PHOENIX REGIONAL STANDARD OPERATING PROCEDURES	
Policy Name: **LIGHT RAIL OPERATIONS**	Policy Number: **M.P. 206.21**
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Related Policies:	
Other Reference:	
Date Implemented: 12/2021-R	Review Date: 12/2026

PURPOSE

This procedure provides guidelines for managing emergency incidents involving the Valley Metro Light Rail System (VMR), highlights specific life safety hazards inherent to the system, and also discusses considerations for shutting down power to the system when necessary. This procedure also provides light rail system information necessary for safe operation and focuses on the most likely light rail scenarios crews will encounter. However, these guidelines are not a universal remedy, and due to the limitless possible scenarios responding personnel could encounter, responding crews should always evaluate risk and exercise caution when operating near the light rail system.

LIGHT RAIL TERMS

LRV= light rail vehicle
OCS= overhead catenary system (overhead light rail electrical wires)
TPSS= traction powered substation
ETS= emergency trip switch (located at TPSS)
OCC= operations control center (nerve center for communications and operations of light rail)
Pantograph= large mechanical arm that connects the LRV to the overhead wires

BACKGROUND

The Light Rail Vehicles (LRVs) operate on DC electric current supplied from the substations (TPSS) by two overhead wires (OCS). LRV's connect with the light rail system in an electrically powered public transportation system. The light rail uses a two-track system that typically run parallel to each other. The LRVs connect with the OCS via a pantograph (large mechanical arm) that can be raised and lowered. The tracks operate as the negative return (not a significant electrical threat) for the current. The Operations Control Center (OCC) functions as the nerve center for the light rail and is able to communicate directly with light rail Operators, Transportation Supervisors, and maintenance crews. The OCC is responsible for coordinating all light rail related emergency

activity. In the event of an emergency, the OCC has the ability remotely de-energize the OCS. The OCC is located in the VMR Operations and Maintenance Center (605 SS. 48th St, Phoenix). The estimated train frequency is every 12 minutes during peak operations and every 20 minutes during off-peak hours. The LRV's are controlled with an Operator located in the forward cab (each end has a cab) of the LRV. The Operator must operate the train by utilizing a controller which controls accelerations and braking. The controller is equipped with a "dead man" switch, which will bring the LRV to a complete stop if the Operator becomes incapacitated. The system times traffic lights using a predicative priority signally system that changes the signals much like the pedestrian button and car sensors do, but the only system that actively takes control of traffic signals is the Opticom system (when equipped) used by emergency responders. Train operators are required to stop for all red lights and hazards.

LRV

- 90 feet long, 12 feet high, 9 feet wide Cab at each end (1 Light Rail Vehicle)
- 103,000 lbs. empty with 200-person max capacity
- Normal max operating speed 35 mph
- Approximately 190 foot stopping distance at 35 mph
- Very Quiet

TRACK SWITCH LOCATIONS

- Allow train movement from one track to another
- Track switches move without warning
- Controlled manually / remotely
- Exert 1200 lbs. of force
- Will crush obstacles, including hands/feet if in switch location
- Manually operable

TRACTION POWER SUBSTATIONS (TPSS)

- Located approximately every mile
- Emergency Trip Switch (ETS) (located outside the door in Knox box)
- What's inside: electrical equipment and Ni-cad batteries
- Electricity AC 12000-21000 volts in, and 650-950 volts DC out

OVERHEAD CONTACT SYSTEM - OCS (THE OVERHEAD WIRES)

- 750-950 Volts Direct Current (DC)
- 2000-6000 AMPs (Taser is .00021 amps 50k volts)
- Wires are tensioned at 5,000 lbs. top wire, and 3000 lbs. bottom wire
- Wires will whip if severed
- The normal height of the light rail overhead contact system wire is 18 feet; however, the underpass at Washington and the SR143 has a max height of only 14.5 feet. BEWARE of lights, flags, or anything else sticking up when crossing the line

RESPONSE

Crews responding Code 3 across the tracks shall adhere to our Code 3 driving procedures. Additionally, any protrusion (extended utility lights, flags, etc.) must be lowered to avoid contact with OCS. Furthermore, the tracks represent an additional lane of traffic that must be cleared when driving. Left hand turns across the tracks account for the highest incidents of collisions with LRV's.

- Adds additional lane of traffic
- Normal height of OCS is 18 feet
- Lowest point is 14.5 feet located at Washington and the SR143 overpass
- Have all lights and/or flags lowered

OPERATING IN LIGHT RAIL INTERSECTIONS

LRV's are approximately 9 feet wide and operate on fixed rail. As such, LRV's are incapable of making contact with an object located outside of the LRV's dynamic envelope. LRV Operators are trained to operate at walking speed when emergency personnel are near the tracks. LRV's are equipped with a Car Wash Mode feature which restricts speed to no greater than 2MPH. The car wash mode may be activated upon request. If LRV movement could compromise the safety of firefighters operating on or adjacent to the light rail tracks, the Company Officer should contact Fire Dispatch and request a notification be made to the OCC to operate LRV's on the alternate track (Single Track Operation). The OCC will dispatch a Transportation Supervisor to the scene and implement an alternate service plan to ensure the safety of Fire personnel. Crews must remain watchful for LRV's, and Company Officers should consider assigning a crew member to watch for LRV's. In scenarios where both light rail tracks are obstructed (e.g., collision blocking both tracks, supply lines etc.) Company Officers must contact the Fire Dispatch and request a notification be made to the OCC advising of such conditions.

RESPONDING TO EMS CALLS ON THE LRV

- LVR Operator will coordinate next stop location with OCC and Alarm Room.
- The alarm room will provide the address and location during dispatch.
- Any open door on an LRV engages the brake and disables the throttle ensuring that the LRV will not move.
- As long as the LRV is functioning normally and on the track, there is no need to shut down power. This will allow the AC and lights to continue functioning.
- Maintain awareness of both LRV and vehicle traffic.

RESPONDING TO LRV VERSUS ANOTHER VEHICLE

When an LRV makes contact with a vehicle, the LRV Operator will notify the OCC. The Operator will then check all LRV's, and the occupants of the other vehicle for injury. All injury information will be relayed to the OCC. Due to low operating speeds most LRV collisions will not result in a derailment. A collision with a large vehicle (e.g., semi-truck, dump truck etc.) may result in a

derailment. If this occurs the LRV Operator will lower the pantograph and eliminate the electrocution risk from the OCS.

In the event of derailment where the pantograph becomes entangled or is unable to be lowered, the entire LRV becomes energized and poses a significant electrocution risk to both emergency responders and any passenger who makes ground contact (completes the circuit).

Company Officers should complete the following evaluation upon arrival to any LRV derailment or LRV vs. large vehicle accident:

ELECTRICAL HAZARD SIZE UP QUESTIONS

- Is the LRV on the tracks?
    - If LRV is on tracks, pantograph may stay raised.
    - If LRV is derailed, pantograph must be lowered.
- Is the Pantograph raised/tangled?
- Is the OCS intact (no poles or wires down)?

ELECTRICAL HAZARD SIZE UP

Scenario #1: If the LRV is derailed and the pantograph is still in contact with the OCS, responding crews should not make contact with the LRV and advise the LRV Operator to lower the pantograph. If the LRV Operator is unable to lower the pantograph, the Company Officer must de-energize the OCS by employing the use of Option #1 or Option #2.

Scenario #2: If the OCS has been compromised or appears to be severely damaged, or if lines are down then crews should not approach the LRV or track. The OCS must be de-energized by employing the use of Option #1 or Option #2.

Option #1: The Company Officer must contact Fire Dispatch and request a notification be made to the OCC to remotely de-energize the OCS. The OCC will have a visual notification that the OCS has been de-energized and will dispatch a Transportation Supervisor to respond to the incident scene with a Hot Stick to provide physical assurance that the OCS is de-energized.

Option #2: The Company Officer should assign another company (or do it themselves if in close proximity) to push the emergency trip switch (ETS) at the closest TPSS (requires Knox key). Pushing the ETS at the TPSS shuts down incoming AC power and outgoing DC power, and also sends a signal to the adjacent substations and shuts down their outgoing DC power, effectively isolating the section of line from power. However, there is no visible confirmation that power has actually been shut down. The Company Officer must contact Fire Dispatch and request a notification be made to the OCC requesting a Transportation Supervisor with Hot Stick to confirm that the OCS is de-energized.

In both instances Crews should refrain from physically touching the LRV and advise passengers to wait inside the LRV, until power has been confirmed to be de-energized.

ACCESS AND EXTRICATION

- Easiest access is through the LRV doors. Crew can manually open them by opening the exterior (emergency door releases). There is one location on each side of the vehicle, located on the left side when facing the LRV.
    - Windows are extremely hard to break
    - Cutting through the body of the LRV doesn't provide adequate access
- The train has been engineered with a bumper and bar 3 inches off the track to reduce the chance of a person becoming trapped underneath.
- LRV's are extremely heavy and unstable when lifting and this should be considered a last resort.
- Valley Metro has a vehicle that can safely lift LVRs, but it has an estimated response time of 30-60 minutes

TRAFFIC CONTROL

- Protect scene as necessary
- Beware of other LRV's in opposite direction
- Consider assigning a crewmember as lookout for LRV's
- Consider PD for traffic control

RESPONDING TO LRV FIRES

LRVs do not have a fire protection system (no sprinklers). Most of the working equipment (A/C, power supplies, and batteries) are located on the top of the LRV. Crews must ensure the LRV, and OCS are de- energized prior to attempting extinguishment of any significant LRV fires. Fires in the bottom undercarriage should only be extinguished after the pantograph has been lowered but does not necessitate shutting down the OCS.

Evacuate LRV (life safety first) to a safe location away from smoke

- Shut down power as necessary
- Stop other LRV traffic as necessary
- Protect the scene from traffic

RESPONDING TO FIRE AT TPSS

- Treat it like electrical substation/vault
- Do Not Enter or put water on it until absolutely confirmed de-energized by APS or SRP
- Beware of OCS
- Consider pushing the ETS, if it is safe to do so
- Call for hazmat if smoke is coming from within TPSS
- Be aware of the risk of hazardous smoke inhalation

MISCELLANEOUS

Natural Gas Incidents

- LRV's produce significant sparks and represent an ignition source for natural gas leaks
- LRV's traffic should be halted for any significant gas leak within close proximity

Impact of Smoke Plume on Light Rail System

- Treat the same way we treat other road closures for smoke plumes
    - LRV's have the ability to shut off outside air if necessary, and this should be a minimum consideration if LRV's are passing by smoke

IMPACTS TO FIRE OPERATIONS

The light rail system impacts Fire Department operations in several ways. First, the OCS represents an electrical hazard as do other electrical lines. OSHA requires any apparatus, ladders, or other equipment to maintain a ten-foot clearance from ungrounded electrical sources such as the OCS. The tracks present access obstacles and influence apparatus placement. Lastly, the alignment can impact water supply.

Consider the following:

- OCS electrical hazards
    - Must stay 10 feet away (in every direction) per OSHA
    - Electrocution risk if straight stream contacts energized OCS
    - Ensure that operating hose streams do not contact the OCS
- Fire ground apparatus placement
    - Crews should preplan first due areas and plan apparatus placement around the light rail
- Laying supply lines across tracks
    - Treat as a water supply of last resort and avoid whenever possible
    - If it is necessary to lay supply lines across the tracks, the Incident Commander will need to communicate clearly to the Alarm Room that they are doing so, and advise them to shut down light rail traffic for that section