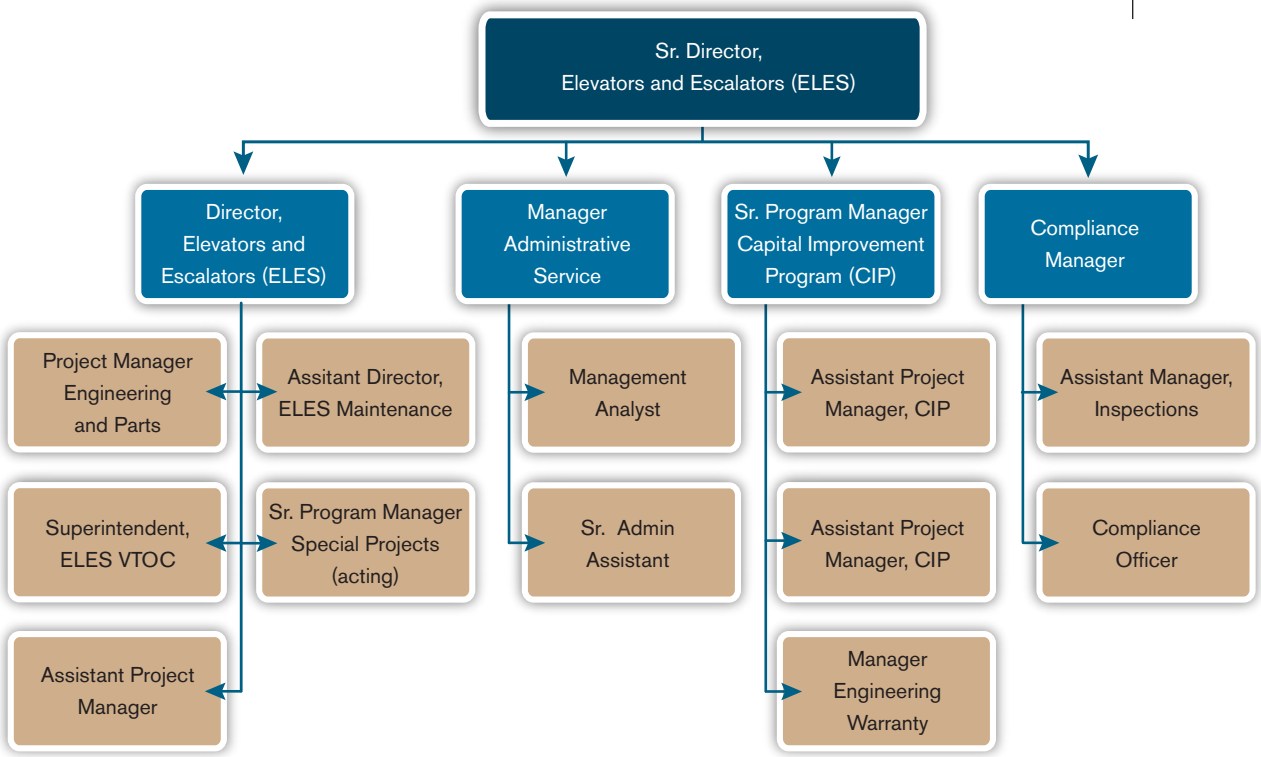
The Office of Elevators and Escalators Services Inspection team are responsible for inspections to maintain compliance with local, state, and federal safety regulations.

The scope of this audit includes Metrorail's elevator and escalator programs. This includes elevator and escalator inspection, maintenance, operational practices and procedures and associated training. These are assessed in relation to rules, procedures, regulations and best practices, and the related aspects of Metrorail's safety plans governing policy and procedure development, implementation and compliance, management structure, planning and governance, and associated training.

Metrorail's Office of Elevator and Escalator Services (ELES) includes maintenance teams reporting to the assistant general superintendent, an engineering group, a special projects group, a capital improvement program (CIP) group and a compliance group. The ELES department is responsible for service, maintenance, inspection and repair of all elevators and escalators across all Metrorail facilities. Maintenance work is carried out by master technicians, journeymen, apprentices and helpers. Journeyman is the primary position for mechanics, with a limited number qualifying for and passing master technician tests. Helpers are entry-level personnel who do not have the level of training of a journeyman. Apprentices are part of a four-year Metrorail training program to become journeymen by obtaining their license. Metrorail generally hires contractors to conduct full rehabilitation and replacement work. One such ongoing project at Franconia-Springfield Station was reviewed as part of the onsite observations for this audit.

Metrorail's Technical Training and Development Department is responsible for delivering most training to elevator and escalator personnel. Technical Training and Development has several instructors specific to elevator and escalator training courses. These personnel were included in the scope of this audit and included in interviews.

Current Organizational Structure



The Office of Elevators and Escalators Services Inspection team are responsible for inspections to maintain compliance with local, state, and federal safety regulations. The Elevators and Escalators maintenance group assigns maintenance activities by functional area, location, and work shifts. WMATA technicians are trained in elevator and escalator maintenance practices and report to maintenance supervisors, who supervise/schedule personnel and inspect maintenance and repair work.

The Vertical Transportation Center (VTOC) provides monitoring of elevator and escalator assets, responds to entrapments and other emergencies and manages Maximo work orders. From VTOC, dispatchers monitor elevator and escalator operation from a central location and notify supervisors, inspectors, contract personnel and management staff of any accidents/incidents or service issues. The dispatch supervisors are responsible for overall daily operations and performance of the service dispatchers in their assigned tasks. Supervisors provide support, data, and analysis directly reporting to assistant superintendents.

Internal Metrorail Reviews and Associated iCAPAs

As part of this audit, the WMSC reviewed the latest Quality Assurance, Internal Compliance & Oversight (QICO) Internal Safety Review for Elevators and Escalators Services, dated November 17, 2023. The WMSC reviewed each finding or issue and the corresponding actions being taken to address them. These are outlined below:

Metrorail's finding states that per codes Metrorail should be completing its inspections in a timely manner and then displaying the certificates accordingly.

➤ **Internal Metrorail Finding FS-ELES-23-01:** *Timely completion of annual inspection safety work orders and availability of asset certificates increases safety and transparency for the riding public.*

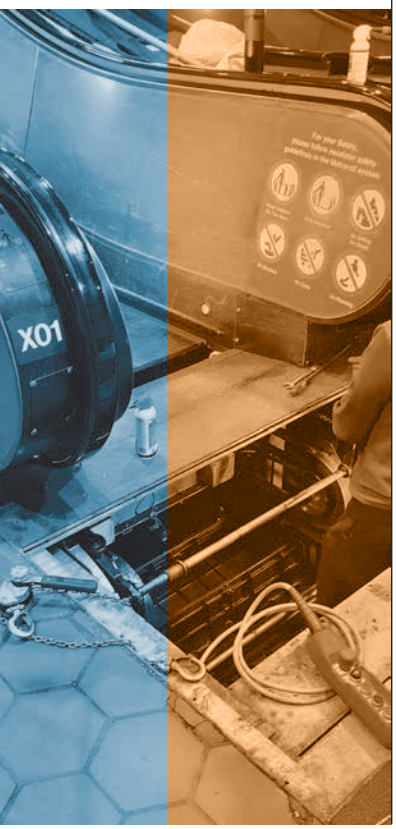
Internal Metrorail iCAPA QICO-ELES-23-01: Implement a process to improve availability of Elevators and Escalators inspection certificates on departmental interactive map and timely completion of annual inspection work orders. (Overall Risk – 2D)

Metrorail's finding states that per codes Metrorail should be completing its inspections in a timely manner and then displaying the certificates accordingly. Any related follow-up work orders should also be completed in a timely manner. Metrorail made a map system to store the certificates on the Office of Elevators and Escalators Services intranet page to address this and provide easier access to each certificate.

This finding was a repeat finding from the 2018 Elevator Internal QICO Review which resulted in iCAPA-QICO-ELES-18-01 that was subsequently closed in August 2019. The iCAPA required a method to make annual inspection certificates for all assets available at their designated location.

WMSC Review

This is particularly relevant to Finding 5 of this audit: Annual inspection certificates for all assets are not currently available or accessible at their designated locations.



➤ **Internal Metrorail Finding FS-ELES-23-02:** *Following supervisory oversight requirements improves compliance to job site regulations while promoting a safe work environment.*

Internal Metrorail iCAPA QICO-ELES-23-02: Reinforce compliance with established supervisor duties and responsibilities. (Overall Risk – 2D)

"During corrective and preventive maintenance activities Elevators and Escalators Services technicians were observed using tools and equipment which require calibration. Typical tools that require calibration utilized by technicians include torque wrenches, dynamometers, and step to skirt indexes. 212-SOP-01 Section 5.3 states "All ELES TMDE [test measurement and diagnostic equipment] assets must be calibrated, and calibration must be completed in a timely fashion according to the calibration Work Order schedule in Maximo."

Quality identified observed technicians using a dynamometer at Dulles Station (N10) on April 4, 2023 which did not have a card or sticker verifying its calibration; Quality also observed a fire extinguisher which held an inspection card that had not been initialed the previous month indicating the fire extinguisher missed the required monthly inspection. "Rail stations and facilities located throughout the transit system are equipped with fire suppression equipment. Fire extinguishers are an essential part of protecting assets and lives from the danger of fire. OSHA 1910.157(e)(2) states portable fire extinguishers must be visually inspected monthly. The fire extinguisher inspection activity is included in the ELES MCP Section 20 and associated preventive maintenance (PM-B) checklist."

WMSC Review

The WMSC did not find equipment outside of its calibration period during our observations for this audit; however, as noted in this audit's Finding 2, Metrorail's calibration procedures do not proactively monitor and remove outdated equipment.

The WMSC also identified fire extinguishers that had not been inspected and signed off; however, the WMSC is not issuing a new finding as there is a current corrective action plan, C-0295B, that addresses fire life safety assets within Metrorail stations. C-0295B is anticipated to conclude by March of 2027.

Following established procedures for performing comb plate impact testing ensures accurate and consistent results.

- **Internal Metrorail Finding FS-ELES-23-05:** *Following established procedures for performing comb plate impact testing ensures accurate and consistent results.*

  Internal Metrorail iCAPA QICO-ELES-23-03: Develop and implement a process to verify comb plate impact testing is compliant with the Maintenance Control Plan (MCP). (Overall Risk – 4D)

  Per WMATA Escalator Maintenance Control Program's (MCP), testing is to be performed on a monthly basis, during the regular preventive maintenance inspection. Testing is also required during annual inspections by jurisdictional authorities. Quality assessed three annual elevator inspections and one preventative maintenance inspection. During all four assessments, Quality observed technicians performing the "Horizontal Side and Center Actuating Force Test" and "Vertical Actuating Force Test" incorrectly by attaching a come-along hook directly to the comb segments of the comb plate, over a piece of scrap metal, or directly to the comb segments.

WMSC Review

The checklists and forms for the observations associated with this internal safety review's field assessments were reviewed and found to have an acceptable level of completeness and detail.

Assessment of Previous Corrective Action Plans

- **C-0199 (Open)**

  Metrorail has not developed and implemented a comprehensive water intrusion and remediation program covering stations, elevators and escalators, which contributes to damage and deterioration of structures and other assets, to electrical hazards and to other safety risks. (**2022 Station Maintenance, Elevators and Escalators Audit**, finding 1.)

  To address this finding, Metrorail developed a process for evaluating water intrusion in stations, elevators, and escalators. That includes the water source, ongoing water management considerations, and thresholds for wet conditions to determine the correct

Reports on the issues discovered along with the mitigations for those locations are being regularly provided to the WMSC.

maintenance or capital options for remediation. Where possible, interim mitigations are being completed and for areas where capital improvements are required, Metrorail is contracting via the 'Water Intrusion Program/Removal Slab Replacement Project.'

This CAP remains ongoing with work being completed to address the issue. Reports on the issues discovered along with the mitigations for those locations are being regularly provided to the WMSC. The anticipated closure for C-0199 is April 25, 2028.

C-0200 (Closed)

Metrorail does not consistently communicate and follow its procedures governing change management and requiring interdepartmental coordination. (**2022 Station Maintenance, Elevators and Escalators Audit**, finding 2.)

To address this finding, Metrorail re-distributed its Policy/Instruction 4.10/4, Configuration Control Management and had personnel acknowledge this review. This was also incorporated into training materials for the ELES Journeyman Refresher Training course. WMSC approved C-0200 for closure on May 4, 2023.

C-0201 (Closed)

Metrorail is not ensuring that ELES personnel work only on the specific types of equipment that they are trained to inspect, maintain, and repair. (**2022 Station Maintenance, Elevators and Escalators Audit**, finding 3.)

To address this finding, Metrorail created a training matrix identifying all required training for elevator/escalator journeyman and apprentices. As new equipment is added to the system, the training matrix is updated accordingly. This equipment familiarization training is being provided to all applicable personnel.

The WMSC approved C-0201 for closure on April 18, 2024. Training materials were reviewed during this audit including the specific equipment familiarization training. Personnel interviewed for this audit stated that equipment manufacturers are often brought in to conduct the training as they are the most familiar with new equipment.

C-0202 (Closed)

Metrorail has not reviewed its ELES standard operating procedures on a regular basis as required by WMATA policy, and has conflicting procedures for elevator and escalator employees. (**2022 Station Maintenance, Elevators and Escalators Audit**, finding 4.)

To address this finding, Metrorail reviewed elevator and escalator procedures to determine which required updating. Updates were made to 9 standard operating procedures and a control log was created to note each document with the required review cycle for future revisions. The WMSC approved C-0202 for closure on October 3, 2023. This current audit did not identify any procedures that were past-due for review.

C-0203 (Closed)

Metrorail does not clearly define what helpers (entry-level ELES personnel) are authorized to do or prohibited from doing, including whether helpers are permitted to work alone and any restrictions required to ensure that work is done safely. (**2022 Station Maintenance, Elevators and Escalators Audit**, finding 5.)

To address this finding, the Office of Elevators and Escalators Services along with the Office of Safety created and submitted a job hazard analysis on its Staff Work Alone Policy and made necessary revisions to the SOP to document the situations or work activities in which staff are not permitted to work alone. The WMSC approved C-0203 for closure on June 16, 2023.

During the present audit, Metrorail personnel confirmed that they are trained on the work alone policy.

C-0204 (Closed)

Metrorail does not ensure that ELES personnel sign in on log books as required by WMATA SOP to ensure their safety. (**2022 Station Maintenance, Elevators and Escalators Audit**, finding 6.)

To address this finding, Metrorail created a stand down training presentation on the importance of—and process for—signing in and out of log books. This training was conducted, and procedures were further updated to include the development and completion of quality checks to address areas where deficiencies were seen. The WMSC approved C-0204 for closure on June 26, 2024. During this audit, the WMSC reviewed log books as part of the audit's onsite observations and did not identify any issues.

C-0205 (Closed)

Metrorail has not maintained a formalized, documented training process for ELES mentors (on-the-job training instructors) who **play a key role in the training of entry-level ELES personnel. (2022 Station Maintenance, Elevators and Escalators Audit**, finding 7.)

To address this finding, Metrorail submitted a maintenance teams mentor training curriculum and then provided this mentor training to all active elevator/escalator journeymen. The WMSC approved C-0205 for closure on May 19, 2023. This audit did not have any findings on elevator or escalator training programs.

C-0206 (Closed)

Metrorail began new inspections referred to as "visual" or "routine" ELES inspections prior to finalizing, communicating and formally implementing an effective procedure. (**2022 Station Maintenance, Elevators and Escalators Audit**, finding 8.)

During this audit, the WMSC reviewed log books as part of the audit's onsite observations and did not identify any issues.

To address this finding, Metrorail revised its elevator/escalator procedures to better align with the American Society of Mechanical Engineers A17.1 Safety Code for Elevators and Escalators and better define each type of inspection that the Office of Elevators and Escalators Services conducts. Re-training was conducted after the procedure revisions for applicable ELES personnel. The WMSC approved C-0206 for closure on May 4, 2023. This audit did not observe any confusion regarding the types of inspections being conducted.

C-0207 (Closed)

ELES Supervisors are not completing all aspects of required QA checks. (**2022 Station Maintenance, Elevators and Escalators Audit**, finding 9.)

To address this finding, Metrorail updated 212-SOP-39, Quality Control Preventative Maintenance and Station Audit, to also include the requirements of monthly quality assurance checks on an ongoing basis in the future. All applicable personnel were trained on the revised procedure for quality assurance checks. The WMSC approved C-0207 for closure on May 2, 2024.

C-0208 (Closed)

Metrorail has an opportunity to improve safety by ensuring an adequate number of trained personnel are available to perform tasks that are assigned to Plant Maintenance. (**2022 Station Maintenance, Elevators and Escalators Audit**, recommendation 1.)

To address this recommendation, Metrorail conducted a staffing assessment of Plant Maintenance, which looked at the efficiency of current resources, any necessary adjustments to the organizational structure, and the areas where the most aggressive recruitment and retention approaches are required. Vacancy review meetings were instituted to bring attention to areas of need. The WMSC approved C-0208 for closure on December 27, 2022. This audit focused only on Office of Elevators and Escalators Services personnel which was not included as part of the original finding but found no issues in terms of the number of trained personnel.

C-0209 (Closed)

Metrorail has effective training instructors for ELES personnel, however their experience does not match the written requirements for the positions. (**2022 Station Maintenance, Elevators and Escalators Audit**, recommendation 2.)

To address this recommendation, Metrorail revised job descriptions for elevator/escalator training personnel to reflect the actual requirements of the role including the knowledge, skills and abilities required. The new job descriptions expanded on the essential functions and responsibilities of the position.

The WMSC approved C-0209 for closure on March 9, 2023. Inconsistencies in job descriptions identified by this audit are noted in Recommendation 1.

Metrorail revised its elevator/escalator procedures to better align with the American Society of Mechanical Engineers A17.1 Safety Code for Elevators and Escalators

C-0210 (Closed)

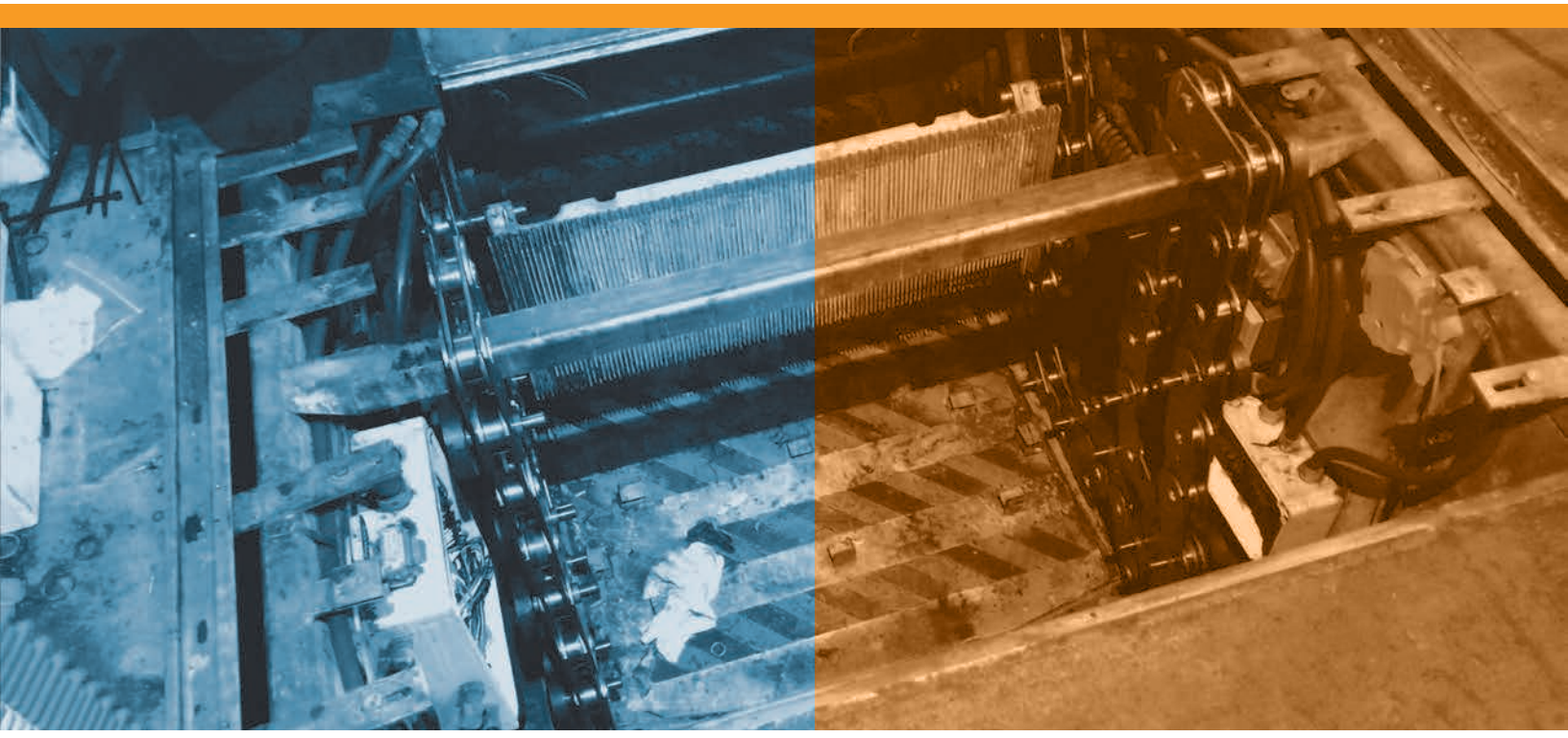
Metrorail has an opportunity to improve data collection and analysis necessary under its Public Transportation Agency Safety Plan (PTASP) by providing more PLNT and ELES personnel with improved, formal training on the use of Metrorail's maintenance management information system (Maximo). (**2022 Station Maintenance, Elevators and Escalators Audit**, recommendation 3.)

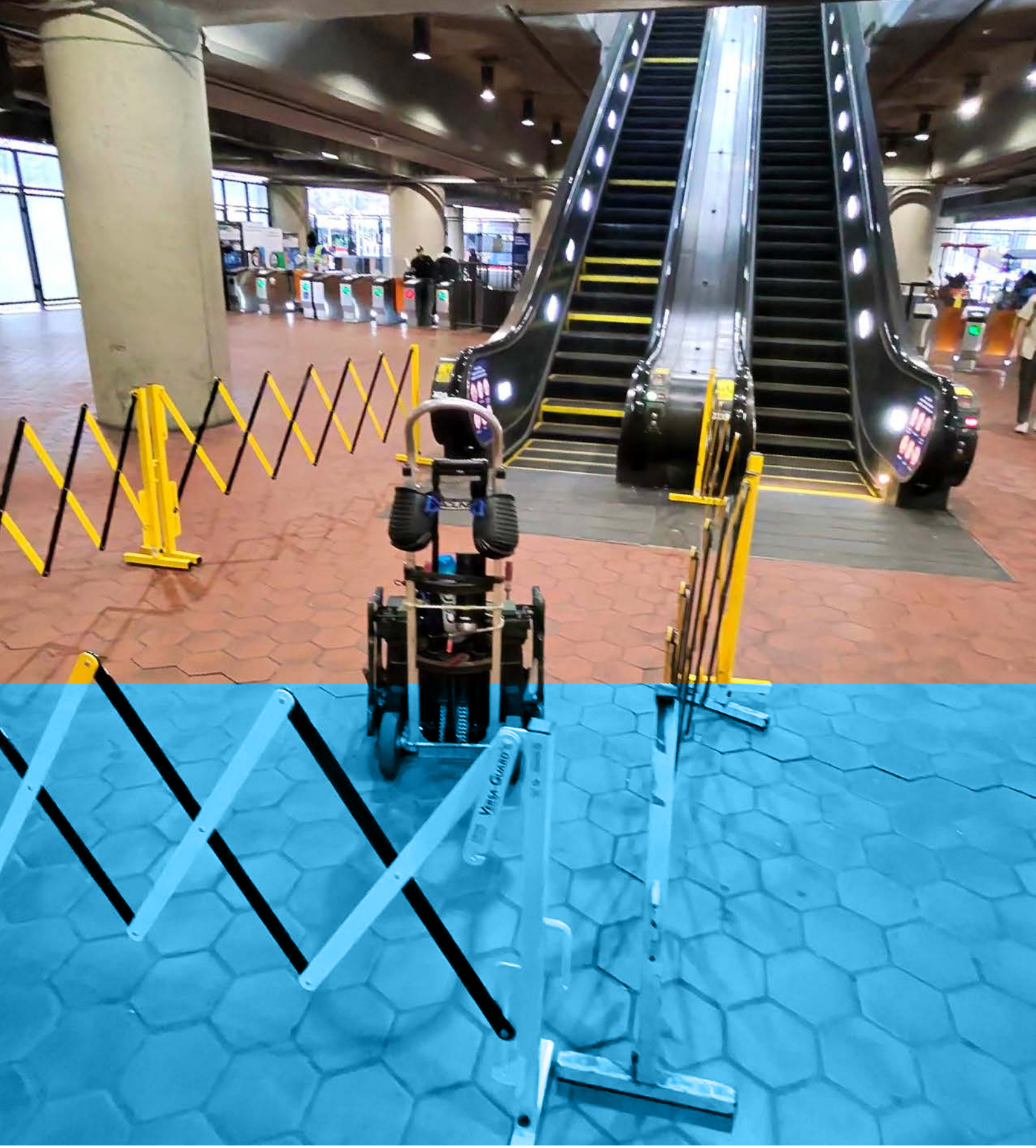
To address this recommendation, Metrorail developed and provided specific Maximo training for relevant frontline workers, supervisors, and management which included compliance managers, general superintendents, assistant superintendents, engineers, technicians, and others. This included training for supervisors to review and perform quality checks of data input into Maximo. The WMSC approved C-0210 for closure on April 18, 2024. Metrorail has further opportunity to improve how elevator and escalator data is input to Maximo, see this audit's Recommendation 2.

C-0211 (Closed)

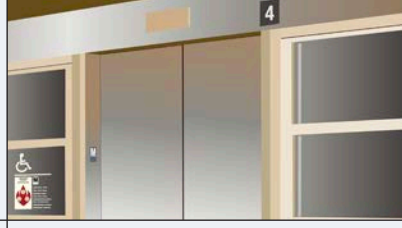
Metrorail can improve the safety of escalators by formalizing procedures to ensure that escalators are regularly operated opposite their normal direction when safe to do so. (**2022 Station Maintenance, Elevators and Escalators Audit**, recommendation 4.)

To address this recommendation, Metrorail conducted an assessment and determined that all equipment was able to operate in the opposite direction than it would ordinarily operate, and that such reverse operations were safe. The WMSC approved C-0211 for closure on March 9, 2023.





What the **WMSC** Found



What the **WMSC** Found

Positive Practices

This audit also identified several positive practices, or success stories, some of which were the direct result of the WMSC's oversight. However, all of the positives detailed below are the result of Metrorail's own work. The WMSC encourages Metrorail to continue these positive practices.

1. Obtaining Personal Protective Equipment (PPE). Each Office of Elevators and Escalators Services journeymen or mechanic confirmed that new or replacement PPE is quickly provided by supervisors upon request without issue. Personnel who the WMSC observed in the field also had the required PPE.
2. Hazard mitigations by Safety Risk Coordinators. The Elevator/Escalator Safety Risk Coordinator was able to show ongoing receipt and review of hazards and the tracking of mitigations related to those hazards.
3. Job Hazard Analyses Creation. Metrorail has a formal job hazard analysis program and specifically has an analysis for each type of elevator/escalator work activity. However, personnel must use the documentation provided and compliance should be monitored to mitigate the hazards identified (see Finding 1 for additional information).
4. Data Trend Analysis. The Office of Elevators and Escalators Services uses data it collects on downtime, time to repair, meantime between failure, and other attributes for each escalator and elevator to analyze issues and determine whether any rehabilitation or replacement projects are needed.

The Elevator/ Escalator Safety Risk Coordinator was able to show ongoing receipt and review of hazards and the tracking of mitigations related to those hazards.

Findings and **Minimum** Corrective Actions

Findings and **Minimum** Corrective Actions

▶ Finding #1: Metrorail elevators and escalators mechanics are not reviewing job hazard analyses as required by Metrorail procedures.

A job hazard analysis is designed to comprehensively identify and mitigate all hazards associated with the work that will be conducted at a location. It helps to ensure personnel are aware of job and site-specific hazards as well as having the required tools and personal protective equipment before commencing work. The job hazard analysis is therefore an effective way of preventing injury or death.

For example, WMSC Investigation Report **W-0191** detailed a serious injury (partial finger amputation) event that occurred at Largo Town Center Station on July 28, 2022. An Office of Elevator and Escalator technician's right middle finger was amputated while reinstalling an escalator metal landing plate. During an investigative interview, the injured employee indicated they had not been issued a tool that would likely have prevented their injury. The report stated:

> "The probable cause of the Serious Injury event was a human factors error (rushing). A contributing factor to the injury was the lack of a proper tool to lower the landing plate, which would have prevented the employee's hands from being within a pinch point. The ELES Technician reported a time constraint pressure to complete the assignment so they could respond to their second assignment before their shift ended. The ELES technician also reported years ago an L-shaped tool was issued that assisted with removing and re-installing landing plates to avoid injuries like the one sustained; however, they were not issued the tool."

A job hazard analysis is designed to comprehensively identify and mitigate all hazards associated with the work that will be conducted at a location.

Requirement:

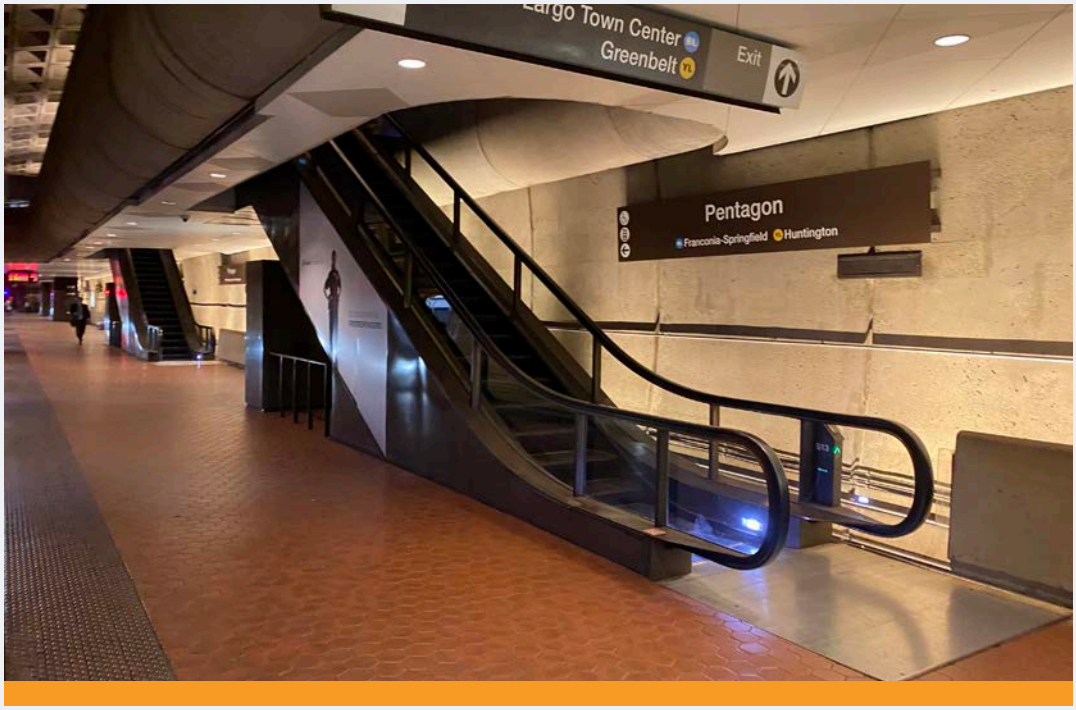
Each Escalator/Elevator Preventative Maintenance Checklist, such as Metrorail Form 50.300, Escalator PM Check Sheet KONE Units, dated February 2020, starts with the first item to be completed at all preventative maintenance inspections as "Perform/Review Job Hazard Analysis (JHA)."

Nonconformance:

The **WMSC's 2022 Station Maintenance, Elevators and Escalators Audit** included finding 5: that "Metrorail does not clearly define what helpers (entry-level ELES personnel) are authorized to do or prohibited from doing, including whether helpers are permitted to work alone and any restrictions required to ensure that work is done safely."

Metrorail took positive steps to address that finding via corrective action plan C-0203 and created a Job Hazard Analysis Program that requires a review of job hazards at the outset of each elevator/escalator work activity. Metrorail created job hazard analyses for various types of elevator and escalator work which include preventative maintenance and repair as part of WMSC CAP C-0203. This CAP resulted from a finding in our **2022 Audit of Station Maintenance, Elevators and Escalators** which found that Metrorail does not clearly define what helpers (entry-level ELES personnel) are authorized to do or prohibited from

The job hazard analysis covers items such as communication of the tasks to be completed, securing the work area, planning the work, and completing the work.



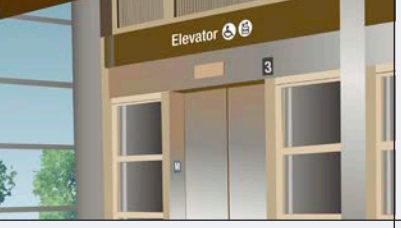
doing, including whether helpers are permitted to work alone and any restrictions required to ensure that work is done safely. Metrorail expanded upon this beyond just the work alone issues and published its Standard Number 4210-2-01/00, "Job Hazard Analysis Program", dated January 10, 2023.

The job hazard analysis covers items such as communication of the tasks to be completed, securing the work area, planning the work, and completing the work. Job hazard analysis controls designed to mitigate hazards include review of procedures, ensuring proper personal protective equipment, checking for first aid kits, fire extinguishers, and other specific controls.

The WMSC observed four different work activities which included elevator preventative maintenance at North Bethesda Station, escalator heavy repair at Georgia Avenue – Petworth Station, escalator preventative maintenance at Fort Totten Station, and escalator preventative maintenance at Metro Center Station and not observe job hazard analyses being conducted at any of the four observations. During one of the observations, personnel stated that they conducted the job hazard analysis via telephone, but this is not in line with the job hazard analysis procedures.

During interviews for this audit, it was confirmed that Metrorail personnel in the field should be conducting job hazard analyses before beginning their daily assignment, at the location where the work is to be performed, to review general and specific hazards based on the specific site and working conditions.

WMSC Investigation Report **W-0156**, describes a serious injury event that occurred on December 4, 2021, at Navy Yard-Ballpark Station, involved contractors injured while performing welding activities during rehabilitation work on an escalator. The work crew was using a crafted work sled to hoist and lower welding equipment throughout the truss to



This event further emphasizes the importance of reviewing the work to be conducted via the job hazard analyses prior to commencement.

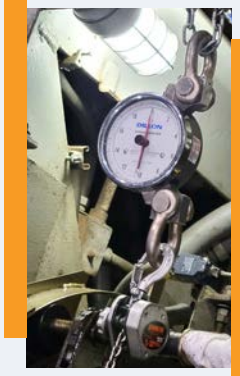
remove equipment after completing welding tasks. During the hoisting operation to move the work sled to the top of the escalator truss, the sling connection unintentionally disconnected from the winch, causing it to descend uncontrolled down the escalator truss, striking two contractors in the path. One contractor received serious injuries to their head, leg and back as the work sled came in contact with them. A second contractor received minor injuries to their arm as the work sled traveled past them.

A contributing factor to the incident identified by Metrorail was a missing work procedure that explained the hazards and preventive measures necessary to remove personnel from the dynamic envelope of the work sled while it was in hoisting operation.

Metrorail corrective actions resulting from this incident included that the contractor's management "will ensure job safety briefings are conducted using an approved Job Hazard Analysis (JHA) prior to work commencing." Corrective actions also included that "ELES management will ensure all contractors conduct job safety briefings using an approved Job Hazard Analysis (JHA) prior to work commencing." This event further emphasizes the importance of reviewing the work to be conducted via the job hazard analyses prior to commencement.

- **Minimum Corrective Action:**
  Metrorail must ensure personnel follow the job hazard analysis procedures in the field. Personnel responsible for conducting the job hazard analysis should be fully trained on all requirements of each job hazard analysis they could conduct. Job hazard analysis should consider specific sites and hazards presented by those sites. This should include regular compliance checks and communication and awareness of the requirements.

Finding #2: Metrorail does not proactively monitor calibration expiration for elevators and escalators equipment.



Calibration of measurement equipment ensures that Metrorail personnel are collecting accurate measurements to ensure all that this information can be used to certify the proper operation of the equipment or identify possible issues such as malfunctions, loading issues, or improper spacing.

Requirement:

Metrorail Procedure Number: 212-SOP-30: FSVT ELES, Rev 6, Procedure for Elevator and Escalator Inspections, dated July 25, 2024 states that "ELES [Office of Elevator and Escalator Services] Maintenance Supervisors have the following responsibilities: 5.5.2 Ensuring that all necessary material, and equipment are calibrated and onsite at the time of inspection."

Metrorail Procedure Number: 212-SOP-01: Section 5.3 states "All ELES TMDE [test measurement and diagnostic equipment] assets must be calibrated, and calibration must be completed in a timely fashion according to the calibration Work Order schedule in Maximo."

During station audits, the ELES Compliance Officer removes any outdated TMDE found.

Nonconformance:

Metrorail's approach to identifying equipment in need of calibration consists of managers, supervisors, or other personnel identifying such equipment and removing it from use. In addition to this practice proactive automated system of identification that prompts removal of equipment in need of calibration is required to ensure tools are calibrated.

Metrorail's Internal Safety Review of Elevators and Escalators Services, dated November 17, 2023 found that personnel in the field were using a dynamometer that was outside of its calibration period. The associated internal corrective and preventive action plan (iCAPA) stated: "Elevators and Escalators Services (ELES) will ensure that supervisors and/or superintendents conduct periodic Quality Assurance (QA) inspections and enforcement of safety compliance at the workplace to improve job site safety as per ELES Maintenance Control Plan."

On January 17, 2025, as part of this audit, the WMSC requested "A. The process/procedure to ensure that out-of-calibration equipment is not used and B. The plan to remedy the existing out of calibration equipment and how that equipment will be collected."

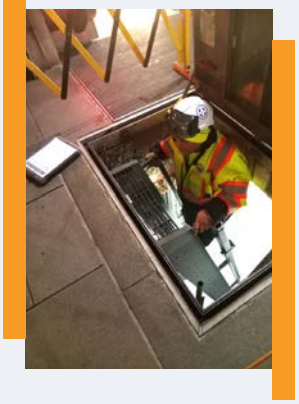
In response to this request, Metrorail stated that "During Jurisdictional Inspections the serial number and calibration date are recorded by the inspectors. Inspectors are not allowed to use outdated TMDE [test measurement and diagnostic equipment] during inspections and will notate on inspection report, if a portion of the testing is unable to be performed due to uncalibrated equipment. The supervisor receives the inspection report and will turn the equipment into Parts Department. During station audits, the ELES Compliance Officer removes any outdated TMDE found. They then bring the equipment to the Parts department and send an email detailing which equipment, the equipment serial number and the station where the equipment was removed from to supervisors."

In both the jurisdictional inspection and station audits listed, the check for calibration is reactive rather than proactive, and that accepts the potential for equipment in the field being out of calibration. Under this approach, if equipment out of calibration was identified, it would necessitate repeating the work and if not identified, the work be completed with uncalibrated tools, risking the collection of incorrect measurements. The safest approach is to devise a system that proactively checks for out of compliance equipment before such is taken to and used in the field.

- **Minimum Corrective Action:**
  Metrorail must create and adopt a process for the calibration of equipment which removes equipment for calibration prior to its calibration due date. Responsibility for ensuring this process occurs must be clearly identified and training must be provided to all applicable personnel.

Metrorail's elevators can be subject to water intrusion issues given the operating environment.

Finding #3: Metrorail personnel are entering elevator pits which have active electrical circuits with standing water present.



Elevator mechanics are required to enter the pits underneath elevators to complete vital preventative and corrective maintenance tasks, however, Metrorail's elevators can be subject to water intrusion issues given the operating environment. It is imperative that workers take safety precautions to protect themselves when those conditions exist.

Requirement:

The 2020 Elevator Industry Field Employees' Safety Handbook lists water as one of several "common hazards" when working in elevator pits and advises taking "appropriate steps to minimize these hazards and any others that are identified." Section 8.2.4(d) (safety precautions when working in pits) states "Do not work in a pit with standing water." And section 5.1(g) (electrical safety general precautions) states "Never troubleshoot circuits when standing or kneeling on metal, wet surfaces or in water. This includes situations where your body comes into contact with another grounded surface during the test and verify step of lock-out tagout."

Nonconformance:

Each of Metrorail's Job Hazard Analyses for work within elevator pits states that workers must "Be vigilant for oil / water on the pit floor" and "not work in a pit with standing water". Metrorail's elevator operating environment–aboveground or underground–makes the units susceptible to water intrusion. In the WMSC's **2022 Audit of Station Maintenance, Elevators and Escalators**, Metrorail identified 30 stations where water enters elevator and escalators or their pits during heavy rain events, and one location where there is a leak from cooling tower condensate.

Metrorail policy prohibits personnel from entering areas with standing water while electrical circuits are active; however, personnel reported entering areas with water at knee or waist depth that required pumping out of the pit. Personnel do not conduct voltage testing prior to entering the pit.

In interviews with two elevator and escalator journeymen, it was indicated that they did not receive personal protective equipment related to electrical hazards, such as electrical gloves or electrical hazard waders. As part of this audit, the WMSC requested a list of "all PPE (Personal Protective Equipment) required for elevator and escalator personnel." Electrical gloves and electrical hazard waders are not included on the list of PPE as being provided to Metrorail personnel working on elevators and escalators.

The WMSC notified Metrorail of this finding on March 26, 2025, prior to the exit conference on March 28, 2025 so that Metrorail could immediately address this hazard.

According to the federal Occupational Safety and Health Administration (OSHA) "Falls are among the most common causes of serious work related injuries and deaths."

◆ **Minimum Corrective Action:**

Metrorail must identify a safe way for personnel to work in elevator pits that factors in the need for maintenance to occur and the fact the water intrusion affecting many elevator pits is either part of a longer-term capital project or cannot be fully resolved. Metrorail must consider and implement mitigations to the hazard posed by elevator pits with water intrusion or the potential for water intrusion.

▶ Finding #4: Metrorail elevator and escalator personnel are not trained on fall protection requirements listed within its job hazard analyses.

According to the federal Occupational Safety and Health Administration (OSHA) "Falls are among the most common causes of serious work related injuries and deaths. Employers must set up the work place to prevent employees from falling off of overhead platforms, elevated work stations or into holes in the floor and walls." (OSHA.gov/fall-protection, accessed on August 8, 2025.)

The U.S. Code of Federal Regulations (CFR), Section 1910, Subpart D, requires that fall protection be provided at elevations of four feet in general industry workplaces. Section 1910.28(b)(6) also requires that fall protection be provided when working over dangerous equipment and machinery.

Section 1910, Subpart D, Section 1910.30(a)(1) requires employers to "Before any employee is exposed to a fall hazard, the employer must provide training for each employee who uses personal fall protection systems or who is required to be trained as specified elsewhere in this subpart. Employers must ensure employees are trained in the requirements of this paragraph on or before May 17, 2017."

Requirement:

The Job Hazard Analysis for Traction Elevator Preventive Maintenance, Repair, Service, Inspection (dated May 30, 2024) states in section 5 that personnel should "1c. Utilize fall protection if needed." The job hazard analysis also lists "Lockout/Tagout, Jumper Policy, Confined Space, and Fall Protection" as required training.

The current elevator and escalator safety training matrix includes a requirement for fall protection training for only one position: elevator and escalator heavy repair journeyman (special projects).

Nonconformance:

Metrorail is currently only training one class of employees, elevator and escalator heavy repair journeyman (special projects) on its fall protection program and requirements. This includes requiring initial training and refresher training.

Other elevator and escalator personnel such as journeyman technicians, master technicians, compliance managers, and compliance officers are not trained on Metrorail's fall protection program or requirements. Journeymen and master technicians can be assigned to complete

Once completed, and if the elevator or escalator passes the inspection, the certificate is displayed to provide assurance to the public that the elevator or escalator is safe to use as evidenced by the posting of a current certificate.

the work covered by the job hazard analysis. including heavy repair in which fall protection may be required to complete the tasks.

◆ **Minimum Corrective Action:**

Metrorail must review job descriptions for all elevator and escalator personnel along with the relevant job hazard analyses to ensure that all personnel are receiving the trainings required by their job classification. This includes but is not limited to any required fall protection training and ancillary or support work tasks that are not primary or routine duties. Metrorail must train relevant personnel as identified and submit evidence of such.

▶ Finding #5: Metrorail is not maintaining or displaying elevator or escalator certificates on-site as required by local jurisdictions.

Regular safety inspections of elevators and escalators are required by law. Once completed, and if the elevator or escalator passes the inspection, the certificate is displayed to provide assurance to the public that the elevator or escalator is safe to use as evidenced by the posting of a current certificate.

Requirement:

District of Columbia Building Code Section 3010.4.1 (Posting of certificate) states "A copy of the most current certificate of inspection shall be conspicuously displayed at all times within the elevator car or attached to the conveying system unless exempted pursuant to Section 3010.6. If the building operator maintains an office in the same building, the certificate of inspection may be made available for public inspection in the office instead of being on display within the elevator." Metrorail does not meet the exemptions listed in Section 3010.6 of the D.C. Building Code.

Maryland Code for Public Safety section 12-811, states "(a) If an inspection discloses that an elevator unit complies with the Safety Code and other regulations adopted by the Commissioner, the Commissioner shall issue a certificate to the owner or lessee of the elevator unit. (b) The certificate shall be posted conspicuously in or on the elevator unit."

Virginia Maintenance Code, section 606.1 states that "An annual periodic inspection is required of all elevators and escalators…The most current certificate of inspection shall be on display at all times within the elevator or attached to the escalator, be available for public inspection in the office of the building operator or be posted in a publicly conspicuous location approved by the code official. Where not displayed in the elevator or attached to the escalator, there shall be a notice of where the certificate of inspection is available for inspection."

Nonconformance:

Maryland's Department of Labor states that "There are two components to the process that results in the issuance of a certificate of inspection: inspecting equipment (Third Party Qualified Elevator Inspector TPQEI or State Inspector) and testing equipment (Licensed Elevator Mechanic). Inspecting is one component required by elevator code,

The District of Columbia, Maryland, and Virginia require that a member of the public be able to verify that these inspections have been carried out as evidenced by the regulations listed above.

(A17.1 section 8.11) to be performed by a QEI certified inspector, confirming compliant equipment safety functions. Testing is another separate component required by the elevator code, (A17.1 section 8.6) to be performed by a licensed elevator mechanic, demonstrating compliant equipment safety performance operation." The District of Columbia, Maryland, and Virginia require that a member of the public be able to verify that these inspections have been carried out as evidenced by the regulations listed above.

As part of this audit, the WMSC visited 14 Metrorail stations, five in the District of Columbia (Georgia Ave-Petworth, Metro Center, Fort Totten, Waterfront, Navy Yard-Ballpark), five in Maryland (Rockville, North Bethesda, Suitland, Naylor Road, Branch Ave), and four in Virginia (Franconia-Springfield, Crystal City, Pentagon City, Potomac Yard). At each of those stations, Metrorail was not displaying or maintaining certificates as required.

The District of Columbia permits certificates in an office onsite for public inspection. Four stations were visited in DC where the station manager could not provide or display the certificate electronically though. There are exceptions to this requirement listed in Section 3010.6 of the DC Building Code. However, Metrorail does not meet the exemptions listed.

After discussion with code compliance officials from the Safety Inspection Unit at the Maryland Department of Labor, the practice of not displaying certificates and referring to the certificate's existence or making the certificate available electronically does not meet the physical posting requirement.

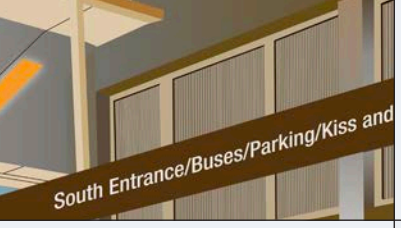
At every station visited, including those in Virginia, a notice is posted in each elevator that directs individuals to the station manager kiosk to view the elevator certificate. Although Virginia permits a more flexible posting than Maryland or the District of Columbia, Metrorail is also not adhering to Virginia's posting requirements.

In interviews personnel confirmed that Metrorail stopped displaying certificates once those were received via mail from the jurisdictions because of vandalism issues and also that station managers were able to display the certificates electronically, however, as stated previously several station managers were unaware of where to locate the certificates.

- **Minimum Corrective Action:**
  Metrorail must adhere to all elevator and escalator periodic inspection certification and posting requirements of the three jurisdictions. Metrorail must review its current procedures and determine a manner of posting that achieves the jurisdiction requirements. Metrorail must institute a regular compliance check to ensure certificates are posted in the manner required by law.

Recommendation 1: Metrorail elevator and escalator job descriptions are incomplete and a subset do not reflect current job responsibilities.

Metrorail's job descriptions identify the duties and responsibilities for each individual worker and are agreed upon and signed. Not having that agreement or understanding of responsibilities and commitments could lead to discrepancies in the work to be completed to maintain the system. Not declaring whether that position is mission essential or critical could lead to staffing issues during events or incidents.



Although the continuing work related to updating and improving the job descriptions is a positive step, the job descriptions must be thoroughly reviewed for accuracy.

Requirement:

Metrorail's Quality Management System Plan section 3.2 states, under document control, that "WMATA departments and projects include procedures for receiving, transmitting, reviewing, approving, disseminating, and archiving critical documents in their respective QMPs. These procedures are reviewed and revised every 2 years unless there are changes that necessitate an earlier review."

Nonconformance:

The **WMSC's 2022 Safety Audit of Station Maintenance, Elevators and Escalators** included a recommendation that "Metrorail has effective training instructors for ELES personnel, however their experience does not match the written requirements for the positions." The recommended corrective action stated that "Metrorail may adjust the job descriptions to reflect the actual requirements of the role, including experience and expertise in the subject area."

To address that recommendation, Metrorail created corrective action plan C-0209, which included the Office of Elevator and Escalator Services reviewing and updating job descriptions to reflect the actual requirements of the role, including experience and expertise in the subject area. Metrorail revised job descriptions accordingly and the CAP was subsequently closed on March 9, 2023.

Since the closure of C-0209, the Office of Elevator and Escalator Services has changed the way it manages and formats job descriptions. As a result, the newer job descriptions are missing certain information:

- Lack of designations for noting items as "Directly Related to Essential Function."
- Lack of completion of fields noting whether certain personnel carry the "Mission – Essential Worker Designation."
- Master ELES Technicians are noted as "Not responsible for supervising others" but one of the later duties is the "Ability to provide leadership to instruct and review work of lower-level mechanics." The act of instructing their work is a supervisory duty.

Although the continuing work related to updating and improving the job descriptions is a positive step, the job descriptions must be thoroughly reviewed for accuracy. The deficiencies identified in ELES job descriptions, which include positions that are safety sensitive, do not meet the goal/requirements of Metrorail's Continuity of Operations Plans (COOP). While the continuing work related to updating and improving the job descriptions is a positive step, they must be thoroughly reviewed for accuracy.

◆ Recommended Corrective Action:

Metrorail has the opportunity to review and update its document review process for elevator and escalator job descriptions to include checks for accuracy and completeness and conduct a review of all job descriptions using that updated process.

Personnel reported that there have been transcription issues with this practice, and it is unclear personnel in the field are not entering their results or findings directly.

Recommendation 2: Metrorail's Office of Elevators and Escalators Services uses multiple systems to capture data which could impair data management and result in discrepancies.

Metrorail currently has personnel in the field conducting preventative maintenance which requires taking measurements and noting the results on paper. This is then transmitted to different office personnel to input into Maximo and, as a result of that human hand off, transcription errors can occur.

Requirement:

Metrorail Procedure Number: 212-SOP-30: FSVT ELES, Procedure for Elevator and Escalator Inspections (Rev. 6, dated July 25, 2024) states that "5.7 VTOC [Vertical Transportation Center] responsibilities are: Generating MAXIMO SWO [service work order] numbers to each Annual and Accident inspection, and entering inspection data into the MAXIMO database and attaching Inspection reports onto SWOs." Section 6.3.1 states "ELES Transportation Safety Inspectors open work orders by notifying Vertical Transportation Operations Center at the completion of the inspection by inputting inspection information into Virtual Operations Center (if Virtual Operations Center is unavailable, by phone), and supplying the following information: Whether the inspection is complete or incomplete, inspection end time, the total number of LM and Corrective Maintenance Work Order items, whether the unit remains in service or will be taken out of service, and any pertinent remarks."

Nonconformance:

Metrorail personnel in the field are regularly using the virtual ELES Operations Center (EOC) system to request open, editing, or inputting of data into Maximo work orders. This is done via mobile phone in the field by maintenance or inspection personnel either via text input or phone calls to the Vertical Transportation Center staff. Vertical Transportation Center staff then take the information and transcribe it into Maximo work orders. Personnel reported that there have been transcription issues with this practice, and it is unclear personnel in the field are not entering their results or findings directly. Personnel in the field would benefit from being able to enter data, in their own words, as they are the ones in charge of conducting the work.

◆ Recommended Corrective Action

Metrorail has the opportunity to review its current elevator and escalator issue-reporting procedures to determine improvements that may reduce the occurrence of errors in its data transcription or repair time.

Next Steps

Metrorail is required to propose corrective action plans to address each finding and recommendation no later than 30 days after the issuance of this report. (WMSC Program Standard, Section 9.C.3.a.) Each proposed corrective action plan must include several elements, including but not limited to, specific and achievable planned actions to remediate the deficiency, the person responsible for implementation, and the estimated date of completion. (Section 9.C.2.) Each proposed corrective action plan must be approved by the WMSC prior to Metrorail's implementation.

Appendices

Appendices A and B

Appendix A: Personnel Interviewed

OFFICE OF ELEVATORS AND ESCALATORS

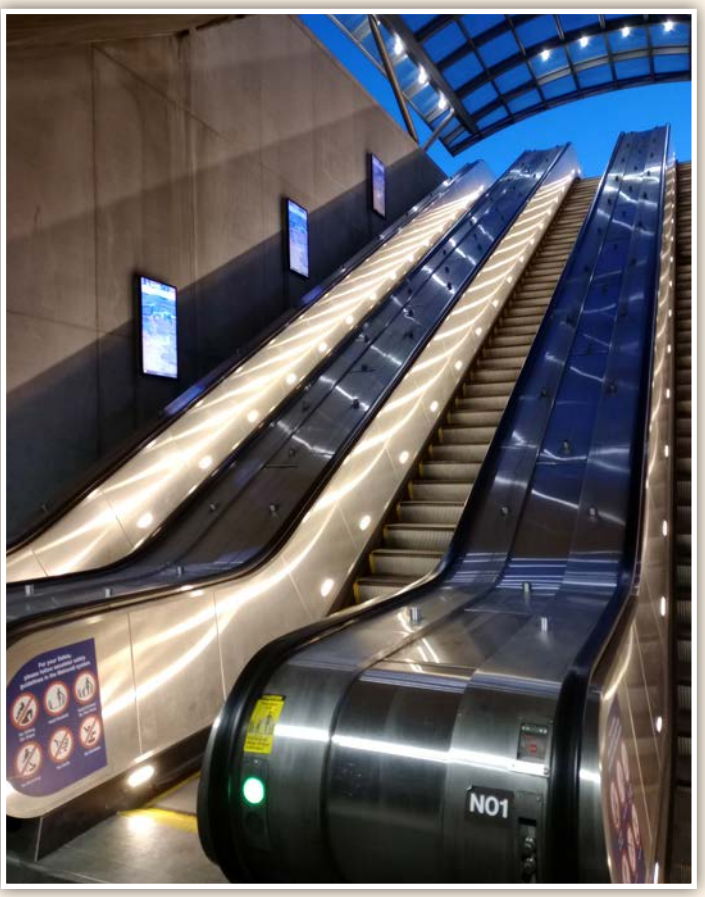
- Assistant Superintendent
- Capital Improvement Projects Engineer
- Compliance Officer
- Director
- ELES Journeyman (7)
- Maintenance Supervisor
- Parts Supervisor
- Safety Risk Coordinator
- Senior Capital Program Manager
- Senior Director
- Service Dispatcher (2)
- Superintendent, Capital Improvement
- Supervisor (3)
- Technician Helper (A) (2)
- Technician Helper (B) (2)
- Vertical Safety Inspector (2)

TECHNICAL TRAINING AND DEVELOPMENT

- Technical Skills Maintenance Training Instructor (2)

Appendix B: Site Visits

- Tuesday, February 4, 2025
  - Elevator Preventative Maintenance Inspection Observation – North Bethesda Station
- Wednesday, February 5, 2025
  - Escalator Heavy Repair Observation – Georgia Avenue – Petworth Station
- Friday, February 7, 2025
  - Capital Improvement Project Observation – Franconia - Springfield Station
- Thursday, February 27, 2025
  - Escalator Preventative Maintenance Inspection Observation – Fort Totten Station
- Thursday, March 6, 2025
  - Escalator Preventative Maintenance Inspection Observation – Metro Center Station



Appendix C

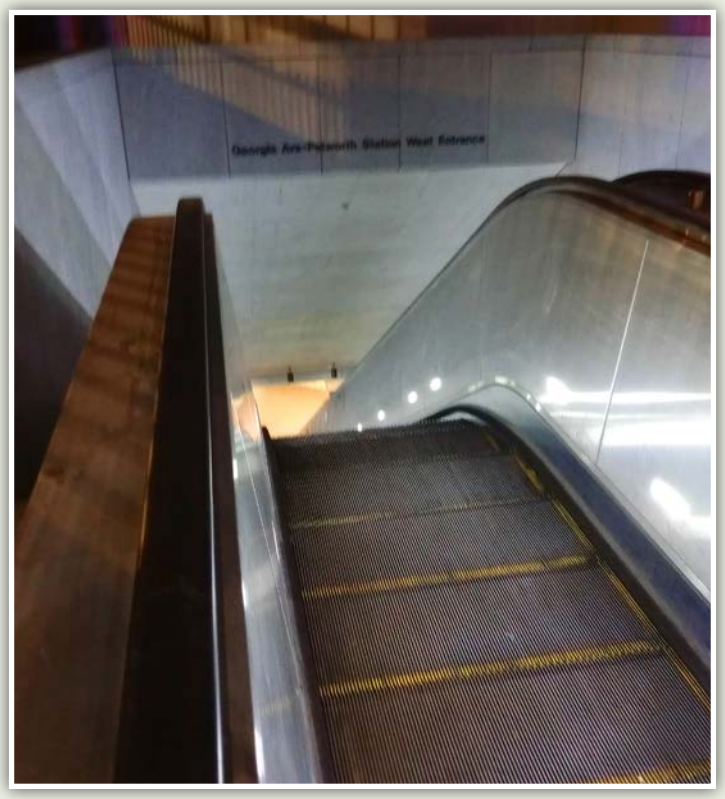
Appendix C: Documents Reviewed

ORGANIZATIONAL CHARTS AND DEPARTMENT RESPONSIBILITIES:

- Division Roles and Responsibilities Descriptions (no date)
- ELES CIP Organization Chart (no date)
- ELES Compliance Organization Chart (no date)
- ELES Maintenance Organization Chart (no date)
- ELES Management Organization Chart (no date)

ROLES/RESPONSIBILITIES/JOB DESCRIPTIONS/ STAFFING:

- Assistant Manager Elevator Code Enforcement, Office of ELES – Job Description (01/22/2025)
- Assistant Superintendent, ELES Maintenance – Job Description (01/22/2025)
- Assistant Superintendent, ELES Services Operations, Contracts and Parts – Job Description (01/22/2025)
- Assistant Project Manager, Capital Improvement Project ELES – Job Description (01/22/2025)
- Associate Project Coordinator – Job Description (01/22/2025)
- Assistant Superintendent, VTRMD – Job Description (01/22/2025)
- Capital Project Management Associate – Job Description (01/22/2025)
- Current Employees and Budgeted Positions List (11/05/2024)
- Director ELES Maintenance – Job Description (01/22/2025)
- ELES Assistant Director – Job Description (01/22/2025)
- ELES CIP Engineer – Job Description (01/22/2025)
- ELES Compliance Officer – Job Description (01/22/2025)
- ELES Heavy Repair/Special Projects Journeyman – Job Description (01/22/2025)
- ELES Maintenance Supervisor – Job Description (01/22/2025)
- ELES Material Specialist – Job Description (01/22/2025)



- ELES Senior Capital Program Manager- Job Description (01/22/2025)
- ELES Service Dispatcher – Job Description (01/22/2025)
- ELES Superintendent – Job Description (01/22/2025)
- ELES Support Assistant – Job Description (01/22/2025)
- ELES Technician Helper, Office of ELES – Job Description (04/11/2018)
- Management Analyst – Job Description (01/22/2025)
- Manager Administrative Services – Job Description (01/22/2025)
- Manager, Engineering – Job Description (01/22/2025)
- Master ELES Technician – Job Description (06/20/2019)
- Personnel Information List (11/05/2024)
- Project Coordinator/Scheduler, Office of ELES – Job Description (01/22/2025)
- Project Manager, Capital Improvement Program – Job Description (01/22/2025)
- Project Manager, Infrastructure – Job Description (01/22/2025)

ROLES/RESPONSIBILITIES/JOB DESCRIPTIONS/ STAFFING: (CONTINUED)

- Senior Administrative Assistant – Job Description (01/22/2025)
- Senior Department Safety Risk Coordinator – Job Description (01/22/2025)
- Senior Director, Office of ELES – Job Description (01/22/2025)
- Supervisor, ELES Engineer – Job Description (01/22/2025)
- Supervisor, ELES Operations Center – Job Description (11/27/2018)
- Supervisor, ELES Parts Department – Job Description (01/22/2025)
- Technical Training Department Employee List (no date)
- Vertical Transportation Safety Inspector – Job Description (01/22/2025)

PROCEDURES/POLICIES/MANUALS/FORMS:

- 112-SOP-02, Document Control Procedure (09/22/2022)
- 112-SOP-03, Quality Management Plan (06/30/2022)
- 112-SOP-06, Maintenance and Service Records-Logs, PM Check Sheets, Test Logs (04/06/2022)
- 212-SOP-19, FSVT ELES: Preventative/Corrective Maintenance (11/29/2024)
- 212-SOP-21, Procedure for Bulk Chemical Storage Using Spill Pallets (08/01/2022)
- 212-SOP-22, FACI-ELES: Staff Work Alone Policy (03/27/2024)
- Elevator Industry Field Employee Safety Handbook (2020)
- 212-SOP-23, FACI-ELES: Management of Electrical and Mechanical Lock Out/Tagout (07/03/2023)
- 212-SOP-30, FSVT ELES: Procedure for Elevator and Escalator Inspections (07/25/2024)
- 212-SOP-40, General Operations Procedure (05/17/2023)
- 212-SOP-41, Work Order Management Procedure (05/17/2023)

PROCEDURES/POLICIES/MANUALS/FORMS: (CONTINUED)

- 212-SOP-42, Staff policies, Conduct and Responsibilities (05/17/2023)
- 212-SOP-43, VTOC Document Procedure (01/27/2025)
- 212-SOP-44, Communications Protocol (05/17/2023)
- 212-SOP-45, VTOC Training Procedure (08/12/2024)
- 212-SOP-50, Departmental Training Guide (12/20/2021)
- 212-SOP-55, ELES-Office of Facilities: Master Elevator/ Escalator Services Technician, Elevator/Escalator Journeyman, Elevator/Escalator, Technician Helper Roles and Responsibilities (11/29/2024)
- 212-WI-28, Preventative Maintenance Work Order Process (06/30/2023)
- 212-WI-40, Elevator Entrapment E.R. (05/19/2023)
- 212-WI-41, Escalator Accident E.R. (05/19/2023)
- 212-WI-44, Service Interruption E.R. (05/24/2023)
- 212-WI-45, Station Water Intrusion E.R. (05/24/2023)
- 212-WI-46, Escalator Step Wreck E.R. (05/24/2023)
- 212-WI-47, Jurisdictional Inspections Work Order Process (05/24/2023)
- 212-WI-49, Work Order Process Work Instruction (05/24/2023)

PROCEDURES/POLICIES/MANUALS/FORMS: (CONTINUED)

- 612-SOP-11, ELES Engineering Responsibility (09/20/2017)
- 712-WI-01, Handling of Hazardous Materials (12/20/2024)
- 712-WI-02, Pick Up and Delivery Process (12/20/2024)
- ASME A17.1, Escalator Treadway Lighting (2019)
- ASME A17.1, Lighting in Elevator (2019)
- ASME A17.1, Lighting of Escalators (2019)
- District of Columbia Elevator Checklist (no date)
- District of Columbia Escalator Checklist (no date)
- ELES Comb Impact Device Adjusting Procedures (02/08/2024)
- ELES Form 08-00, Elevator PM Check Sheet (02/04/2020)
- ELES Form 09-00, Elevator Traction PM Check Sheet (no date)
- ELES Form 10-00 Escalator PM Check Sheet (02/04/2020)
- ELES Form 11-00 Escalator PM Check Sheet (02/04/2020)
- ELES Form 12-00, Escalator PM Check Sheet (02/04/2020)
- ELES SOP and Work Instruction Document List (no date)
- Memorandum on Classroom Policies (08/28/2012)
- Memorandum on PPE Required for Elevator and Escalator Personnel (12/02/2024)
- Out-of-Calibration Equipment Process and Procedure (no date)
- Permanent Order T-17-07, Procedures for the Areas of Refuge (05/17/2017)
- Quality Management Plan (07/08/2023)
- Virginia Elevator Inspection Form (no date)
- Virginia Escalator Inspection Form (no date)

- WMATA Manual of Design Criteria, Elevator Lighting (no date)
- WMATA Manual of Design Criteria, Escalator Lighting (no date)
- WMATA Manual of Design Criteria, Lighting for Underground Elevators and Escalators (no date)

TRAINING:

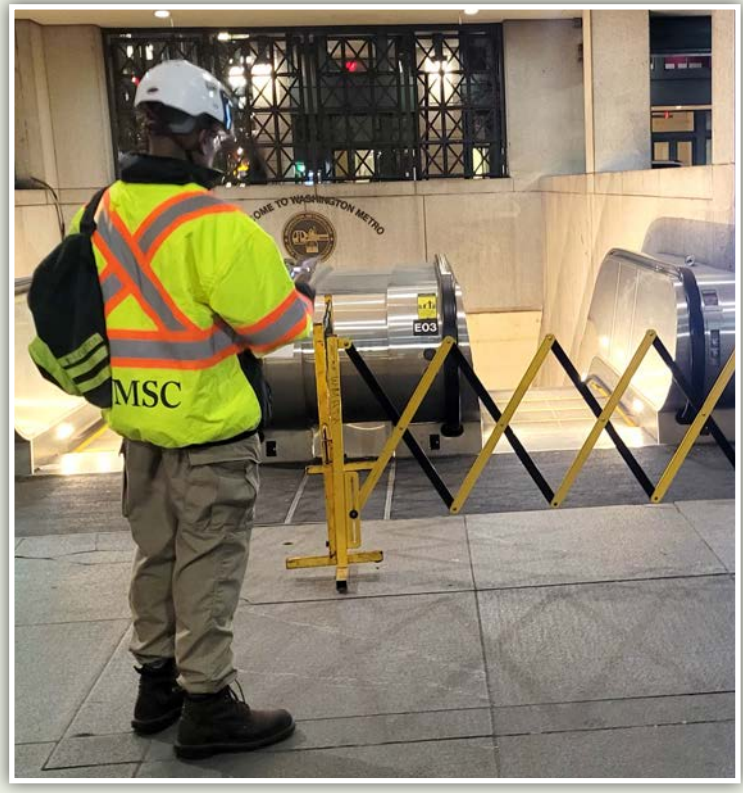
- 400 Advanced PLC Applications (no date)
- AC Fundamentals Course Summary (05/30/2019)
- AC Motors Course Worksheet (no date)
- ACME Transformer Wiring Diagrams (no date)
- Ammeters Training Presentation (no date)
- Balanced Piston Pressure Control Valves Information Guide (no date)
- Basic Hydraulic Circuits Hands-on Skills (2019)
- Basic Motor Controls Training Materials (no date)
- BDC-to-Seven Segment Latch/Decoder/Driver Information Sheet (07/2014)
- Center Opening Hatch Door Assembly Diagram (11/03/1994)
- Chapter 2: Basic Instruments and Measurements Training Materials (no date)

TRAINING: (CONTINUED)

- Chapter 5, Hydraulic Principles Training Materials (no date)
- Chapter 6, Hydraulics Training Materials (no date)
- Chapter 7, Pneumatic Principles Training Materials (no date)
- Chapter 8, Pneumatics Training Materials (no date)
- Chapter 9: Magnetism Training Materials (no date)
- Chapter 15: Process and Instrumentation Systems Training Materials (2009)
- Circuit Principles, Determining Power, and Electrical Efficiency Quiz (no date)
- Click PLC Instruction Set (no date)
- Control of Hazardous Energy: Lockout/Tagout Awareness Presentation (07/2016)
- Course 200, Types of Styles of ELES Training Materials (no date)
- Course 208, Escalator Principles of Operations Training Materials (no date)

- Course 209, Escalator Electrical Systems Training Materials (no date)
- Course 210, Escalator Step Installation and Maintenance Training Materials (no date)
- Course 211, Escalator Handrail Installation and Maintenance Training Materials (no date)
- Course 212, Escalator Basic Inspection and Maintenance Training Materials (no date)
- Course 213, Hydraulic Elevators Training Materials (no date)
- Course 214, Elevator Electrical System Safety Procedures Training Materials (no date)
- Course 215, Elevator Mechanical Drive Systems Safety Procedures Training Materials (no date)
- Course 216, Introduction to Elevator Doors Training Materials (no date)
- Course 217, Electric Traction Elevator Safety Procedures Training Materials (no date)
- Course 218, Hydraulic Elevator Safety Procedures Training Materials (no date)
- Course 220, Elevator Other Systems Training Materials (no date)
- Course 221, Elevator Entrapments Training Materials (no date)
- Course 250, ELES Troubleshooting Training Materials (no date)
- Course 300, ELES Input and Output Controls Training Materials (no date)
- Course 301, ELES Electrical and Electronic Systems Training Materials (no date)
- Course 401, Programmable Logic Control Training Materials (no date)
- Course 402, Advanced System Analysis Training Materials (no date)
- DC Fundamentals Course Summary (05/30/2019)
- DC Fundamentals Series Circuit Analysis Practice Sheets (no date)
- DC Generator Information Guide (no date)

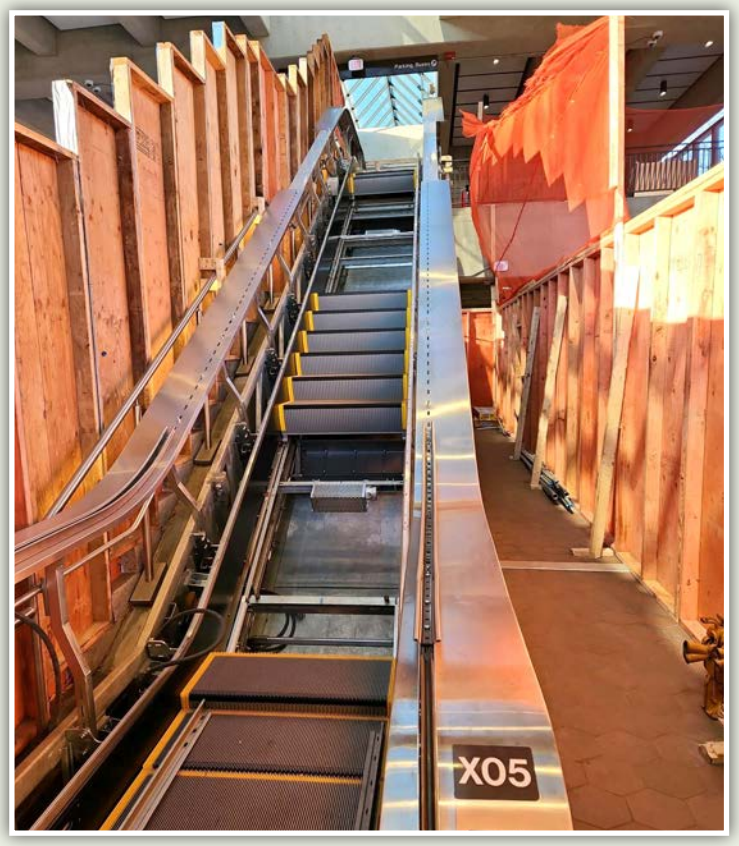
TRAINING: (CONTINUED)



- Dupont Circle – CD Vol I and II (05/07/2013)
- Electrical Machinery Training Presentation (no date)
- ELES Apprenticeship Program Curriculum Overview (no date)
- ELES Apprenticeship Program TSMT Training Brochure (03/2020)
- ELES Equipment Familiarization Training Schedule (2022)
- ELES Equipment Troubleshooting Guides (no date)
- ELES Journeyman Curriculum Overview (no date)
- ELES Journeyman Refresher Training Records (05/2022 to 03/2023)
- ELES Journeyman Refresher Training Schedule (01/2023)
- ELES Journeyman Training: KONE Escalator Instructor Guide (no date)
- ELES Journeyman Training: KONE Escalator Mechanical (no date)
- ELES Personnel NAESA Qualified Elevator Inspector Certifications (no date)
- ELES Safety Training Matrix (no date)
- ELES Technical Training Matrix (no date)
- ELES Training Instructor, Office of ELES – Job Description (06/05/2024)
- ELES Training Schedule (02/24/2025 to 03/07/2025)
- Elevator Industry Field Employee Handbook (2010)
- Escalator Handrail Splice Course Syllabus and Presentation (no date)
- Fire Extinguisher Training Course Description (no date)
- Fluid Power Graphic Symbols Handout (2011)
- Fluke Digital Meter Training Presentation (no date)
- Forklift Daily Inspection Form (no date)
- Fundamentals of Electricity Post-Evaluation Solution Key (no date)
- GAL Elevator Door Course Exam (no date)
- Hatch Reinforcement and Drillings Three Speed Diagram (11/11/1994)
- Hazardous Waste Management Training Course Description (no date)
- High Voltage Safety Awareness Training Certifications (01/15/2015)
- Hot Work Program Familiarization Training Course Description (no date)
- Hot Work Safety Supervisor Training Course Description (no date)
- Hydraulic and Pneumatic Fundamentals Course Summary (05/30/2019)
- Industrial Controls Training System, Basic Controls – Student Manual (06/2007)
- Industrial Controls Training System, Motors Drives – Student Manual (06/2014)
- Installing and Troubleshooting Electrical Systems, Chapter 1: Print Reading Fundamentals Training Materials (no date)
- Installing and Troubleshooting Electrical Systems, Chapter 2: Residential and Commercial Electrical Symbols Training Materials (no date)

TRAINING: (CONTINUED)

- Installing and Troubleshooting Electrical Systems, Chapter 3: Industrial Electrical and Electronic Symbols Training Materials (no date)
- Installing and Troubleshooting Electrical Systems, Chapter 4: Electrical Drawings and Plans Training Materials (no date)
- Installing and Troubleshooting Electrical Systems, Chapter 5: Electrical and Electronic Systems Training Materials (no date)
- Installing and Troubleshooting Electrical Systems, Chapter 11: Industrial Control Systems Training Materials (no date)
- Installing and Troubleshooting Electrical Systems, Chapter 13: Industrial Equipment Training Materials (no date)
- Installing and Troubleshooting Electrical Systems, Chapter 14: Fluid Power Systems Training Materials (no date)
- Introduction to Safety Management System SSMSA Training Course Description (no date)
- Kiosk and Station Familiarization, Participant Manual (08/18/2023)
- LAP 1, Hydraulic Power Systems (2011)
- LAP 2, Basic Hydraulic Circuits (2010)
- LAP 3, Principles of Hydraulic Pressure and Flow (2009)
- LAP 4, Hydraulic Speed Control (2014)
- LAP 5, Pressure Control Circuits (2009)
- Lockout/Tagout Training Course Description (no date)
- Manager/Supervisor Safety Management System Training Course Description (no date)
- Mathematics for Skilled Trades Course Summary (05/30/2019)
- Mechanical Theory and Applications Course Summary (05/30/2019)
- Mechanical Training System: Belt Drives II, Information Job Sheets (06/2005)
- Metrorail Stations SOP Handbook (09/2015)
- Module 1, General Safety Procedures - Training Materials (no date)
- Module 2, Introduction to the Principles of Operation - Training Materials (no date)
- Module 3, Escalator Sub-Systems Overview - Training Materials (no date)
- Module 4, Electrical Control Systems - Training Materials (no date)
- Module 5, Safety Devices - Training Materials (no date)
- Networking Essentials, Chapter 1: Introduction to Computer Networks Training Materials (no date)
- Networking Essentials, Chapter 2: Physical Layer Cabling – Twisted Pair Training Materials (no date)
- Networking Essentials, Chapter 3: Physical Layer Cabling – Fiber Optics Training Materials (no date)
- Networking Essentials, Chapter 4: Wireless Networking Training Materials (no date)
- Networking Essentials, Chapter 5: Interconnecting the LANs Training Materials (no date)
- Networking Essentials, Chapter 6: TCP/IP Training Materials (no date)



TRAINING: (CONTINUED)

- Networking Essentials, Chapter 7: Introduction to Router Configuration Training Materials (no date)
- Networking Essentials, Chapter 8: Introduction to Switch Configuration Training Materials (no date)
- Networking Essentials, Chapter 9: Routing Protocols Training Materials (no date)
- Networking Essentials, Chapter 10: Internet Technologies – Out to the Internet Training Materials (no date)
- Networking Essentials, Chapter 11: Troubleshooting Training Materials (no date)
- Networking Essentials, Chapter 12: Network Security Training Materials (no date)
- Networking Essentials, Chapter 13: Cloud Computing and Virtualization Training Materials (no date)
- Networking Essentials, Chapter 14: Codes and Standards Training Materials (no date)
- NFPA 70 National Electrical Code (2014)
- Ohmmeter Circuit Analysis Presentation (no date)
- One Line Electrical Schematic (2004)
- Orientation and Background Course Summary (05/30/2019)
- OSHA 10-Hour Construction Training Course Description (no date)
- OSHA 30-Hour Industry Training Course Description (no date)
- Personnel Training Tracker (no date)
- Plant Belt Tensioning Roster (11/2017)
- PLC CPU Familiarization Guide (no date)
- PLC Ladder Logic Programs, Scan Operation, and Relay Logic Instructions (no date)
- Position Certification and Training Requirements (no date)
- Principles of Hydraulic Pressure and Flow Hands-On Skills (2021)
- Quadruple 2-Input Exclusive-OR Gates User Guide (03/1988)

- Refresher Training AC Fundamentals Pre-Evaluation (no date)
- RSLogic 500 Software Getting Results Guide (03/2010)
- Safe Forklift Operation Test (no date)
- Schematic Symbols Exam (no date)
- Semiconductor Fundamentals: Voltage Dividers and Regulators in Single Phase Power Supplies Lesson Plan (no date)
- Semiconductors Course Outline (12/21/2000)
- Silver Line Phase II Training Course Tracker (01/06/2025)
- Simpson Meter Training Presentation (no date)
- Single Speed and Two Speed Operator Data Table (02/23/1987)
- Solid State Fundamentals for Electricians, Chapter 1: Safety Review Training Materials (no date)
- Solid State Fundamentals for Electricians, Chapter 2: PC Board Construction and Repair Training Materials (no date)
- Solid State Fundamentals for Electricians, Chapter 3: Semiconductor Diodes Training Materials (no date)
- Solid State Fundamentals for Electricians, Chapter 4: DC Power Supplies- Single Phase Training Materials (no date)

TRAINING: (CONTINUED)

- Solid State Fundamentals for Electricians, Chapter 5: Solid State Transducers Training Materials (no date)
- Solid State Fundamentals for Electricians, Chapter 6: Transistor as DC Switch Training Materials (no date)
- Solid State Fundamentals for Electricians, Chapter 7: SCR Applications Training Materials (no date)
- Solid State Fundamentals for Electricians, Chapter 8: Triac, Diac, and UJT Training Materials (no date)
- Solid State Fundamentals for Electricians, Chapter 9: Transistor as an AC Amplifier Training Materials (no date)
- Technical Skills and Maintenance Training, Post-Test, Troubleshooting (no date)
- Tools and Material Handling Course Summary (05/30/2019)
- TSMT Course Evaluation Form (no date)
- TSMT Student Grade Tracker (06/2014)

- TSMT Training Course Roster Form (06/2014)
- Two Speed Car Assembly Diagram (09/07/1995)
- Understanding the RCtime Instruction and Creating Strings in EEPROM (05/1996)
- Virginia Inspector Licensing Certification Training Course Description (no date)
- Welding Certification Training Course Description (no date)
- Well Pump to Tank Ladder Schematic Diagram (09/25/1987)
- Wiring Technologies and Equipment Course Summary (05/30/2019)
- WMATA Book Checkout Form (no date)
- WMATA Escalator Student Manual for Dulles Silver Line Phase II (08/2019)
- WMATA Trainee Sign-in Sheet (no date)
- WMATA Weekly Training Evaluation Form (no date)
- Zener Regulator Information Guide (no date)

INSPECTION AND MAINTENANCE:

- Annual Inspection Checklist, Elevator C15S02 (04/22/2024)
- Annual Inspection Checklist, Elevator C15S02 (03/11/2024)
- Annual Inspection Checklist, Elevator T26X01 (05/07/2024)
- Annual Inspection Checklist, Escalator C01S04 (12/29/2024)
- Annual Inspection Checklist, Escalator C01S04 (09/22/2024)
- Annual Inspection Checklist, Escalator C02W06 (10/22/2024)
- Annual Inspection Checklist, Escalator C02W06 (09/08/2024)
- Annual Inspection Checklist, Escalator C04X03 (02/25/2025)
- Annual Inspection Checklist, Escalator D01X09 (03/10/2024)

INSPECTION AND MAINTENANCE: (CONTINUED)

- Annual Inspection Checklist, Escalator D01X09 (02/02/2024)
- Annual Inspection Checklist, Escalator D03E05 (05/06/2024)
- Annual Inspection Checklist, Escalator E05X04 (02/26/2025)
- Annual Inspection Checklist, Escalator E05X04 (01/09/2025)
- Annual Inspection Checklist, Escalator F02X04 (06/02/2024)
- Annual Inspection Checklist, Escalator F02X04 (03/14/2024)
- Annual Inspection Checklist, Escalator K04X02 (02/26/2025)
- Certificate of Inspection, Elevator B95X01 (02/25/2025)
- Certificate of Inspection, Escalator C01N01 (02/28/2025)
- Certificate of Inspection, Escalator B01E06 (02/21/2025)
- Certificate of Inspection, Escalator D08S03 (10/28/2024)
- Certificate of Inspection, Escalator E01X01 (03/03/2025)
- Certificate of Inspection, Escalator E04X04 (03/03/2025)
- Certificate of Inspection, Escalator E05X04 (02/28/2025)
- Certificate of Inspection, Escalator F03N12 (03/03/2025)
- Current Actions Status, Elevators (no date)
- Current Actions Status, Escalators (no date)
- Current Actions Status, Water Intrusion (no date)
- Dial Torque Wrench Inventory and Calibration List (no date)
- Dynamometer Inventory and Calibration List (no date)
- ELES Downtime and Availability Detail Report, Elevator (01/2022 to 11/2024)
- ELES Downtime and Availability Detail Report, Escalator (01/2022 to 11/2024)
- ELES Elevator Asset List (11/05/2024)
- ELES Elevator Availability Chart (11/25/2024)

- ELES Elevator PM Check Sheets (09/2024 to 11/2024)
- ELES Elevator Work Order List - E08X04 and E08X05 (no date)
- ELES Escalator Asset List (11/05/2024)
- ELES Escalator Availability Chart (11/25/2024)
- ELES Escalator PM Check Sheets (09/2024 to 11/2024)
- ELES Escalator Work Order List - B10X01, B10X02, and B10X03 (no date)
- Elevator and Escalator Daily Digest Performance Summary (11/20/2024)
- Elevator and Escalator Certificate and Inspection Status tracker (no date)
- Elevator and Escalator Certification Status (no date)
- Elevator and Escalator PM Schedule (02/23/2025 to 03/08/2025)
- Step Skirt Indexing Tool Inventory and Calibration List (no date)
- Step to Skirt Measuring Device Inventory and Calibration List (no date)

INSPECTION AND MAINTENANCE: (CONTINUED)

- Third Party QEI Inspection/Test Report (04/2016)
- Water Intrusion Identification Log (no date)
- Water Remediation Program Priority List (no date)

INTERNAL REVIEWS:

- Internal Review, Service Delivery – Operations Compliance and Quality (06/22/2023)
- Internal Review, Service Delivery – Training, Certification and Safety Sensitive Employees Operational Testing (03/21/2023)
- Internal Safety Review, Elevators and Escalators Services (11/17/2023)

SAFETY CERTIFICATION:

- Job Hazard Analysis, Escalator Preventive Maintenance, Minor Repair, Service, Inspections (05/30/2024)

SAFETY CERTIFICATION: (CONTINUED)

- Job Hazard Analysis, Gear Box Replacement (05/30/2024)
- Job Hazard Analysis, Handrail Replacement (05/30/2024)
- Job Hazard Analysis, Hot Work Operations Welding, Cutting, Burning (05/30/2024)
- Job Hazard Analysis, Hydraulic Elevator Preventive Maintenance, Repair, Service, Inspections (05/30/2024)
- Job Hazard Analysis, Step Chain/Rack and Axle Replacement (05/30/2024)
- Job Hazard Analysis, Traction Elevator Preventive Maintenance, Repair, Service, Inspections (05/30/2024)
- Risk Mitigations Hazard Log (no date)

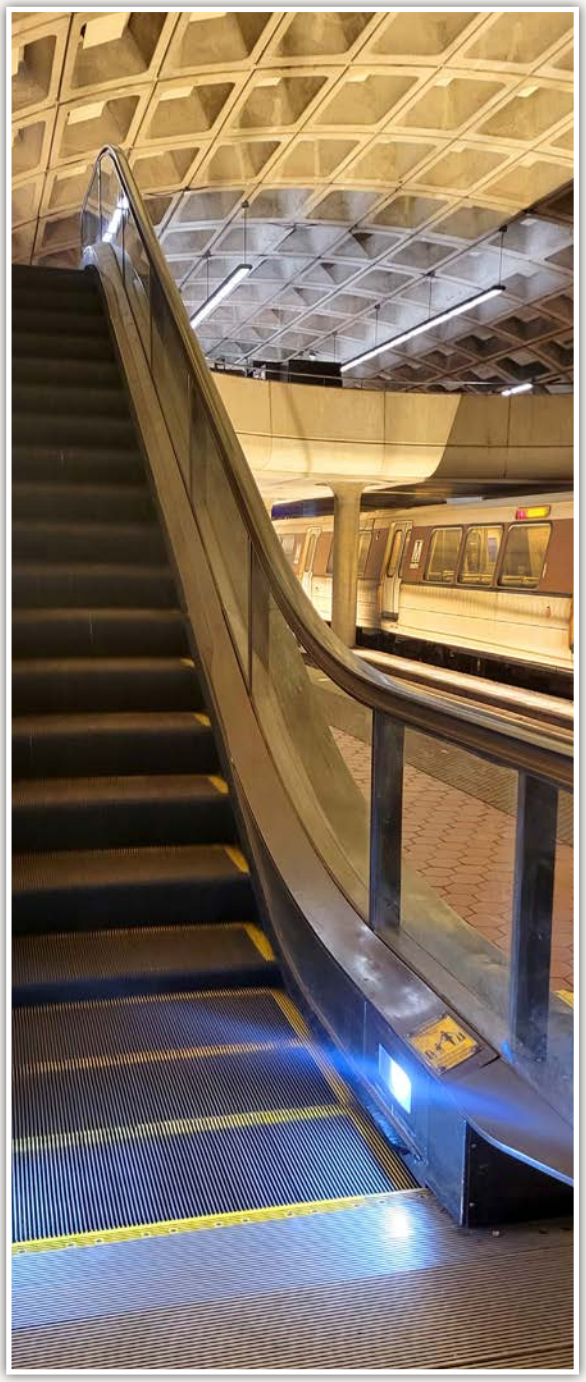
CAPITAL PROJECTS:

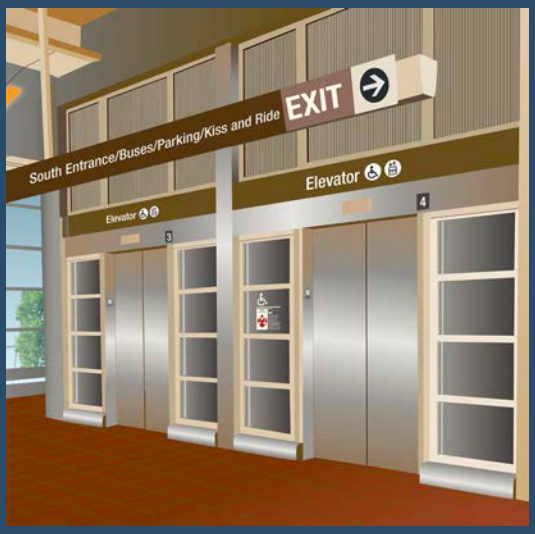
- CIP0072 Elevator Rehabilitation Program Overview (no date)

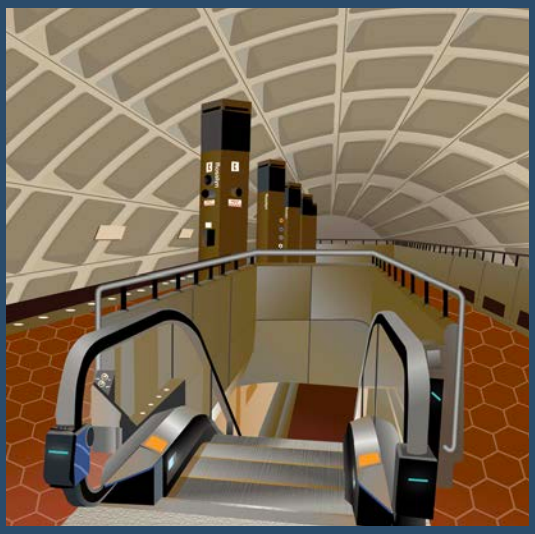
Appendix D

Appendix D: Public Transportation Agency Safety Plan Elements

1. **General Requirements**
   - a. Transit Agency Information
   - d. Safety Performance Targets (including Safety Performance Target Setting Methodology and Timeline, Safety Performance Targets, and System Reliability Targets)
   - f. Development and Implementation of a Safety Management System (SMS)
2. **Safety Management Policy**
   - a. Safety Management Policy
   - b. Employee Safety Reporting Program
   - c. Communication of the Safety Management Policy
   - d. Necessary Authorities, Accountabilities, and Responsibilities (including Accountable Executive, SMS Executive, Agency Leadership and Executive Management, Key Staff, and Safety Committees)
3. **Safety Risk Management**
   - a. Safety Risk Management Process (including Safety Hazard Identification, Safety Risk Assessment, and Safety Risk Mitigation)
   - b. Ongoing Management of Safety Risk (including Occupational Safety and Health Risk Management, Operational Safety Risk Management, Safety Certification, and Environmental Risk Management)
4. **Safety Assurance**
   - a. Safety Performance Monitoring and Measurement (including Monitoring Operations and Maintenance Procedures, Monitoring of Operational Safety Rik Mitigations, Safety Investigations, Information Monitoring, and Emergency Risk Management)
   - b. Management of Change
   - c. Continuous Improvement
   - d. Corrective Action Plans
5. **Safety Promotion**
   - a. Competencies and Training (including Employee Safety Training, Safety Rules and Procedures Training, Contractor Safety, Training Recordkeeping, Compliance with Training Requirements, and SMS-specific Training Requirements)
   - b. Safety Communication (including Direct Staff Communication, Hazard and Safety Risk Information, and Employee Safety Reporting Program Engagement)
6. **Documentation**







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