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WMSC Commissioner Brief: W-0156 – Serious Injury – Navy Yard Station – December 4, 2021

Prepared for Washington Metrorail Safety Commission meeting on April 12, 2022

Safety event summary:

Two contractors were injured by a work sled when it disconnected from a winch and descended into them at Navy Yard Station. One contractor sustained serious injuries that required medical transport to a hospital. The other contractor's injuries did not require medical assistance.

Contractors were completing welding work as part of rehabilitation work on an escalator unit in the station and utilized a sled to hoist equipment up and down the escalator truss. A mechanic helper was operating the winch at the top of the escalator unit and another helper was assigned to observe the hoisting line, periodically moving it to prevent the line from becoming caught. The sled, built by the contractor personnel specifically for the job, did not have a safety line attached. During hoisting operations, the sling disconnected from the winch and descended uncontrolled down the escalator truss, striking the two contractors who were in its path. The contractors should not have been inside the truss as the sled was being moved, however there were no safety procedures or work plans to communicate this requirement to them.

Contractor 1 sustained injuries to their arm as the sled passed them and Contractor 2 received serious injuries to their head, leg and back when the sled struck them and came to a stop. The work crew removed the sled from Contractor 2 and administered aid until District of Columbia Fire and Emergency Medical Services (DCFEMS) arrived and transported them to a local hospital. Contractor 1 did not require medical assistance.

According to interviews, the ELES Inspector responsible for oversight of the contractors was not present during the job safety briefing. They also did not witness the event.

Probable Cause:

The probable cause of this event was the use of equipment not engineered with adequate safeguards. A contributing factor to the severity of the outcome was the absence of a Job Hazard Analysis (JHA), work instructions or safety procedures requiring personnel to clear the path of the of the sled while in use.

Corrective Actions:

Metrorail collaborated with the Contractor to identify and implement best practices for sled use.

A Safety Stand Down related to construction hazard identification, rigging and working around hoisted equipment was conducted.

A qualified contractor is now designated to inspect all equipment prior to use.

Contractors will ensure job safety briefings are conducted using approved JHA prior to commencing work.

WMSC staff observations:

Metrorail should ensure all equipment used by contractors meets WMATA standards.

Metrorail should also conduct organized, consistent, and effective checks of construction and contractor work to ensure Metrorail rules and procedures are complied with.

The WMSC oversees Metrorail's work and safety obligations, whether that work is conducted by Metrorail employees, contractors, or sub-contractors. Metrorail safety rules apply to all of these Metrorail personnel. The WMSC considers the safety of all of these individuals when conducting our oversight work.

Staff recommendation: Adopt final report.

Washington Metro Area Transit Authority

Department of Safety and Environmental

Management (SAFE)

FINAL REPORT OF INVESTIGATION A&I E21631

Date of Event:	12/04/2021
Type of Event:	Serious Injury
Incident Time:	05:51 hours
Location:	Navy Yard Station, Escalator W02
Time and How received by SAFE:	06:00 hours via IMO Notification
WMSC Notification Time:	06:48 hours
Responding Safety Officers:	WMATA: No WMSC: No Other: N/A
Rail Vehicle:	N/A
Injuries:	Two contractors: one major injury, one minor injury
Damage:	None
Emergency Responders:	DCFEMS

Navy Yard Station – Serious Injury

December 4, 2021

Table of Contents

Abbreviations and Acronyms

CCTV	Closed-Circuit Television
CF	Contributing Factor
DCFEMS	District of Columbia Fire and Emergency Medical Services
ELES	Office of Elevators and Escalators
JHA	Job Hazard Analysis
NOAA	National Oceanic and Atmospheric Administration
RC	Root Cause
SAFE	Department of Safety and Environmental Management
SRC	Safety Risk Coordinator
WMATA	Washington Metropolitan Area Transit Authority
WMSC	Washington Metrorail Safety Commission

Executive Summary

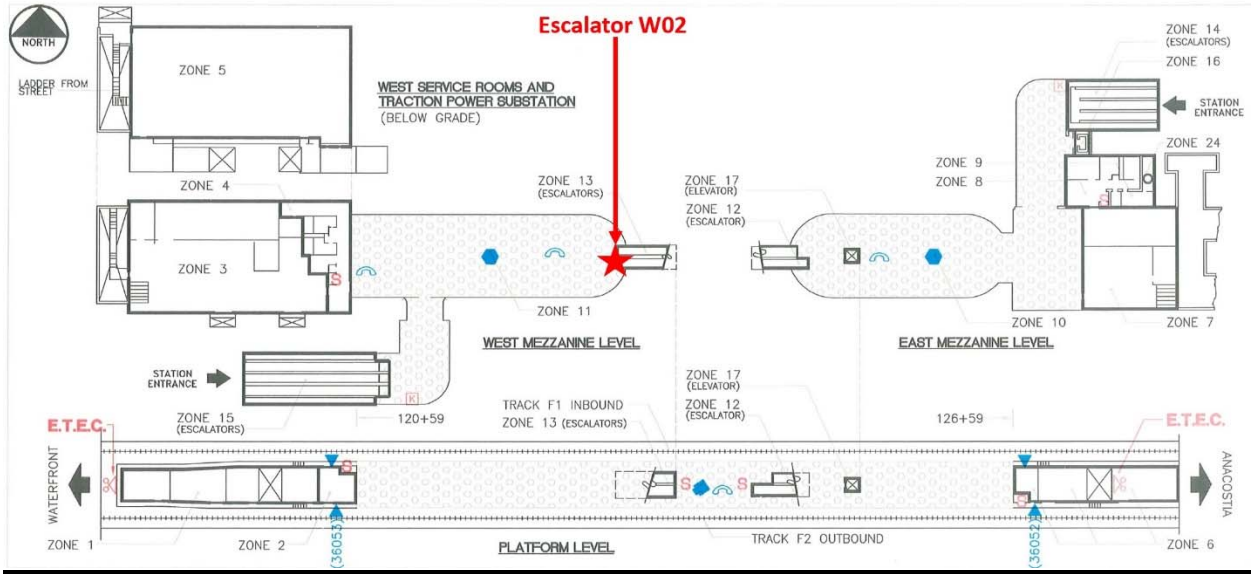
On Saturday, December 4, 2021, at approximately 05:51 hours, a Mid-American Elevator Company Inc. Contractor was injured while performing welding activities on Escalator W02 at the Navy Yard Station. A work crew containing four contractors was performing rehabilitation work on the Escalator W02. The work crew was in the process of removing their equipment after completing welding tasks towards the end of the overnight shift. The work crew utilized a crafted work sled to hoist and lower welding equipment throughout the shift. 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. The crew removed the work sled from the seriously injured contractor and provided immediate aid to them until they were transported to George Washington University Hospital for their injuries. The second contractor did not request medical treatment. There was no equipment damage as a result of this incident.

The probable cause of the serious injury event was inadequate equipment design. The design of work sled and hoist connection was built by contractor personnel specifically for this task. It was not engineered with adequate safeguards to prevent unintentional disconnection to the hoisting winch. A contributing factor to the incident 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.

Incident Site

Navy Yard Station, Escalator W02

Field Sketch/Schematics



Purpose and Scope

The purpose of this incident investigation and candid self-evaluation is to collect and analyze available facts, determine the probable cause(s) of the incident, identify contributing factors, and make recommendations to prevent a recurrence.

Investigation Methods

The investigative methodologies included the following:

- Formal Interviews – SAFE conducted four interviews as part of this investigation. Representatives from the Washington Metrorail Safety Commission (WMSC) and union representatives (as requested) were present. The interviews included the following personnel:
  - Office of Elevator and Escalator (ELES) Inspector (WMATA)
  - Contractor - Apprentice 1
  - Contractor - Apprentice 2
  - Contractor - Mechanic

- Informal Interviews – Collected through conversations with individuals during the investigation to provide background and supporting information.

- Documentation Review – A collection of relevant work history information and process documentation in Metro systems of record. These records include:
  - Contractors' Training and Certification Records
  - Contractors' 30-Day Work Histories
  - Mid-American Elevator Company Inc. and WMATA Contract

- Mid-American Elevator Company Inc. Safety Program
- National Oceanic and Atmospheric Administration (NOAA)
- Incident Photographs

- System Data Recording Review – A collection of information contained in Metro Data Recording Systems. This data includes:
  - Closed-Circuit Television (CCTV) Playback

Investigation

The contractor work crew reported assembling and receiving a job briefing at the beginning of their shift at approximately 23:00 hours on December 3, 2021. The WMATA inspector arrived after the job briefing, which was provided by the contractor lead. The briefing included a description of the work to be completed for the shift: welding operations for escalator rehabilitation of Escalator W02. Work operations continued throughout the shift without incident, with the work sled hoist operating without issue, transporting welding equipment throughout the work site. The WMATA inspector moved around the work area throughout the shift, observing work operations.

On Saturday, December 4, 2021, at approximately 05:51 hours, the crew of four Mid-American Elevator Contractors were completing work activities on Escalator W02 at the Navy Yard Station. As the work crew was in the process of completing the welding tasks for the evening, they organized their work tools to be removed. The work crew utilized a work sled throughout the shift to move welding equipment up and down the escalator truss where pan replacement operations were being conducted. As the crew cleaned up the work site for the day, the work sled was hoisted up. One helper was assigned to operate the winch during the hoisting operation. A second helper observed the hoisting line and periodically lifted it to prevent the line from becoming caught on the crossmembers/frame. During the hoisting operation, two contractors were located within the truss below the work sled. While in operation, the sling connecting the work sled to the winch became disconnected, causing it to descend the escalator truss and make contact with the two contractors working below. The work sled went past the first contractor who received minor injuries to their arm. The work sled continued to descend and made direct contact with the second contractor. This contact resulted in the second contractor receiving serious injuries to their head, leg and back. The other contractors came to the aid of the injured contractor and emergency services were requested. The work sled came to rest at the bottom of the escalator. The injured contractor was transported to George Washington University Hospital for their injuries. The work sled and escalator were not damaged in this incident.

Closed-Circuit Television (CCTV) Playback

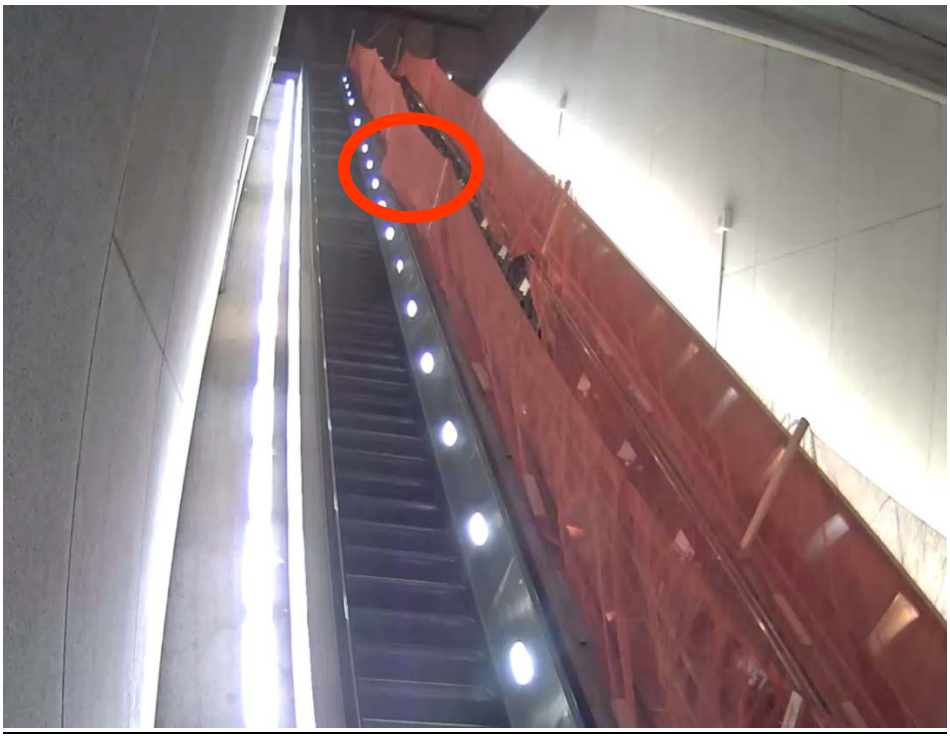


Diagram 1 – CCTV playback displaying the contractor fallen into the construction netting after being struck by the work sled at approximately 05:51:29 hours.

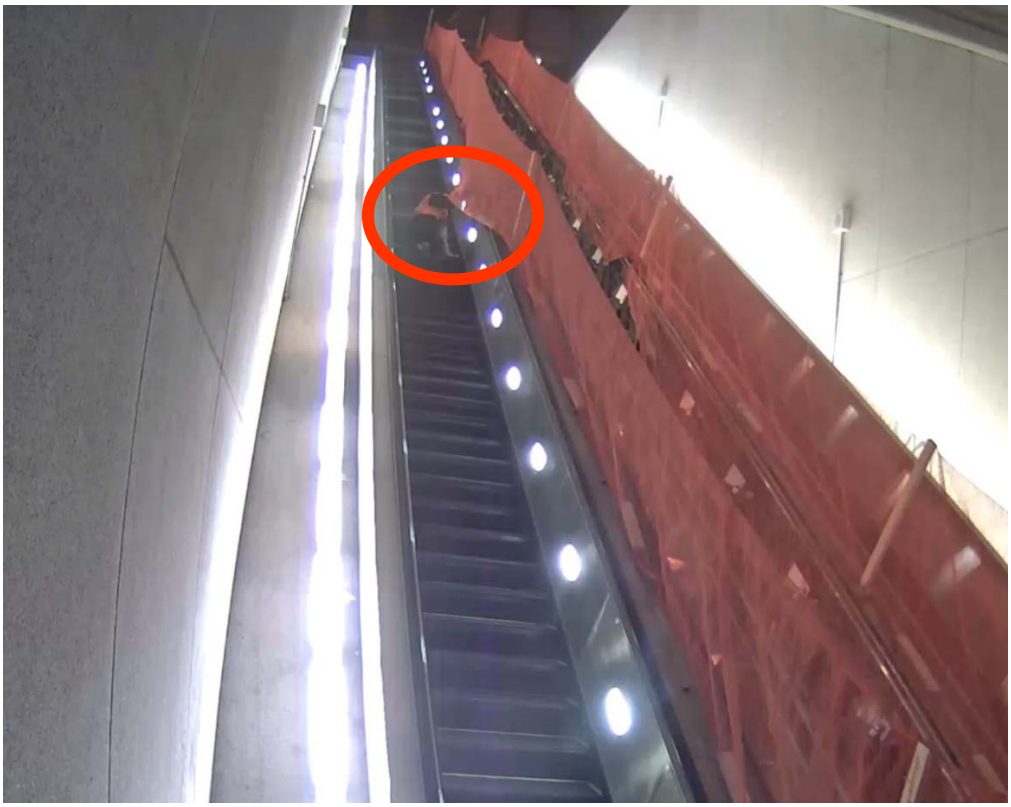


Diagram 2 – CCTV playback displaying the contractor crawling out of work area onto to adjacent, stopped escalator at approximately 05:52:05 hours.

Diagram 3 – CCTV playback displaying the contractor being transported away from the incident scene at approximately 06:06:16 hours.

Interview Findings

During the interviews with Mid-American Elevator personnel, it was revealed that the ELES Inspector was not present for the job safety briefing conducted before the contractors began working on the escalator. The Contractor-Mechanic reported the use of work sleds is common when working within escalator trusses to transport tools and equipment. They reported that the sled in use was built for this project by other members of the contractor team. The Contractor-Mechanic stated there were no work instructions to govern how the work sled should be operated. They added there were training requirements needed to operate a work sled. The Contractor-Mechanic also stated as the work sled was being hoisted, all work activities should have stopped until the work sled was secured.

Findings

- ELES Inspector was not present for the Job Safety Briefing conducted prior to work commencing, but was present throughout the shift.
- Work sled in use was assembled by personnel prior to the incident date for the work task.
- The winch being used to hoist the work sled did not contain a safety guard for the quick release function.
- The work sled did not have a safety line attached.
- The sling became detached from the retaining hook during the hoisting operation.
- Work Sled operations were not governed by a work instruction or job hazard analysis (JHA).

Weather

At the time of the incident, NOAA recorded the temperature at 43° F, partly cloudy, 71% humidity, north to south winds at 5 mph and visibility of 10 miles. The event occurred within an interior portion of the station. SAFE has concluded that weather was not a contributing factor in this incident (Weather source: NOAA – Location: Washington, DC).

Immediate Mitigation to Prevent Recurrence

- Work sled was secured at the incident scene.
- A work stoppage was issued for the escalator rehabilitation project at Navy Yard Station.
- Other escalator rehabilitation projects were inspected and confirmed to have no work sleds in use.

Probable Cause Statement

The probable cause of the serious injury event was inadequate equipment design. The design of work sled and hoist connection was built by contractor personnel specifically for this task. It was not engineered with adequate safeguards to prevent unintentional disconnection to the hoisting winch. A contributing factor to the incident 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.

SAFE Recommendations/Corrective Actions

SAFE will continue working with Mid-American Elevator and WMATA oversight personnel to identify and implement recommended best practices for the use of work sleds. These recommendations and corrective actions will be tracked and verified by SAFE upon completion. The responsible department will also be identified in the corrective action code, and the respective departmental Safety Risk Coordinator (SRC) will manage the mitigation.

Corrective Action Code	Description	Responsible Party	Estimated Completion Date
97187_SAFE CAPS_ELES_ 001	(RC-1, CF-1) Mid-American Elevator management will conduct a safety stand down related to construction hazard identification, rigging and working around hoisted equipment.	ELES/SAFE SRC	Completed
97187_SAFE CAPS_ELES_ 002	(RC-1, CF-1) Mid-American Elevator management will designate a qualified person (Safety Superintendent) to inspect all equipment prior to being used.	ELES/SAFE SRC	Completed
97187_SAFE CAPS_ELES_ 003	(RC-1, CF-1) Mid-American Elevator management will ensure all work sleds are engineered for their specific purpose prior to being approved for use.	ELES/SAFE SRC	Completed
97187_SAFE CAPS_ELES_ 004	(RC-1, CF-1) Mid-American Elevator management will ensure job safety briefings are conducted using an approved Job Hazard Analysis (JHA) prior to work commencing.	ELES/SAFE SRC	Completed
97187_SAFE CAPS_ELES_ 005	(RC-1, CF-1) ELES management will ensure assigned ELES Inspectors conduct direct observations of contractors to ensure the safety of workers.	ELES/SAFE SRC	4/15/2022
97187_SAFE CAPS_ELES_ 006	(RC-1, CF-1) ELES management will ensure ELES Inspectors complete training focusing on what to look for while on construction sites, and how and when to intervene when the worksite is unsafe.	ELES/SAFE SRC	5/1/2022
97187_SAFE CAPS_ELES_ 007	(RC-1, CF-1) ELES management will ensure all contractors conduct job safety briefings using an approved Job Hazard Analysis (JHA) prior to work commencing.	ELES/SAFE SRC	Completed
97187_SAFE CAPS_ELES_ 008	(RC-1, CF-1) ELES management will develop a Lessons Learned and distribute it throughout the department for awareness.	ELES/SAFE SRC	5/1/2022

Appendices

Appendix A – Interview Summaries

The below narratives are summaries of the interviews with SAFE and represent the statements made by the involved individuals. As such, times and details may present a conflict with the data contained in systems of record.

ELES Inspector

This employee is a WMATA ELES Inspector with a total of 23 years of service: seven years as an ELES Mechanic, five years as a Maintenance Supervisor and 11 years as a ELES Inspector. The ELES Inspector was RWP-4 certified in December of 2021. This employee had no history of sleep issues to report.

The ELES Inspector reported they were assigned to inspect the work of the contractors completing work on Escalator W02 at Navy Yard Station. When the incident occurred, the ELES Inspector stated they were not in the immediate area. After the incident occurred, the ELES Inspector went to the scene to assist the injured contractor. After the injured contractor was transported, the ELES Inspector began to conduct a preliminary investigation into the incident. The ELES Inspector stated the contractors were using the work sled to transport tools and equipment to and from the work area within the escalator truss. They stated there was one contractor at the top landing controlling the winch, and second contractor at the work sled as it moved up the escalator truss, a third contractor approximately 20 feet below the sled within the escalator truss, and the fourth contractor working below the third contractor within the escalator truss. ELES Inspector stated they were able to take photographs of the incident area, the work sled and tools the work sled was carrying. ELES Inspector stated they think as the work sled was being hoisted, it came in contact with a cross member which could have pushed the retaining clip (spring-loaded clasp) inward allowing the sling loop to become unsecured by the clip; resulting in the work sled traveling freely down the escalator truss towards the contractors working inside. ELES Inspector reported they could not have prevented the incident from occurring.

Contractor - Apprentice 1

This Contractor is a Mid-American Elevator employee with 3 months of experience as an Apprentice. This Contractor has no history of sleep issues to report.

Based on the SAFE interview, the Contractor stated they were working inside the escalator truss with a total of four contractors on the project. Contractor reported once they were finished with their work, they began to secure all the tools for the end of the shift. The Contractor reported they placed the welding machine and other tools on the work sled to be hoisted to the top of the escalator truss. As the work sled was being hoisted, the Contractor stated something came loose and the entire work sled began to descend down the escalator truss towards the two contractors working below. They reported they did no know what came loose. As the work sled descended, they stated it came in contact with the two contractors. Contractor then stated the work sled caused injuries to the contractor working at the lowest position and they went to render aid before calling emergency services. They stated there was not anything they could have done to prevent this incident from occurring.

Contractor - Apprentice 2

This Contractor is a Mid-American Elevator employee with 6 months of experience as an Apprentice. This Contractor has no history of sleep issues to report.

Based on the SAFE interview, the Contractor stated they were working within the escalator truss at Navy Yard Station when the incident occurred. The Contractor reported they were adjusting their position within the escalator truss and noticed the work sled descending in direction on their left side. As the Contractor attempted to get out of the way, the work sled made contact with them and they received minor injuries to their arm. The Contractor stated they used the work sled throughout the day without any issues. They stated they did not know what occurred during the hoisting operations because they were working within the escalator truss and not focused on what the other contractors were doing at the time. The Contractor stated they do not think they could have prevented the incident for occurring from their position.

Contractor – Mechanic

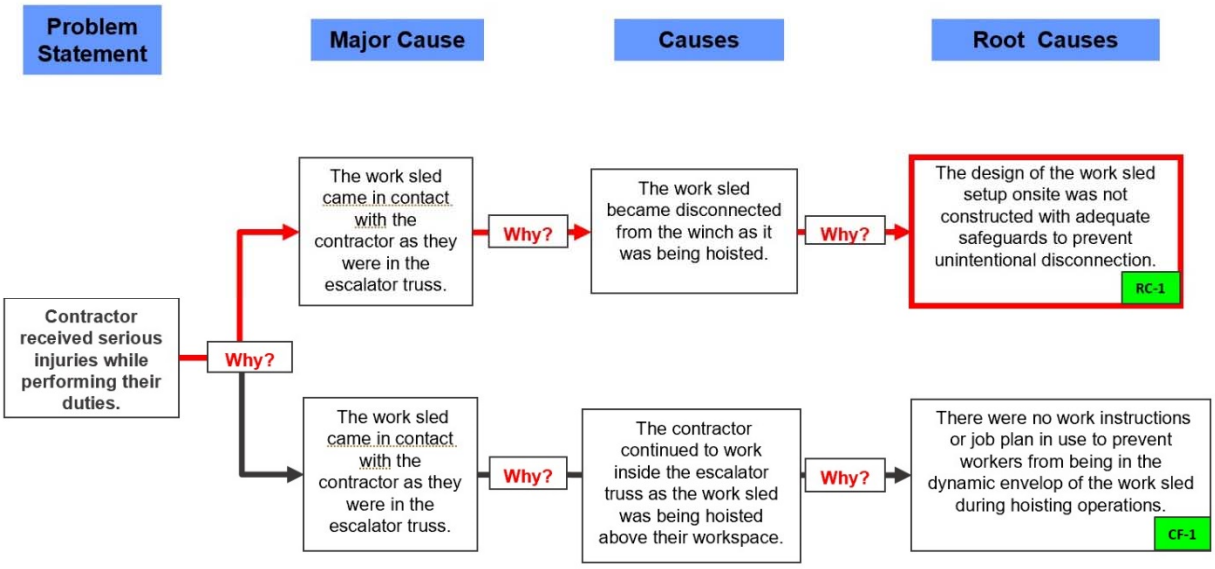
This Contractor is a Mid-American Elevator employee with 22 years of experience as a Mechanic. This Contractor has no history of sleep issues to report.

Based on the SAFE interview, the Contractor reported they were hoisting up the work sled after the work in the escalator truss was near completion. As they were hoisting, they stated something broke loose and the work sled dropped down the escalator truss towards the other contractors working. After they witnessed the work sled coming in contact with the contractor at the lowest position, they immediately went to render aid. The Contractor stated the injured contractor crawled out of the escalator truss where they had been working and onto the adjacent escalator. The Contractor stated they then called 911. After the incident occurred, they cleaned up the work area and secured all the tools and equipment. The Contractor stated they did not have an issue with the work sled prior to the event. They used it throughout their shift. The Contractor stated there was nothing they could have done to prevent the incident from occurring.

Injured Contractor

SAFE attempted to interview the contractor that sustained the serious injury via the Mid-American Elevator's Union Representative however the contractor declined to participate in an interview.

Appendix B – Root Cause Analysis



Appendix C – Photographs of Incident Site

Photograph 1 – Top view of Escalator W02 displaying the winch and work sled setup.

Photograph 2 – Close up view of hoist connection.

Photograph 3 – Bottom view of work sled in escalator truss.

Photograph 4 – Photograph of sling in use during incident.

Appendix D – Job Hazard Analysis

Job Hazard Analysis (JHA)

Activity/Work Task: Moving Welding Equip	Overall Risk Assessment Code (RAC) (Use highest code)					
Project Location: 89 Escal Modernization	**Risk Assessment Code (RAC) Matrix**					
Contract Number: FQ19006	**Severity**	**Probability**				
Date Prepared: 01/11/2022		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): [redacted]	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by (Name/Title): [redacted]	Marginal		M	M	L	L
Contractor/Subcontractor: TMAkm Joint Venture	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above). The RAC is developed after correctly identifying all of the hazards and fully implementing all controls.					
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely	**RAC Chart**				
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	E = Extremely High Risk				
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of JHA.	H = High Risk				
		M = Moderate Risk				
		L = Low Risk				

Job Steps	Hazards	Controls	P	S	RAC
Daily Safety Meeting ("5 minute safety plan")	General Hazard Reminders	Review project progress, changing work conditions and hazards (ladders, slip/trip/falls etc.)	U	Ca	E
When positioning welding equipment for work within the truss envelope proceed as follows: 1. Carry the welding equipment up/down the adjacent stairs or escalator that is out of service	General Hazard Reminders, Sprains/Strains, Damage to Material/Tank, Fire/Burns	Proper PPE when working. Use proper lifting techniques, use only approved mechanical lifting device if possible. Moon Dolly or winch are not to be used when transporting equipment, gas tank safety caps must be used whenever transporting or relocation tanks, Two (2) fire extinguishers are to be set up on site prior to welding, Fire watch maintained for one (1) hour after work is complete.	U	Ca	E

Document 1 – Mid-American Elevator Job Hazard Analysis page 1 of 3.

Activity/Work Task: Moving Welding Equip	Overall Risk Assessment Code (RAC) (Use highest code)	
Project Location: 89 Escal Modernization	**Risk Assessment Code (RAC) Matrix**	

2. Once you are at the appropriate location transfer the equipment over the upper deck to a coworker inside the truss envelope

3. If additional welding is to be performed beyond the cable reach, remove the equipment from the truss envelope and reposition the equipment by reversing the steps listed above

4. Neither the moon dolly or winch are to be used to transport welding equipment

5. Gas tank safety caps must be used whenever transporting or relocating tanks

Document 2 – Mid-American Elevator Job Hazard Analysis page 2 of 3.

Activity/Work Task: Moving Welding Equip	Overall Risk Assessment Code (RAC) (Use highest code)	
Project Location: 89 Escal Modernization	**Risk Assessment Code (RAC) Matrix**	
6. Prior to setting up welding operations make sure a minimum of two fully charged fire extinguishers are on site 7. Fire watch must be performed for a minimum of one hour after welding takes place		

Equipment(s) to be Used	Competent Person/Personnel name(s)	Inspection Requirements
	[redacted]	

Document 3 – Mid-American Elevator Job Hazard Analysis page 3 of 3.